

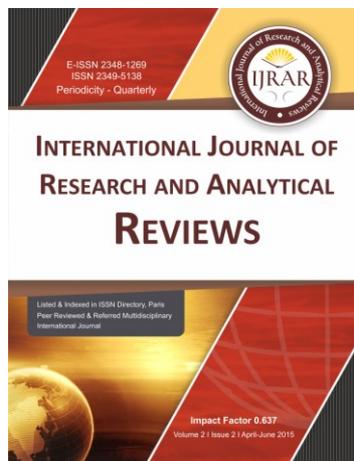
International Journal of Research and Analytical Reviews

UGC Approved Research Journal

Periodicity - Quarterly



Atman Publishing Academy



International Journal of Research and Analytical Reviews

Atman Publishing Academy

2061-C/2/B, Nr. Adhyatma Vidya Mandir, Sanskar Mandal, Bhavnagar-364002.

Contact : 9427903033 E mail : editorsijrar@gmail.com, ijrar1@gmail.com



International Journal of Research and Analytical Reviews

ijrar.com

© IJRAR - All rights reserved. Reproduction in any form is strictly prohibited.
This work is licenced under Creative Commons International Licence Attribution 4.0 E-version.

Rs. 900

Subscription	1 year	2 years	5 years
Individual	3,000	6,000	15,000
Institutional	4,000	8,000	40,000
Advertisement	1000/Black	3000/colour	Per Page

Send your Paper(s)/Article(s) and Contact us on any one of following

E mail: (1) editorsijrar@gmail.com (2) ijrar1@gmail.com (3) drbjoshi@ijrar.com

Contact No.: +91 9427903033

-
1. Thoughts, language vision and example in published research paper are entirely of author of research paper. It is not necessary that both editor and editorial board are satisfied by the research paper. The responsibility of the matter of research paper/article is entirely of author.
 2. Editing of the IJRAR is processed without any remittance. The selection and publication is done after recommendations of at least two subject expert referees.
 3. In any condition if any National/International University denies accepting the research paper/article published in IJRAR, than it is not the responsibility of Editor, Publisher and Management.
 4. Only the first author is entitle to receive the copies of all co-author.
 5. Before re-use of published research paper in any manner, it is compulsory to take written permission from the Editor – IJRAR, unless it will be assumed as disobedience of copyright rules.
 6. All the legal undertakings related to IJRAR is subject to Bhavnagar Jurisdiction.

Editor

International Journal of Research and Analytical Reviews

Atman Publishing Academy

2061-C/2/B, Nr. Adhyatma Vidya Mandir, Sanskar Mandal, Bhavnagar-364002.

Contact : 9427903033 E mail : editorsijrar@gmail.com, ijrar1@gmail.com

Editor in chief**Dr. R. B. Joshi****Senior Advisory Board**

Dr. H. O. Joshi Retd. Prof. & Head, Department of Education, Saurashtra University, Rajkot, Gujarat.	Dr. Bhavesh Joshi Associate Professor College of Food Processing Technology & Bioenergy, Agricultural University, Anand – 388110, Gujarat	Vasantkumar Pathak Director, Pathak Group of Schools & College, Rajkot.
---	---	---

Editorial Board

Prof. (Dr.) Ami Upadhyay Director, Department of Humanities And Social Sciences, Dr. Babasaheb Ambedkar Uni. A'Bad.	Dr. Awa Shukla Asst. Professor & Director, Social Sciences Dept. Babasaheb Ambedkar Open University, Ahmedabad.	Dr. Dushyant Nimavat Associate Professor Department of English, Gujarat University, Gujarat, India
Dr. A. Heidari Faculty of Chemistry California South University (CSU) Irvine, California, U. S. A.	Dr. Bharat Ramanuj Professor & Head, Department of Education, Saurashtra University, Rajkot.	Dr. Nahla Mohammed Abd El-Aziz Assistant professor - Entomology Department, Faculty of Science Cairo University, Egypt.
Dr. Manahar Thaker Principal G. H. Sanghavi college of Education, Bhavnagar, Gujarat.	Dr. K. S. Meenakshisundaram Director, C. A. A., Great Lakes Institute of Management, Chennai	Dr. J. D. Dave I/c Principal P.D. Malviya Graduate Teachers' College, Rajkot, Gujarat.
Dr. M. B. Gaijan Associate Professor, Shamaldas Arts College, Bhavnagar.	Dr. A. K. Lodi H.O.D. Faculty of Education, Integral University, Lucknow(UP)	Dr. Trupti Pathak Assistant Vice President(Tech.) Claris life Sciences, Ahmedabad. Gujarat.
Dr. K. Ramadevi Associate Professor Department of Civil Engineering Kumaraguru College of Technology, Coimbatore, Tamilnadu.	Dr. Jayant Vyas Professor & Head, Department of Education, M. K. Bhavnagar University, Bhavnagar	Dr. Dilip D. Bhatt Associate Prof. & Head, Department of English, V. D. K. Arts college, Savarkundla, Gujarat.
K. S. Dave Lecturer J. H. Bhalodia Women's College Rajkot, Gujarat.	Dr. Anil Ambasana Retd. Prof. & Head, Department of Education, Saurashtra University, Rajkot. Gujarat.	Dr. Sandeep R. Sirsat Associate Professor & Head, Department of Computer Science, Shri Shivaji Science & Arts College, Chikhli, Dist: Buldana (M.S.-India)

Review Committee

Editor & Head of Review Committee

Dr. S. Chelliah

Professor & Head,

Dept. of English and Comparative Literature,
Madurai Kamraj University, Madurai-21, **India.**

<p>Mr. Zeeshan Shah Senior Lecturer, Department of Multimedia and Communication, University College of Bahrain, Kingdom of Bahrain.</p>	<p>Dr. Samira Shahbazi Plant Protection & Biotechnology Research Group, Nuclear Agricultural Research School, Nuclear Science & Technology Research Institute (NSTRI), Iran</p>	<p>Dr. Belal Mahmoud Al-Wadi Lecturer, University of Dammam (Saudi Arabia), Founder & Vice President of the Jordanian Society for Business Entrepreneurship (Jordan)</p>
<p>Harish Mahuvakar Associate Professor & Head, Dept. of English, Sir P. P. Institute of Science, Bhavnagar, Gujarat, India.</p>	<p>Dr. Mainu Devi Assistant Professor (Sr. Grade) in Zoology, Diphu Govt. college, Karbi Anglong – Assam India.</p>	<p>Asim Gokhan YETGIN Assistant Professor, Faculty of Engineering, Dumlupinar University, Kutahya, Turkey.</p>
<p>Dr. A. Kusuma Assistant Professor, Department of Social Work, Vikramasimhapuri University, Nellore.(AP)</p>	<p>Prof. Rajeshkumar N. Joshi I/C Dean, Faculty of Arts & Humanities, C. U. Shah University, Gujarat, India.</p>	<p>Sunita. B. Nimavat Assistant Professor of English, N.P.College of Computer & Mgt., Kadi (North Gujarat).</p>
<p>Nahla Mohammed Abdelazez Assistant Professor Faculty of Science, Cairo University, Giza Governorate, Egypt.</p>	<p>Dr. Riyad Awad Associate professor, Structural Engineering, An - Najah National University, Nablus, Palestine.</p>	<p>Dr. Amer A. Taqa Professor Dept. of Dental Basic Science, College of Dentistry, Mosul University, Masul, Iraq.</p>

Contents

C. S.

01	Applications and Challenges of IOT Manjunath V	01 – 08
02	Lifetime Enhancement of the Wireless Sensor Network Using the Sink Relocation and the Cluster Methodology Swarna.N	09 – 13
03	Awareness and utility of HELINET consortia resources by PG students, Faculty members and Research scholars of Pharmacy Colleges Ramesha J & Dr. Dhanamjaya. M & Prof. V.G. Talawar	14 – 22
04	SENTIMENT ANALYSIS USING DEEP LEARNING Rekha Raichal & Rahul .U & Gandikota Ayyappa	23 – 29
05	Impact of Artificial intelligence in 21st century business Mukunda.G & Punitha.G	30 – 33
06	Correlation between Big Data and Cloud Computing Navatha. S, Kavitha. M,	34 – 37
07	Research Paper on Basic of Artificial Neural Network Netra Sanjeev Mirji & Shivam Kumar	38 – 43
08	PARTIALLY IMPAIRED STUDENT AND COMPUTER SCREEN MAGNIFIER Vidhya P & N.Kapilan	44 – 48
09	COMPARATIVE STUDY ON WEB DEVELOPMENT - WEB 1.0, WEB 2.0 & WEB 3.0 Vsantha S & Raghavendra Rao B G	49 – 52
10	Influence of AJAX Technology in Web Applications THIMMAPPA NT & RAMESHA S.	53 – 57
11	A Comparative Study on Big Data with Various Technologies Archana M, & Sushmitha U & Flora Princess	58 – 63
12	Recent Advances in Applications of Augmented Reality Pavana B.S & Prabhal subbaiah P & Mohan G.K	64 – 68
13	OBJECT ORIENTED APPLICATION FRAMEWORKS AMITHA K.N & FARHEEN KHANUM	69 – 74
14	A Survey on Artificial Intelligence and Its Applications Jyothsna A.N, Manoj Kumar G.A, Jafur , Dhanush R	75 – 77
15	Artificial Intelligence in Indian Health Sector Ms. Shruti D. Nilegaonkar	78 – 80

International Journal of Research and Analytical Reviews

- 16 **DATA MINING Earlier Prediction of Heart Disease using Locality Sensitive Hashing** 81 – 86
Dr Vinay Ranganathan & S.Geetha Ramesha
- 17 **TEXT MINING AND SENTIMENT ANALYSIS DEPICTING STRESS LEVELS AMONG STUDENTS DUE TO EXAMINATIONS USING R PROGRAMMING** 87 – 92
Veena.R & Jyothsna.R
- 18 **IOT BASED SMART FARMING: CHALLENGES AND OPPORTUNITIES IN INDIAN PERSPECTIVE** 93 – 97
Archana Karnik K.M, Amitha S.K
- 19 **INTERNET OF THINGS (IOT)** 98 – 102
Thimmappa . T. N & Rashmi.M.J & Supriya.R
- 20 **Analysis of SMC Using Artificial Neural Networks** 103 – 106
Sharmila.G
- 21 **Science and technology** 107 – 107
Dr.Sharmila Biswas

ECE

- 22 **SIZE AND SHAPE CONTROLLED BAND GAP VARIATION IN CdSe QUANTUM DOTS AND RODS** 108 – 112
Malasa M.R, Akhila B.D
- 23 **A Study on Nanoparticles and their applications** 113 – 115
Rajashri Padaki & Aishwarya Padaki
- 24 **A brief study of Graphene and its applications** 116 – 121
Rajashri Padaki & Rohan Anvekar & Rohit Hosmani & Netra Mirji
- 25 **Rectangular Slot Loaded Square Monopole Microstrip Antenna for Triple band operation** 122 – 125
Basawaraj Patne, Nagraj Kulkarni and S.N. Mulgi

Maths

- 26 **A STUDY OF SOME APPLICATIONS OF DIGRAPHS** 126 – 132
RoopaRajashekhar Anagod and Putul Dutta
- 27 **Concepts of Mathematical Modeling-A Decision Making Tool in Economics** 133 – 136
Shobha T & Ramesh T C
- 28 **Solution of Non-Linear Differential Equations with Exponential Function using Power Series Method** 137 – 139
Prof. Ramesh T C & Prof. Shobha T
- 29 **EXACT SOLUTIONS FOR HEAT TRANSFER OF A MAGNETOHYDRODYNAMIC FLUID-SATURATED POROUS MEDIUM OVER A PERMEABLE NON-ISOTHERMAL STRETCHING SHEET** 140 – 148
S.S. Bellad, Archana M and Vijayalakshmi A.R
-

- 30 **STUDY OF VELOCITY AND TEMPERATURE OF GRAVITY-DRIVEN CONVECTIVE NANOFLUIDS FLOW PAST AN OSCILLATING AN OSCILLATING VERTICAL PLATE IN THE PRESENCE OF MAGNETIC FIELD** 149 – 155
Ramya T.G. and Vijayalakshmi A.R
- 31 **CONFORMALLY BERWALD FINSLER SPACE WITH (α, β) - METRIC** 156 – 158
Sheelavathi R, Vasantha D M
- 32 **Comparative Study of Optimization Techniques in Transportation Problem** 159 - 166
Suma C & Haritha A
-

National Conference

SAMVIDH - 2019

14th OCTOBER 2019

Organised by

SESHADRIPURAM EDUCATIONAL TRUST

SESHADRIPURAM FIRST GRADE COLLEGE

NAAC ACCREDITED 'A' GRADE

Recognized by UGC under 20 2(f) & 12(B),

Affiliated to Bengaluru Central University #26, Yelahanka New Town,

Bengaluru -560064.

International Journal of Research and Analytical Reviews

SESHADRIPURAM EDUCATIONAL TRUST(SET)

Seshadripuram Educational Trust is one of the oldest and most reputed educational organizations in the country. The Seshadripuram group of institution was founded in the year 1930. SET has grown from strength to strength to a total student population of over 20,000.

SESHADRIPURAM FIRST GRADE COLLEGE

Seshadripuram First Grade College, a premier educational institution founded in 1992, is an academic fraternity of individuals dedicated to the motto of 'commitment to excellence'. We strive to reach perfection through our Earnest academic pursuit of excellence. The college offers undergraduate courses in Commerce(B.Com), Management(BBA), Science(BCA, BSc-EMC and BSc-BBG) and Postgraduate courses in commerce M.Com(FA) and Business Administration(MBA).

INTERNAL QUALITY ASSURANCE CELL

Quality assurance and enhancement being an ongoing campaign, the IQAC of the college organizes workshops and seminars on quality related themes and the various programs of the college have been documented in the form of a self-study report.

- To develop a system for conscious, consistent and catalytic improvements, quality and performance
- To make a significant and meaningful contribution towards academic excellence
- To usher in quality by working out intervention strategies to enhance performance
- To optimize and integrate modern methods of teaching and learning
- To disseminate information on quality parameters and share research with other institutions
- The IQAC of S.F.G.C is chaired by the Principal and constituted with members of the Trust and heads of departments as members.

NATIONAL CONFERENCE

ABOUT SAMVIDH

This Sanskrit word means **knowledge and experience**. The people and ideas that are ahead of their time, innovative, experimental and fresh. *Samvidh* which begins as a movement in the cultural realm morphed gradually as the hallmark of modernism, epitomizing ideas, styles and methods that are very original, pushing disciplinary boundaries, innovating and applying new concepts and techniques beyond the mainstream status quo.

CONFERENCE OBJECTIVES

SAMVIDH-2019

We have great pleasure in informing you about National Conference to be held on 14th, October 2019 at Seshadripuram First Grade College campus, Yelahanka New Town, Bangalore-64. The conference will provide a platform to share your approaches, issues and the emerging ethos of the conference across the country. We take immense pleasure in inviting you and your colleagues to participate and present papers in our conference.

International Journal of Research and Analytical Reviews

PHYSICAL SCIENCES – STEM

The department of physical sciences started in the academic year 1999. Since its genesis, the department is striving to set a platform for faculty and students to enhance the research ideas in various ways by means of conducting conferences, workshops competitions, seminars, symposiums, guest lectures, paper and poster presentations and minor projects. This national conference aims to explore and enhance the potential of the researchers and inspire the science fraternity.

Conference Committee

Chief Patron:

SHRI N. PANDITARADHYA

President, Seshadripuram Educational Trust.

Patrons:

DR. WOODAY P. KRISHNA

Honourable General Secretary.

SHRI W.D ASHOK

Management representative: IQAC
Hon Trustee, Seshadripuram Educational Trust

Organising Committee

DR.S.N. VENKATESH

Principal, Seshadripuram First Grade College and Conference chairman.

PROF.P.V. MATHEW

IQAC Co-ordinator.

PROF.T.C. RAMESH

Head, Department of Mathematics.

PROF.RAJASHRI PADAKI

Head, Department of Electronics.

International Journal of Research and Analytical Reviews

PROF.T SHOBHA

PROF. H.K MOHAN

PROF.REKHA RAICHAL

Head, Department of Computer Science

PROF.NETRA SANJEEV MIRJI

PROF. N.T THIMMAPPA

PROF. K.N AMITHA

PROF. D.N SHRUTI

PROF. M ARCHANA

PROF. B.S PAVANA

PROF. S RAMESHA

PROF. A.N JYOTHSNA

PROF. T.K DIVAKAR

Faculty Co-Ordinators

PROF.NETRA SANJEEV MIRJI

Convenor, Physical Science Forum

PROF. A.N JYOTHSNA

Conference Convenor.

PROF. M ARCHANA

Co-Convenor

PROF. T SHOBHA

PROF. H.K MOHAN

PROF. N.T THIMMAPPA

PROF. B.S PAVANA

Contact Details

PROF. A.N JYOTHSNA: 9986202828

PROF. M ARCHANA: 8095926332

Applications and Challenges of IOT

Manjunath V

Assistant Professor,

Department of Computer Science, Government First Grade College,
Gurumatkal, Yadgir.

ABSTRACT: Nowadays Internet of Things (IoT) gained a great attention from researchers, since it becomes an important technology that promises a smart human being life, by allowing a communications between objects, machines and every things together with peoples. IoT represents a system which consists a things in the real world, and sensors attached to or combined to these things, connected to the Internet via wired and wireless network structure. The IoT sensors can use various types of connections such as RFID, Wi-Fi, Bluetooth, and ZigBee, in addition to allowing wide area connectivity using many technologies such as GSM, GPRS, 3G, and LTE. IoT-enabled things will share information about the condition of things and the surrounding environment with people, software systems and other machines by the technology of the IoT, the world will becomes smart in every aspects, since the IoT will provides a means of smart cities, smart healthcare, smart homes and building, in addition to many important applications such as smart energy, grid, transportation, waste management and monitoring . In this paper covered a concept of many IoT applications and the challenges that facing the implementation of the IoT.

Keywords: IoT Applications, Future Technologies, Smart Cities, Smart Environment, Smart Energy and Grid, Smart Manufacturing, Smart Healthcare.

INTRODUCTION

The Internet of Things (IoT), sometimes referred to as the Internet of Objects, will change everything including ourselves. The Internet has an impact on education, communication, business, science, government, and humanity [1]. Clearly, the Internet is one of the most important and powerful creations in all of human history and now with the concept of the internet of things, internet becomes more favorable to have a smart life in every aspects[2].

Internet of Things is a new technology of the Internet accessing. By the Internet of Things, objects recognize themselves and obtain intelligence behavior by making or enabling related decisions thinks to the fact that they can communicate information about themselves [3]. These objects can access information that has been aggregated by other things, or they can added to other services [3]. Figure 1 reviews that with the internet of things, anything's will able to communicate to the internet at any time from any place to provide any services byany network to anyone. this concept will create a new types of applications can involve such as smart vehicle and the smart home, to provide many services such as notifications, security, energy saving, automation, communication, computers and entertainment [4,5].

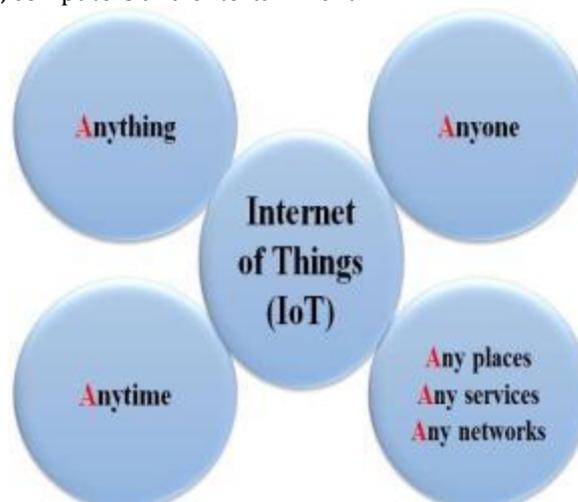


Figure 1. Internet of things Concept

By developing the IoT technology, testing and deploying products it will be much close to implementing smart environments by 2020 [6]. In the near future, storage and communication services will be highly pervasive and distributed: people, machines, smart objects, surrounding space and platforms connected with wireless/wired sensors, M2M devices, RFID tags will create a highly decentralized resources interconnected by a dynamic network of networks [7].

In the IoT, the communication language will be based on interoperable protocols, operating in heterogeneous environments and platforms [8]. IoT in this context is a generic term and all objects can play an active role to their connection to the Internet by creating smart environments, where the role of the Internet has changed[9]. The aim of this paper is presents the internet of things Applications and challenges.

1. INTERNET OF THINGS STANDARDIZATIONS AND PROTOCOLS

By the 2020 around 50 to 100 billion things will be connected electronically by internet [10]. Figure 2 shows the growth of the things connected to the internet from 1988 to forecast 2020. The Internet of Things (IoT) will provide a technology to creating the means of smart action for machines to communicate with one another and with many different types of information [11]. The success of IoT depends on standardization, which provides interoperability, compatibility, reliability, and effective operations on a global scale [12].

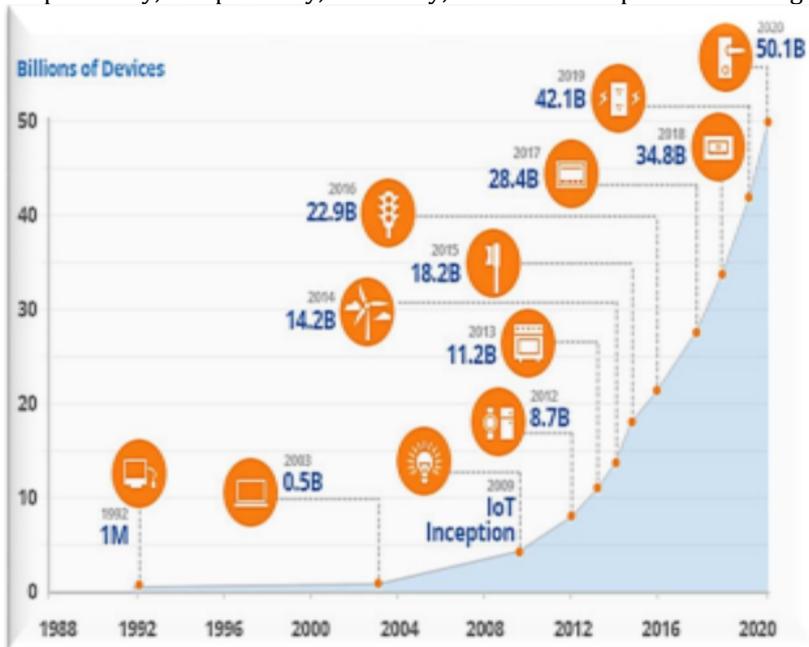


Figure 2. Internet of Things Growth

Today more than 60 companies for leading technology, in communications and energy, working with standards, such as IETF, IEEE and ITU to specify new IP based technologies for the Internet of Things.

The design of the IoT standards is required to consider the efficient use of energy and network capacity, as well as respecting other constraints such as frequency bands and power levels for radio frequency communications. As IoT evolves, it may be necessary to review such constraints and investigate ways to ensure sufficient capacity for expansion, for example in case of additional radio spectrum allocation as it becomes available.

IEEE Standards Association (IEEE-SA) develops a number of standards that are related to environment need for an IoT. The main focus of the IEEE standardization activities are on the Physical and MAC layers. The IEEE provides an early foundation for the IoT with the IEEE802.15.4 standard for short range low power radios, typically operating in the industrial, scientific and medical band in addition to use ZigBee technology. The IEEE-SA has an over 900 active standards and more than 500 standards under development. In its research into IoT, it has identified over 140 existing standards and projects that are relevant to the IoT. The base project related to IoT is IEEE P2413 which it is currently considering the architecture of IoT. ETSI produces globally applicable standards for information and communications technologies (ICT), including fixed, mobile, radio, converged, broadcast and Internet technologies, discusses a similar concept under the label of “machine to machine (M2M) communication.

These standards are considered as one of the basic standards of IoT, because its associate with M2M technology which is one of the basic techniques related to IoT.

Internet Engineering Task Force (IETF) is concerned with the evolution of the Internet architecture and the smooth operation of the Internet and known as large, open to international community of network designers, operators, vendors and researchers. IETF provides its own description of IoT which provides a most recognizable enhancement to support IPv6, with the 6LoWPAN. The 6TiSCH Working Group is being formed at the IETF to address the networking piece of that unifying standard. Based on open standards, 6TiSCH will provide a complete suite protocols for distributed and centralized routing operation over the IEEE 802.15.4e TSCH MAC. ITU's Telecommunication Standardization Sector (ITU-T) considered as a first organization of standards development and coordination of the Internet of Things. They but standards to gain benefit of integrated information processing capacity, and industrial products with smart capabilities. In addition to make development on electronic identities that can be queried remotely, or be equipped with sensors for detecting physical changes around them.

2. INTERNET OF THINGS APPLICATIONS

Internet of things promises many applications in human life, making life easier, safe and smart. There are many applications such as smart cities, homes, transportation, energy and smart environment.

a. Smart Cities

Many major cities were supported by smart projects, like Seoul, New York, Tokyo, Shanghai, Singapore, Amsterdam, and Dubai. Smart cities may still be viewed as a cities of the future and smart life, and by the innovation rate of creating smart cities today's, it will became very feasible to enter the IoT technology in cities development. Smart cities demand require careful planning in every stage, with support of agreement from governments, citizens to implement the internet of things technology in every aspects. By the IoT, cities can be improved in many levels, by improving infrastructure, enhancing public transportation reducing traffic congestion, and keeping citizens safe, healthy and more engaged in the community as shown in Figure 3. By connection all systems in the cities like transportation system, healthcare system, weather monitoring systems and etc., in addition to support people by the internet in every place to accessing the database of airports, railways, transportation tracking operating under specified protocols, cities will become smarter by means of the internet of things.

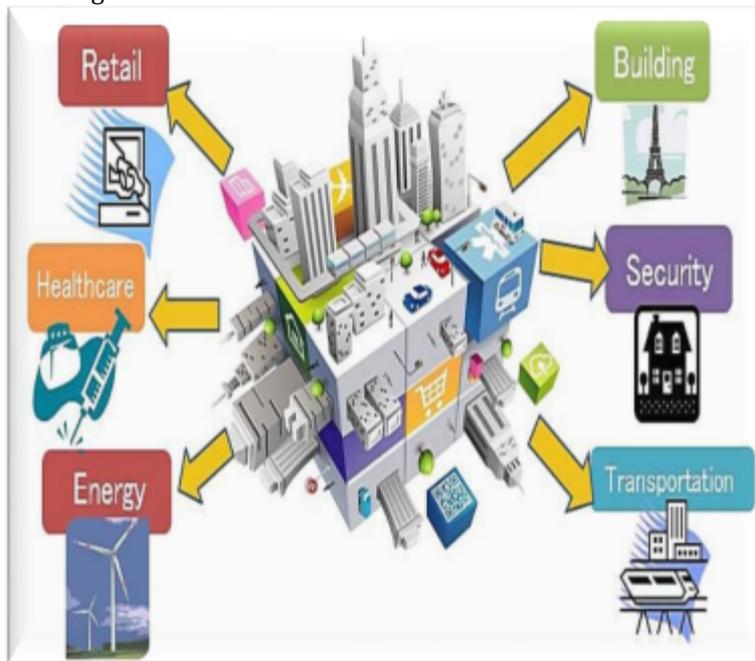


Figure 3. Smart Cities Aspects

b. Smart Home and Buildings

Wi-Fi's technologies in home automation has been used primarily due to the networked nature of deployed electronics where electronic devices such as TVs, mobile devices, etc are usually supported by Wi-Fi. Wi-Fi have started becoming part of the home IP network and due the increasing rate of adoption of mobile computing devices like smart phones, tablets, etc. For example a networking to provide online streaming

services or network at homes, may provide a mean to control of the device functionality over the network. At the same time mobile devices ensure that consumers have access to a portable 'controller' for the electronics connected to the network. Both types of devices can be used as gateways for IoT applications. Many companies are considering developing platforms that integrate the building automation with entertainment, healthcare monitoring, energy monitoring and wireless sensor monitoring in the home and building environment. By the concept of the internet of things, homes and buildings may operate many devices and objects smartly, of the most interesting application of IoT in smart homes and buildings are smart lighting, smart environmental and media, air control and central heating, energy management and security as shown in Figure 4 below.



Figure 4. Smart Home & building applications

Wireless sensor networks (WSNs) with integration to the internet of things technology will provide an intelligent energy management in buildings, in addition to the obvious economic and environmental gains. Internet together with energy management systems also offers an opportunity to access a building's energy information and control systems from a laptop or a smartphone placed anywhere in the world. The future Internet of Things, will provide an intelligent building management systems which can be considered as a part of a much larger information system used by facilities managers in buildings to manage energy use and energy procurement and to maintain buildings systems.

c. Smart Energy and the SmartGrid

A smart grid is related to the information and control and developed to have a smart energy management [41]. A smart grid that integrates the information and communications technologies (ICTs) to the electricity network will enable a real time, two way communication between suppliers and consumers, creating more dynamic interaction on energy flow, which will help deliver electricity more efficiently and sustainably. The key elements of information and communications technologies will include sensing and monitoring technologies for power flows; digital communications infrastructure to transmit data across the grid; smart meters with in-home display to inform energy usage; coordination, control and automation systems to aggregate and process various data, and to create a highly interactive, responsive electricity. Many applications can be handled due to the internet of things for smart grids, such as industrial, solar power, nuclear power, vehicles, hospitals and cities power control. Figure 5 shows the most important application that may be enabled by the internet of things as in the smart grid aspect.



Figure 5. Smart grid applications

Today’s grid is very reliable and can deal with normal electricity fluctuations and it will take a step further towards using a low carbon energy system, by allowing integration between the renewable energy and green technologies, and offering many benefits to customer in cost savings through efficient energy use at home.

d. SmartHealth

A close attention that required to hospitalized patients whose physiological status should be monitored continuously can be constantly done by using IoT monitoring technologies. For smart health sensors are used to collect comprehensive physiological information and uses gateways and the cloud to analyze and store the information and then send the analyzed data wirelessly to caregivers for further analysis and review as shown in Figure 6 below [45]. It replaces the process of having a health professional come by at regular intervals to check the patient’s vital signs, instead providing a continuous automated flow of information. In this way, it simultaneously improves the quality of care through constant attention and lowers the cost of care by reduces the cost of traditional ways of care in addition to data collection and analysis.

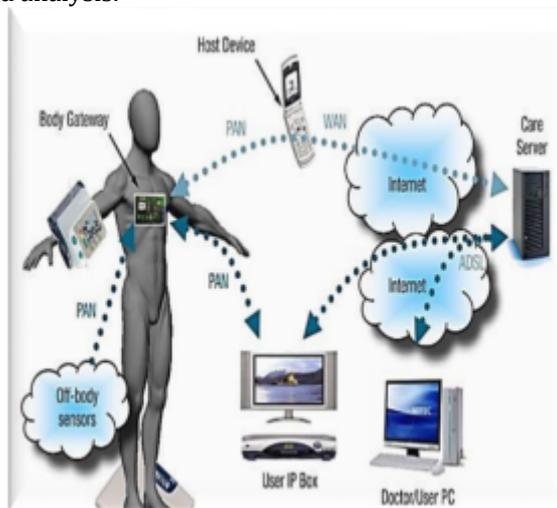


Figure 6. Smart healthcare concept

Many peoples around the worlds are suffering from the bad health because they don’t have ready access to effective health monitoring and may be a suspected to be as critical situation patients. But with small, powerful wireless solutions connected through the IoT are now making possible for monitoring to come to these patients. These solutions can be used to securely capture patient health data from a variety of sensors,

apply complex algorithms to analyze the data and then share it through wireless connectivity with medical professionals who can make appropriate health recommendations.

e. Smart Transportation and Mobility

The development in transportation is one of the factors to indicate the wellbeing of the country. A road condition monitoring and alert application is one of the most important of IoT transformation application. The main idea of the concept of smart transportation and mobility is to apply the principles of crowd sourcing and participatory sensing. The process began with user identified the route wishes and marked some points as pothole in the smart phone's application. The smart transportation is deal with three main conceptions as shown in Figure 7, they are transportation analytic, transportation control, and vehicle connectivity. The transportation analytic represents the analysis of demand prediction and anomaly detection.

The routing of vehicles and speed control in addition to traffic management are all known as transportation control which they actually tightly related to the way of the vehicles connectivity (V2X communication), and overall governed by multi-technology dissemination.

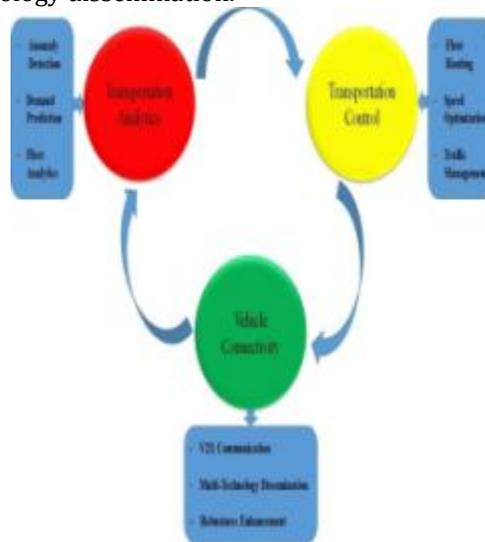


Figure 7. Smart Transportation Aspects

IoT can also be used in transportation is an electric vehicles, which is an important means to reduce both the fuel cost and the impact of global warming have also gained considerable attention from drivers. Government in many countries has supported researches on systems to monitor performance of Lithium-ion (Li-on) battery for electric vehicle as explored. The system presented was designed to detect the functions of Li-on power battery by deriving the driving situation from the realistic working conditions for driver so that the driver was able to get the idea of the route status. This solution was embedded with many essential functions such as dynamic performance test of the Li-on battery, remote monitoring with on-line debugging and error correction that could significantly reduce the maintenance cost.

3. INTERNET OF THINGS CHALLENGES

The fact that Internet of things applications and scenarios outlined above are very interesting which provides technologies for smart every things. , but there are some challenges to the application of the Internet of Things concept in cost of implementation. The expectation that the technology must be available at low cost with a large number of objects. IoT are also faced with many other challenges, such as:

Scalability: Internet of Things has a big concept than the conventional Internet of computers, because of things are cooperated within an open environment. Basic functionality such as communication and service discovery therefore need to function equally efficiently in both small scale and large scale environments. The IoT requires a new functions and methods in order to gain an efficient operation for scalability.

Self-Organizing: Smart things should not be managed as computers that require their users to configure and adapt them to particular situations. Mobile things, which are often only sporadically used, need to establish connections spontaneously, and able to be organize and configure themselves to suit their particular environment.

Data volumes: Some application scenarios of the internet of things will involve to infrequent communication, and gathering information's form sensor networks, or form logistics and large scale

networks, will collect a huge volumes of data on central network nodes or servers. The term represent this phenomena is big data which is requires many operational mechanism in addition to new technologies for storing, processing and management.

Data interpretation: To support the users of smart things, there is a need to interpret the local context determined by sensors as accurately as possible. For service providers to profit from the disparate data that will be generated, needs to be able to draw some generalizable conclusions from the interpreted sensor data.

Interoperability: Each type of smart objects in Internet of Things have different information, processing and communication capabilities. Different smart objects would also be subjected to different conditions such as the energy availability and the communications bandwidth requirements. To facilitate communication and cooperation of these objects, common standards are required.

Automatic Discovery: In dynamic environments, suitable services for things must be automatically identified, which requires appropriate semantic means of describing their functionality.

Software complexity: A more extensive software infrastructure will be needed on the network and on background servers in order to manage the smart objects and provide services to support them. That because the software systems in smart objects will have to function with minimal resources, as in conventional embedded systems.

Security and privacy: In addition to the security and protection aspects of the Internet such in communications confidentiality, the authenticity and trustworthiness of communication partners, and message integrity, other requirements would also be important in an Internet of Things. There is a need to access certain services or prevent from communicating with other things in IoT and also business transactions involving smart objects would need to be protected from competitors' prying eyes.

Fault tolerance: Objects in internet of things is much more dynamic and mobile than the internet computers, and they are in changing rapidly in unexpected ways. Structuring an Internet of Things in a robust and trustworthy manner would require redundancy on several levels and an ability to automatically adapt to changed conditions.

Power supply: Things typically move around and are not connected to a power supply, so their smartness needs to be powered from a self-sufficient energy source. Although passive RFID transponders do not need their own energy source, their functionality and communications range are very limited. Hopes are pinned on future low power processors and communications units for embedded systems that can function with significantly less energy. Energy saving is a factor not only in hardware and system architecture, but also in software, for example the implementation of protocol stacks, where every single transmission byte will have to justify its existence.

Wireless communications: From an energy point of view, established wireless technologies such as GSM, UMTS, Wi-Fi and Bluetooth are far less suitable; more recent WPAN standards such as ZigBee and others still under development may have a narrower bandwidth, but they do use significantly less power.

Conclusion

Internet of things is a new technology which provides many applications to connect the things to things and human to things through the internet. Each objects in the world can be identified, connected to each other through internet taking decisions independently. All networks and technologies of communication are used in building the concept of the internet of things such technologies are mobile computing, RFID, wireless sensors networks, and embedded systems, in addition to many algorithms and methodologies to get management processes, storing data, and security issues. IoT requires standardized approach for architectures, identification schemes, protocols and frequencies will happen parallels, each one targeted for a particular and specific use. by the internet of things many smart applications becomes real in our life , which enable us to reach and contact with every things in addition to facilities many important aspects for human life such as smart healthcare, smart homes, smart energy , smart cities and smart environments.

Internet of things may facing two major challenges in order to guarantee seamless network access; the first issue relates to the fact that today different networks coexist and the other issue is related to the big data size of the IoT. Other current issues, such as address restriction, automatic address setup, security functions such as authentication and encryption, and functions to deliver voice and video signals efficiently will probably be affected in implementing the concept of the internet of things but by ongoing in technological developments these challenges will be overcome. This paper surveyed some of the most important applications of IoT with particular focus on what is being actually done in addition to the challenges that facing the implementation of the internet of things concept.

References

1. M. A. Ezechina, K. K. Okwara, C. A. U. Ugboaja. The Internet of Things (Iot): A Scalable Approach to Connecting Everything. The International Journal of Engineering and Science 4(1) (2015) 09-12.
2. <http://www.meraevents.com/event/iot-workshop>
3. <http://www.nxp.com/assets/documents/data/en/white-papers/INTOTHNGSWP.pdf>
4. Saranya C. M., Nitha K. P., Analysis of Security methods in Internet of Things. International Journal on Recent and Innovation Trends in Computing and Communication, Volume 3, Issue 4; April 2015.
5. Sapandeeep Kaur, Ikvinderpal Singh. A Survey Report on Internet of Things Applications. International Journal of Computer Science Trends and Technology Volume 4, Issue 2, Mar - Apr2016.
6. S. Misra et al., Security Challenges and Approaches in Internet of Things. Springer Briefs in Electrical and Computer Engineering,2016.
7. Suwimon Vongsingthong and Sucha Smanchat. A Review of Data Management in Internet of Things. KKU Res. J. 2015
8. http://cdn2.hubspot.net/hubfs/552232/Downloads/Partner_program/Smart_Environment_Flyer.pdf?t=1458917278396
9. <http://docplayer.net/1073234-Internet-of-things-converging-technologies-for-smart-environments-and-integrated-ecosystems.html>
10. Jayavardhana Gubbia, Rajkumar Buyyab, Slaven Marusic, Marimuthu Palaniswami. Internet of Things (IoT): A vision, architectural elements, and future directions. Future Generation Computer Systems 29 (2013) 1645-1660.
11. <https://dupress.deloitte.com/dup-us-en/focus/internet-of-things/iot-commercial-real-estate-intelligent-building-systems.html>
12. Grandinetti, Lucio. Pervasive Cloud Computing Technologies: Future Outlooks and Interdisciplinary Perspectives: Future Outlooks and Interdisciplinary Perspectives. IGI Global, 2013.

Lifetime Enhancement of the Wireless Sensor Network Using the Sink Relocation and the Cluster Methodology

Swarna.N

n.swarna1991@gmail.com

ABSTRACT: *In a wireless sensor network (WSN), how to conserve the limited power resources of sensors which to extend the network lifetime of the WSN as much as possible while performing the sensing and sensed data reporting tasks, is the most crucial issue in the network design. Recent advances in micro manufacturing technology have enabled the development of low-power, low-cost, multifunctional sensor nodes for wireless communication. Sink relocation is an efficient network lifetime extension method; it avoids consuming too much of battery energy for a specific group of sensor nodes. Here a moving strategy called energy-aware sink relocation (EASR) for mobile sinks in WSNs is proposed. A secure routing based on transposition cryptography is used. The routing algorithm makes sink node share a key with all nodes in the wireless sensor network using which a new encrypted value would be generated for transmission. The aim of this work is to enhance the network lifetime of the wireless sensor network in secured environment.*

Keywords: *energy efficiency, EASR, cluster, secure transmission.*

I.

INTRODUCTION

A WSN consists of small-sized sensor devices, which are equipped with limited battery power and are capable of wireless communications. When a WSN is deployed in a sensing field, these sensor nodes will be responsible for sensing abnormal events (e.g., a fire in a forest) or for collecting the sensed data (temperature or humidity) of the environment [3]. In the case of a sensor node detecting an abnormal event or being set to periodically report the sensed data, it will send the message hop-by-hop to a special node, called a sink node [1]. The sink node will then inform the supervisor through the Internet.

The cluster formation of a network plays its own advantage in terms of time and energy saved. Any clutter could be formed based on different criteria such as the area covered, the similarity between nodes, the distance between nodes and others. Each cluster would be assigned with the leader nodes as the cluster head, which gain as the different condition form the electing a particular nodes as the cluster head.

It is considered that only source and sink node participate in the network coding process. In this scene, a Secure Routing is to be used. This secure routing algorithm, which utilizes the characteristics that most network nodes can transmit the data correctly, hashes the encoded data by shared hash table and aggregates hash values to store in each coded data packet for ensuring data consistency in sink node. At the same time, it encrypts random coding parameters with shared secret key [9] which supervises and protects the data security. In this way, it prevents the eavesdropping and tampering behavior of malicious nodes.

The routing path may be static or dynamic, depending on the given routing algorithm. The applications of WSNs are broad, such as [4] weather monitoring, battlefield surveillance, inventory and manufacturing process. In general, due to the sensory environments being harsh in most cases, the sensors in a WSN are not able to be recharged or replaced when their batteries drain out of power. The battery drained out nodes may cause several problems such as, incurring coverage hole and communication hole problems. Thus, several WSN studies have engaged in designing efficient methods to conserve the battery power of sensor nodes, for example, designing duty cycle scheduling for sensor nodes to let some of them periodically enter the sleep state to conserve energy power, but not harming the operating of the sensing job of the WSN [3]; designing energy-efficient routing algorithms to balance the consumption of the battery energy of each sensor node [8]; Note that most of these approaches can coexist in the operating of the WSN. The other energy conserving approach is to use mobile sensors to adjust their locations from a region with a high level of total battery energy of nodes to a low energy region. Although this approach can extend the network lifetime of a WSN, the relocation of sensor nodes will also expand their battery energy. A compromise approach is to use a mobile sink to relocate its position instead of relocating the sensor nodes [3], [6]. The sensor node near the sink will quickly drain out its battery power after relaying several rounds

of sensed data with reported tasks being performed by other sensor nodes, and consequently the WSN will die.

In this method, a method of sink relocating scheme is used to guide the sink when and where to move to. Some mathematical performance analyses are given to demonstrate that the proposed sink relocating scheme can prolong the network lifetime of a WSN. A simulation is conducted to investigate the performance of the EASR [1] method against some traditional methods by numerical simulation.

The Energy-Efficient Load-Balanced Routing Protocol (the Maximum Capacity Path, MCP), in order to prolong the network lifetime of a WSN, energy saving is the key design issue. Routing protocol designs of message reporting in a WSN can generally be classified into two categories: static routing and dynamic routing. For the static routing type, when as the message reporting paths are determined, each sensor node will report its sensed data along the predetermined path to the sink at any time. On the other hand, a dynamic routing protocol might alter the routing paths in each transmission round according to the current state of the sensor nodes' residual battery energy. Due to the fact that the dynamic routing protocols can balance the load on each sensor node, it performs better for network lifetime prolonging than the static routing protocols. In this work, we use a dynamic routing protocol, called Maximum Capacity Path (MCP), as the underlying routing protocol of the proposed sink relocation method. The MCP has also been demonstrated to perform well in prolonging network lifetime in a WSN. In the following, we will use an example to illustrate the procedure steps of the MCP routing algorithm. The MCP mainly consists of three procedure steps. They are, (1) layering graph G into a layered network N (2) determining the maximum capacity path for each sensor node and (3) routing performed and residual energy updated. The MCP will iteratively perform the above three steps for each round of message reporting.

The concept of cluster head selection and collection of data from that head node is an efficient method which would reduce the time the sink would take for relocation to collect the data from all other nodes which would be done based on further discussed EASR [1] method.

In general, WSNs can be classified into two categories, stationary and relocatable WSNs, depending on whether the nodes are capable of moving or not. When a stationary WSN is deployed in a sensing field, each sensor node locates at a fixed position to perform round-and-round of sensing and message reporting/relaying tasks until a sensor node (or a portion of the sensor nodes) drain out their battery energy; then the WSN dies. For the category of relocatable WSNs, sensor nodes or the sink are capable of moving. As the total energy level of a region drops down to a low level state or there are some sensing holes or communication holes in the region due to some sensor nodes draining out their battery energy, then some mobile sensors can relocate their locations and move into this region to relieve the above problem. Although this approach can prolong the network lifetime of the WSN, the relocating sensors will also consume their battery energy to perform the relocating task. As discussed previously, sink relocation is a compromise approach for prolonging network lifetime and the sensor nodes remain stationary to conserve battery energy. Several research works have proposed mechanisms for the sink relocation policy.

II. RELATED WORK

The energy efficient protocols are been of more in research which has resulted in many protocols. Few existing protocols include the sink mobility concept. The concepts that include the sink in main screen are: The stationary sink scheme [6] assumes that the sink is not capable of moving and remains stationary at all times. Since the sink in the stationary sink scheme stays in the same position, the neighbors of the sink (the hot-spots) are always the same set of sensor nodes. Consequently they will quickly drain out their battery energy.

One-step moving [5] method: The method firstly computes a position for the destination of moving, which can be determined by the total residual battery energy of the sensor nodes. When a moving destination is determined, the One-step moving scheme will drive the sink to directly move to the destination despite the distance.

These existing system doesn't effectively provide the sink mobility and does not discuss about the security issues where as proposed system would be combined with security mechanism to make the network more secured while transferring the data, which is to be in applications such as often deployed in the battlefield to monitor enemy forces, real-time situation and the track of target, thus there are high requirement for data reliability.

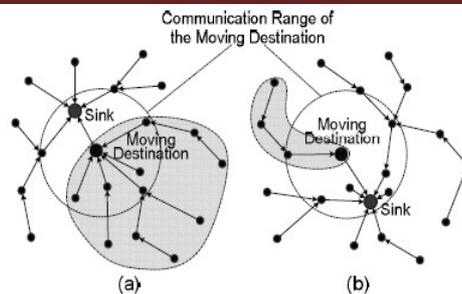


Figure 1.1: Different stay position if sink

In data-gathering applications, the sensor nodes near to the sink have to consume more energy to forward data than the nodes far from the sink if multi hop routing protocols are employed. Therefore, the sink will move into the communication range of the Moving Destination to force it to expend much energy on forwarding data for other nodes, which is beneficial the sink stays at the position like in Figure 1.1 (a) to gather data, the Moving Destination has to forward data for its five one-hop neighbor nodes and their children nodes. However, if it stays at the position like in Figure 1.1 (b), the Moving Destination only forwards data for one neighbor node and its children nodes. In this case, if the Moving Destination is the root node of a big tree for forwarding data, its only child node will be drained of its energy quickly. On the other hand, if the Moving Destination is the root node of a small tree, the sink has to spend many data-gathering periods staying beside the Moving Destination to burn up its energy, which is also very dangerous for the nodes that are in the vicinity of the Moving Destination and inadequate in energy.

III. PROPOSED SYSTEM

In proposed method we make use of the concept of the cluster formation and the cluster head creation. Here we divide area of the sensor network into different quadrants based on the area, later each quadrant is named as the cluster and an cluster head is been assigned, the cluster head selection would be made based on the cluster head selection algorithm which work based on the energy level and the density of the nodes in a cluster. That is a node which as the highest energy and the large number of neighbors in the cluster is been selected as the cluster head. Later a sink relocation method would be applied based on the condition met. In the EASR (energy aware sink relocation) method [1], the technique of energy-aware transmission range adjusting to tune the transmission range of each sensor node according to its residual battery energy is incorporated. The relocating decision made by the sink will take the MCP (maximum capacity path) [2],[3] routing protocol, as the underlying message routing in order to gain the merit of prolonging network lifetime.

The MCP method is used as the underlying routing method to limit the influence since the only parameter of the MCP is the same as the decision parameter of the proposed EASR method; that is the residual battery energy of the sensor nodes.

The proposed EASR consists of two components, the energy-aware transmission range adjusting and the sink relocation mechanism that are described as follows.

Here focus is on the secure solution involving source nodes and sink node. In order to achieve secure routing from end to end, the first issue is to prevent tampering by malicious nodes. Commonly, the method to solve this problem is to increase system redundancy. Because the multiple nodes which are isolated from each other handle the same task in parallel, the probability of all nodes are failure is far less than the non-redundant network. Hence, the Secure Routing based on public key cryptography [8] which utilizes the majority rule to make sure the correctness of data and uses the network coding to protect the confidentiality of data is proposed. It transformers encoded data packets with one-way hash function, aggregates the hash values and stores them in each coded data packet, and then introduces the voting mechanism to the sink node. As long as the information passed over by majority link is coincident, the information is transmitted from source nodes.

In general, a larger transmission range set for a sensor node will increase the number of neighbors and consequently enhance the quality of the energy-aware routing; however, it also bring the drawback of longer distance message relaying, which will consume more battery energy of a sensor node. We classify sensor nodes into three types by the 'healthy' state of their battery and adjust their transmission range accordingly.

Here the cluster head selection method could be made use of as an advantage which reduces the time and energy of the sink to move to all the nodes to collect the information. This process would be done by first dividing the whole area into different region based on certain range and the by using the cluster head selection method the dynamic cluster head would be selected to every region based on the criterion such as highest residual energy and the density i.e, the highest number of neighbors the can communicate. Later by those nodes with least energy and those which do not come under the range of the cluster head the sink would use the EASR method and collect the data directly. MCP method would also be used internally for the communication between the nodes and cluster head.

The sink relocation mechanism consists of two parts. The first is to determine whether to trigger the sink relocation by determining whether a relocation condition is met or not. The second part is to determine which direction the sink is heading in and the relocation distance as well. For the relocation condition, the sink will periodically collect the residual battery energy of each sensor node in the WSN.

IV. RESULTS

The network lifetime of an wireless sensor network as per the above method is been compared with the that of the lifetime of the sensor network with static sink and the results are been shown as a graph, which is plotted using the NS2 and xgraph methodology. The figure 1.2 gives the graph of the comparison which clearly shows that the energy level (green line) when using the sink relocation method gives the better performance compared to that of static sink (red line) method. That is using the static sink forces all the other nodes to routed the information irrespective of the energy level and the distance they are placed, this makes the drastically fall the overall energy level of the network which is been overcome greatly by using the sink relocation methodology.

The figure 1.3 shows the comparison of the throughput values, which is the calculation of the packet drop to that of the time, as in static sink it collects the information from all the nodes it creates the traffic leading to the frequent drop of the packets, but this would not be a problem in the proposed method as we make use of the cluster head which is first responsible to collect the data within the clusters and only the aggregated data would be sent to the sink reducing the traffic and the number of drops.



Figure 1.2: energy level graph

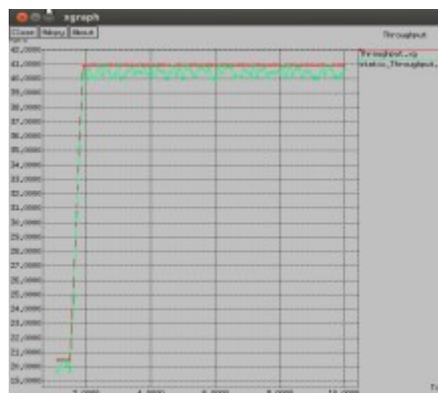


Figure 1.3: Throughput graph

V. CONCLUSION

The battery energy of the sensor node will effect the network lifetime of the sensor network. There are many research works that aim to design the routing protocol which is energy efficient. one such effective work could be making the mobile sink to move towards the nodes with lower battery energy so as to maintain its energy which would have either be depleted for the routing, this process would be made more effective by combining this method along with the concept of clustering, where the cluster heads would be used to collect data from nodes first and later would be passed on to sink, which save the time and energy of sink by avoiding the multiple moves. This sink relocation would be done by making use of a energy aware sink relocation (EASR) method, which take residual battery energy into account mainly. A secured data transmission is an advantageous work that can be performed which in this project is been achieved using the transposition security mechanism. Finally a simulation results would be used in support with the argument of EASR, that it can effectively prolong the network lifetime.

REFERENCE

1. Chu-Fu Wang, Jau-Der Shih, Bo-Han Pan, and Tin-Yu Wu, "A Network Lifetime Enhancement Method for Sink Relocation and Its Analysis in Wireless Sensor Networks", IEEE sensors journal, vol. 14, no. 6, june 2014.
2. G. S. Sara and D. Sridharan, "Routing in mobile wireless sensor network: A survey," Telecommun. Syst., Aug. 2013.
3. F. Akyildiz, W. Su, Y. Sankarasubramaniam, and E. Cayiric, "Wireless sensor networks: A survey," Comput. Netw., vol. 38, no. 4, pp. 393–422, Mar. 2002.
4. C. M. Cordeiro and D. P. Agrawal, "Ad Hoc and Sensor Networks: Theory and Applications", Singapore: World Scientific, Mar. 2006.
5. G. L. Wang, G. H. Cao, and T. L. Porta, "Movement-assisted sensor deployment," in Proc. IEEE Inf. Commun. Conf., Aug. 2004, pp. 2469–2479.
6. L. Sun, Y. Bi, and J. Ma, "A moving strategy for mobile sinks in wireless sensor networks," in Proc. 2nd IEEE Workshop Wireless Mesh Network., Sep. 2006, pp. 151–153.
7. Y. Sun, W. Huangfu, L. Sun, J. Niu, and Y. Bi, "Moving schemes for mobile sinks in wireless sensor networks," in Proc. IEEE IPCCC, Apr. 2007, pp. 101–108.
8. Baolin Sun, Ying Song, Chao Gui1 and Ting Zhang, "Performance of Network Coding Based Multipath Routing in Wireless Sensor Networks", IJCSI International Journal of Computer Science Issues, Vol. 9, Issue 6, No 2, November 2012.
9. Jing Chen, Ruiying Du, Qian Wang, Shixiong Yao, "Secure Routing Based on Network Coding in Wireless Sensor Networks" , 12th IEEE International Conference on Trust, Security and Privacy in Computing and Communications 2013.

Awareness and utility of HELINET consortia resources by PG students, Faculty members and Research scholars of Pharmacy Colleges

Ramesha J¹ & Dr. Dhanamjaya. M² & Prof. V.G. Talawar³

¹Research Scholar, REVA University, Bengaluru, Karnataka 560064, India

²Registrar, REVA University, Rukmini Knowledge Park, Kattigenahalli, Yelahanka, Bangalore-560 064

³Former Vice-chancellor, University of Mysore, Mysore, Karnataka 570006, India and

Advisor to REVA University, Bengaluru, Karnataka 560064, India

ABSTRACT: This article discussed about successful implementation of HELINET consortia, which is first of its kind in the country in the Health science higher education originated in the state of Karnataka. The access to HELINET Consortia resources provided to over 57 Pharmacy colleges imparting PG students, faculty members and Research scholars affiliated to Rajiv Gandhi University of health sciences (RGUHS). The study has been aimed to find out the awareness of access to HELINET Consortia resources, availability of e-resources under HELINET Consortia and Usefulness of e-resources provided by HELINET consortia are analyzed. HELINET Consortia has different Resources from various databases. They are Science direct, Wiley online library, Bentham Science, Clinical Key, Pro Quest, Oxford University Press, Jay Pee digital and Springer. The result shows that Science Direct plays major role 1532 (71%) in Pharmacy e-resources in HELINET Consortia followed by Bentham science 1313 (61%), Pro Quest 1212 (56%) and least satisfied by Clinical Key 45 (2%) and Springer 27 (1%). And the infrastructure to use these resources is not adequate and can hinder the ability to meet the requirements of users.

Keywords: HELINET, E-journals, Consortium, Resource sharing, Networking

Introduction

The scholarly communication has a long history. As the first journal started in 1665 in the form of "transactions of the royal society" by 'Henry Oldenberg' and his associates in royal society of London. Later the system of peer review has been introduced 'peer review' to maintain the quality of the work done by the author. This system of peer review has been existence for around 300 years. Most of the publishing was done by the societies and non-profit professional associations. The entry of commercial publishers in to the journal publishing has renewed the vigour of the science communication. In the later part of the 20th century, during 1970's to be precise, the journal costs have started increasing above the inflation rates. This phenomenon is called the 'serial crisis'. Many small publishing houses were either bought-out by the bigger publishing houses or closed their operations by not being able to compete with the big balanced publishers. With the advent of Internet in the end of the 20th century, the scholarly communication speed has taken into new shape. The traditional print journals have been added with the online or e-version of the same journals along with the print versions. So is the case with the pharmacy journals, where in the speed of publishing new science discoveries, new methods, new procedures, new processes and drug discoveries are deemed to be published in a speedy manner to reach the medical practitioners. With the emergence of interdisciplinary and multidisciplinary nature of the subjects, many specialized journals have started to emerge. This has made the libraries to subscribe each and every journal to cater to the needs of their users within the available budget. This phenomenon has given rise to the concept called consortia, wherein, group of similar libraries coming together and subscribing to a particular publisher or subject journals at a discounted prices to counter the budgetary constraints.

Definition and meaning

Consortia is a Latin word, meaning "partnership", "association" or "society" and derives from consors 'partner', itself from con- 'together' and sors 'fate', meaning owner of means or comrade. The word 'Consortia' is the plural form of 'Consortium'. It is derived from the Latin word for Fellowship. A library consortium is a formal association of libraries, not under the same institutional control, but usually, restricted to a specific geographical area or region, number of Libraries, types of materials, or subject interest, which is established to develop and implement resources sharing among member libraries.

About Consortia

A consortium in the specific sense for libraries is an association of two or more libraries, companies, organizations with the objective of participating in a common activity or pooling their resources for achieving a common goal. In the present millennium, the explosion of information and the telecommunication technologies are increasing day-by-day and therefore it is essential to develop the appropriate information infrastructure and organize the Library and Information Centers in such a way that the organization must satisfy the relevant needs of the information society. No library is self-sufficient to purchase all the books, Journals, databases and other library documents within their library budgetary limits. So different institutions or universities may purchase an electronic product and share its cost creating a "Consortia".

About HELINET Consortia

The acronym, HELINET stands for 'Health Science Library and Information Network'. The idea of HELINET conceived by Rajiv Gandhi University of health sciences and successfully implemented which is first of its kind in the country in the health science education. The consortium was started with a vision to improve the quality of education and research in the Health Science institutions of the state of Karnataka through enhanced access to high quality health science information. HELINET's goal is to deliver information to the desk-top of their users round-the-clock. The major benefit of this consortium was expanded access to core international e-journals. Prior to the launch of the HELINET consortia, access to health science journals by each college was limited. HELINET has made it possible for each college to access and share the contents of more than 3000 journals, in effect increasing the access provision. HELINET works on the basis of a set mission such as "To network all the Health Science libraries, for minimizing the cost of acquisition and maintenance of learning resources and maximizing their utilization among college and institutions".

Need for the study

The consortia facilitate the libraries to get the benefit of wider access to e-resources at affordable cost and at the best terms of licenses. Journals, databases being expensive resources and their collection size being inadequate in most of the libraries as discussed above.

The HELINET Consortia initiative was to provide adequate resources and access infrastructure through consortia model of purchasing/licensing shared access to journal literature. The process of developing an e-Journal consortia was thought off to be initiated for the Medical Colleges as the first test case, and extended to other faculties on the demand and success. It has been a decade, since the HELINET consortia has been in existence. Most of the affiliated pharmacy colleges of RGUHS in Karnataka are members of the HELINET consortia. The statistics provided by the consortia administration has been encouraging. Hence, this study is aimed to determine the awareness and utility of e-resources in the HELINET consortia students, researchers and faculty members of pharmacy colleges affiliated to RGUHS.

Objectives of the study:

- To know the awareness of HELINET Consortia resources
- To know the usefulness of HELINET Consortia resources
- To know the availability of e-resources provided under HELINET Consortia
- To Know the Problems facing while accessing HELINET Consortia
- To identify satisfaction level on use of e-resources Under HELINET Consortia

3. Literature review**3.1 Awareness and usage of e-resources and its impact:**

Adetomiwa et al (2018) conducted a survey over 21 private university lectures established and approved between 1999 and 2012 in South-West Nigeria. For the study stratified random sampling technique based on probability proportionate to size method was adopted by selecting 1,656 (60 per cent) full time academic staff from the population size of 2,760. The result of the analysis showed that there was average level of awareness of electronic databases among academic staff in private universities in South-West, Nigeria.

Aquil Ahmed and Sulaiman Al-Reyaee (2017) assessed and compared the awareness and usability level among undergraduate students of two Medicine and Dental Colleges of Al-Jouf University, Skaka, Saudi Arabia. A questionnaire supplemented to 300 users to collect the data. The study found that the awareness and utilization level of students related to available e-databases varied significantly especially when

comparing individual colleges and databases. The overall knowledge and use of e-databases by medical students was much higher than the dental students. And study recommended that the medical librarians and faculty members should educate the users.

3.2 Search strategy and motivation towards use of e-resources

Thompson (2014) the study a multilevel search strategy was used to identify relevant available ELR for use in enhancing geriatric APRN education and to evaluate the educational utility of identified ELRs based on established criteria in USA. The study reveals that Increased number of older adults in the United States and new APRN educational initiatives emphasizing competencies across the entire adult-gerontology scope of practice have made it incumbent upon nursing faculty to enhance existing curricula.

Thomas, Davidson, Kyrrillidou and Plum (2012) study entitled 'Measuring use of licensed electronic resources, analysed the use of e-resources by 21 member libraries of the Ontario Council of University Libraries (OCUL). They study found that 68.75% of the users use e-resources from off-campus, 19.05% access e-resources from an on-campus location but outside the library and only 12.2% of them use e-resources from the library premises. The study further explored that 68.73% of the undergraduate students, 18% of the post-graduate students and only 2.5% of the faculty use e-resources from within the library. They noted that the off-campus use of e-resources increased from 45.14% in 2004-2005 to 68.74% during 2010-2011.

3.3 Factors affecting the use of e-resources

Msiska, Kunitawa, and Kumwenda (2017) Assessed factors that affect the use of electronic medical record (EMRs) in Malawi, particularly at Queen Elizabeth and Kamuzu Central Hospitals. It further investigated the reasons why paper-based records are still in use despite the numerous associated disadvantages. The study shows that attitude of health workers towards EMR usage was positive and there was higher usage of EMRs at QECH compared to KCH, even though EMRs were first introduced at KCH. Short supplies of computers and inconvenient locations of EMR machines heavily affected EMR usage in some departments. Health workers still found EMRs to be quicker, more secure, and more accurate in aiding patient management compared to paper-based records.

Ruchi Jain Garg, Vinod Kumar, Vandana, (2017) purpose of their paper is to develop and validate a scale involving the factors affecting usage of e-resources. These respondents were postgraduates from business schools in Nagpur, Maharashtra (India). The data were gathered from 347 respondents through personal interviews. The study identified five factors which are affecting usage of e-resources were training modes, awareness, influencers, utilitarian benefits, and experiential and hedonic benefits.

3.4 E-resources for quick studying and clinical decision making

Egle (2014) conducted a survey to evaluate the use of web-based resources by residents by distributing questionnaires to surgical residents in Michigan and third- and fourth-year medical students at an American allopathic and osteopathic medical school and a Caribbean allopathic school. Study reveals that most of the respondents favouring textbooks or board review books for prolonged study, but e-resources are frequently used for quick studying, clinical decision-making questions, and medication queries. This study also demonstrates that e-resources have not entirely replaced hardcopy books for medical student and resident studying, but they are widely used.

3.5 Computer literacy and attitudes of users towards use of e-resources

Lwoga et al (2018) conducted questionnaire survey using a stratified random sampling technique on 135 faculty members at MUHAS between August and October 2016, to assess the usage behaviour e-resources among health sciences faculty and their level information literacy (IL) practices, and whether individual characteristics and IL skills can influence faculty member's usage of e-resources at Muhimbili University of Health and Allied Sciences (MUHAS). The findings revealed that Google search engine, Wikipedia and four scholarly databases and search engines, the level of awareness and 19 scholarly databases was less than 50 per cent.

4. Methodology

The researchers used survey method and collect the responses from the PG students (MPharm, Pharm D, Pharm D (Post-baccalaureate) Research scholars and Faculty members who are studying/working in 2018-2020 batches the various pharmacy colleges affiliated to RGUHS (Rajiv Gandhi University of Health Sciences), Bengaluru. Keeping in mind the basic objectives of the study, Telephonic interviews were also conducted with Pharmacy professionals to assess the relevant information. The population of 2158 is the sample size selected for the current study.

5. Data Analysis

Data analysis is the results of the data obtained in the present investigation. And for the purpose of this study 2500 questionnaires were distributed to the PG students (M.Pharm. Pharm D and Pharm D (Post-baccalaureate), Research scholars and Faculty Members of 57 Colleges. Out of which 2158 responses were received. Among the total responses 1297 respondents are PG students, 36 are research scholars and 826 are faculty members of Pharmacy Colleges in Bengaluru. The data collected was scrutinized, classified and tabulated for better understanding and clarity.

5.1. Population Study

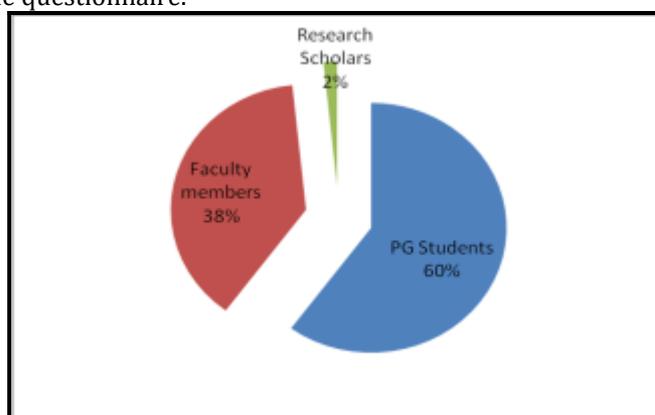
Gender	Category							
	PG Students		Faculty Members		Research Scholars		Total	
	Resp	%	Resp	%	Resp	%	Resp	%
Male	842	65	567	69	21	60	1430	66.27
Female	455	35	259	31	14	40	728	33.73
Total	1297	100	826	100	35	100	2158	100.00

Personal detail section of the questionnaire provides information regarding the sex and different qualifications as can be seen from Table 5.1. It is found that, 66.27% of population of the study was Males, and only 33.73% of total respondents were Females, who can use e-resources available through library for different purposes.

5.2 Category wise distribution of Respondents

Category	No. of Respondents	%
PG Students	1297	60.11
Faculty members	826	38.27
Research Scholars	35	1.62
Total	2158	100

It is found from the table 5.2 that, the highest number of respondents are PG Students 1297(60%) and second highest is Faculty Members 826 (38%) and the least 35 (2%) of the respondents are research scholars responded to the questionnaire.



Picture 1: Category wise distribution of Respondents

5.3 Awareness about E-resources

	PG Students		Faculty Members		Research Scholar		Total	
	No.	%	No.	%	No.	%	No.	%
Yes	1297	100	826	100	35	100	2158	100.00
No	0	0	0	0	0	0.00	0	0.00
Total	1297	100	826	100.00	35	100.00	2158	100.00

Table 5.3 shows on the awareness of e-resources among the respondents available through the library 100 % of the PG Students, Faculty members and research scholars are aware about the e-resources available in their field of study and research.

5.4 Awareness of consortia and databases

Consortia / Databases	Category						Total	%
	P.G. Students		Faculty Members		Research Scholar			
	Resp	%	Resp	%	Resp	%		
HELINET	1196	92.21	826	100.00	35	97.22	2057	95.32
PubMed	614	47.34	826	100.00	35	97.22	1475	68.35
Medknow	205	15.81	826	100.00	35	97.22	1066	49.40
Wiley Online Library	951	73.32	699	84.62	26	74.29	1676	77.66
CINHAL	46	3.55	1	0.12	5	14.29	52	2.5241
ProQuest	635	48.96	324	39.23	16	45.71	975	45.18
BenthamScience	568	43.79	320	38.74	7	20.00	895	41.47
Clinical Key	68	5.24	8	0.97	0	0.00	76	3.52

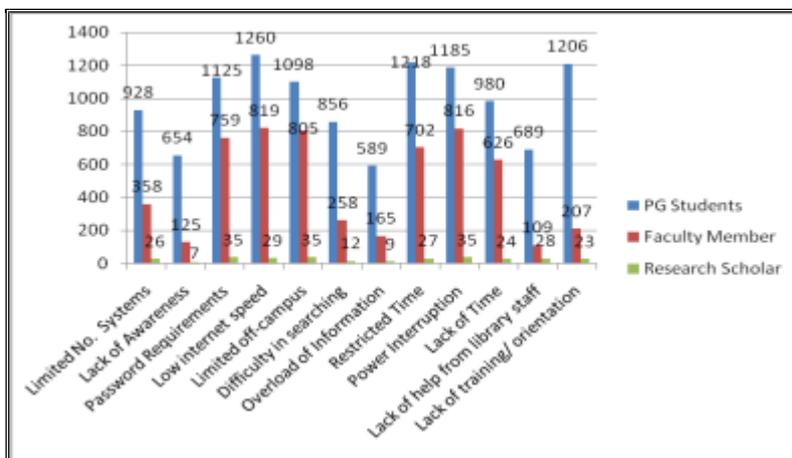
Since the medical / Pharmacy literature is very costlier to buy individually, the consortia based subscription was introduced.

HELINET: The highest number of respondents which includes PG Students, Faculty and Researchers 2057 (95%) are aware on the HELINET online database and the lowest number of respondents including Faculty, PG Students and Researchers 52 (3%) are aware on the CINHAL online database.

5.5 Problems facing while accessing HELINET Consortia

Sl. No	Problems	Category						Total	%
		PG Students		Faculty Member		Research Scholar			
		Count	%	Count	%	Count	%		
a	Limited No. Systems	928	71.55	358	43.34	26	74.29	1312	60.80
b	Lack of Awareness	654	50.42	125	15.13	7	20	786	36.42
c	Password Requirements	1125	86.74	759	91.89	35	97.22	1919	88.92
d	Low internet speed	1260	97.15	819	99.15	29	82.86	2108	97.68
e	Limited off-campus	1098	84.66	805	97.46	35	97.22	1938	89.81
f	Difficulty in searching	856	66.00	258	31.23	12	34.29	1126	52.18
g	Overload of Information	589	45.41	165	19.98	9	25.71	763	35.36
h	Restricted Time	1218	93.91	702	84.99	27	77.14	1947	90.22
i	Power Interruption	1185	91.36	816	98.79	35	97.22	2036	94.35

j	Lack of Time	980	75.56	626	75.79	24	68.57	1630	75.53
k	Lack of help from library staff	689	53.12	109	13.2	28	80	826	38.28
l	Lack of training/ orientation	1206	92.98	207	25.06	23	65.71	1436	66.54



Problem Facing

Table 5.5. It indicates that the highest number of respondents says low internet speed 2108 (98%) is a very critical problem to access e-resources. Followed by other problems were limited number of systems by 1312 (61%) and overload of information by 763 (35%) of the respondents.

5.6 Satisfaction level on HELINET Consortia resources

Resources	Category	Highly Satisfied		Moderately Satisfied		Partially Satisfied		Least Satisfied		Not Satisfied		Total
		Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	
Science Direct	PG Students	852	65.69	259	19.97	128	9.87	43	3.32	15	1.16	1297
	Faculty Members	653	79.06	114	13.80	35	4.24	24	2.91	0	0.00	826
	Research Scholars	27	77.14	5	14.29	3	8.57	0	0.00	0	0.00	35
	Total	1532	70.99	378	17.52	166	7.69	67	3.10	15	0.70	2158
Wiley Online Library	PG Students	175	13.49	102	7.86	185	14.26	77	5.94	758	58.44	1297
	Faculty Members	45	5.45	69	8.35	125	15.13	366	44.31	221	26.76	826
	Research Scholars	2	5.71	8	22.86	12	34.29	9	25.71	4	11.43	35
	Total	222	10.29	179	8.29	322	14.92	452	20.95	983	45.55	2158
Bentham Science	PG Students	765	58.98	278	21.43	117	9.02	131	10.10	6	0.46	1297
	Faculty Members	526	63.68	131	15.86	89	10.77	71	8.60	9	1.09	826
	Research Scholars	22	62.86	6	17.14	2	5.71	3	8.57	2	5.71	35
	Total	1313	60.84	415	19.23	208	9.63	205	9.49	17	0.78	2158
Clinical Key	PG Students	26	2.00	12	0.93	29	2.24	0	0.00	1230	94.83	1297
	Faculty Members	17	2.06	64	7.75	126	15.25	163	19.73	456	55.21	826

	Research Scholars	2	5.71	5	14.29	9	25.71	4	11.43	15	42.86	35
	Total	45	2.09	81	3.75	164	7.60	167	7.74	1701	78.82	2158
Pro Quest	PG Students	657	50.66	478	36.85	102	7.86	34	2.62	26	2.00	1297
	Faculty Members	536	64.89	124	15.01	86	10.41	68	8.23	12	1.45	826
	Research Scholars	19	54.29	9	25.71	3	8.57	3	8.57	1	2.86	35
	Total	1212	56.16	611	28.31	191	8.85	105	4.87	39	1.81	2158
Oxford University Press	PG Students	62	4.78	21	1.62	91	7.02	21	1.62	1102	84.97	1297
	Faculty Members	37	4.48	46	5.57	135	16.34	144	17.43	464	56.17	826
	Research Scholars	5	14.29	2	5.71	3	8.57	12	34.29	13	37.14	35
	Total	104	4.82	69	3.20	229	10.61	177	8.20	1579	73.17	2158
Jaypee Digital	PG Students	258	19.89	325	25.06	198	15.27	277	21.36	239	18.43	1297
	Faculty Members	489	59.20	246	29.78	35	4.24	24	2.91	32	3.87	826
	Research Scholars	16	45.71	9	25.71	8	22.86	1	2.86	1	2.86	35
	Total	763	35.36	580	26.88	241	11.17	302	13.99	272	12.60	2158
Springer	PG Students	16	1.23	21	1.62	93	7.17	178	13.72	989	76.25	1297
	Faculty Members	9	1.09	14	1.69	16	1.94	263	31.84	524	63.44	826
	Research Scholars	2	5.71	5	14.29	9	25.71	4	11.43	15	42.86	35
	Total	27	1.25	40	1.85	118	5.47	445	20.62	1528	70.81	2158

HELINET is the well-known consortia based service in the field of Medical science/ Pharmacy. HELINET has different Resources from various databases in its consortia. They are Science direct, Wiley online library, Bentham Science, Clinical Key, Pro Quest, Oxford University Press, Jay Pee digital and Springer.

Among the total number of PG Students, Faculty and Research scholars, the highly satisfied respondents to the Science Direct are 1532 (71%) and the least number of respondents who are not satisfied are 15 (1%) and the average i.e., moderately satisfied respondents on Science direct are 378 (18%). It shows the majority number of respondents are satisfied with the Science Direct Resources.

Wiley resources are also playing a major role in the HELINET Consortia.

It is found from the Table 5.6. Majority of the respondents 983 (46%) are not satisfied and moderately satisfied are 179 (8%) and followed by highly satisfied respondents are 222 (10%). It shows the majority number of respondents is not satisfied with the Wiley Online Library Resources.

The third important resources of the HELINET are Bentham Science.

The Table 5.6. It shows PG students, Faculty and Research scholars, are highly satisfied to the Bentham science 1313 (61%) and the least number of respondents who are not satisfied are 17 (1%) and the average i.e., moderately satisfied respondents on Bentham science are 415(19%). It shows the majority number of respondents is satisfied with the Bentham Science Resources.

Clinical Key resources are highly referred in Medical field. Even though it's being used by pharmacy field.

It shows from the Table 5.6 Majority of the respondents 1701 (79%) are not satisfied and moderately satisfied are 81 (7%) and followed by highly satisfied respondents are 45 (2%). It shows the majority number of respondents is not satisfied with the Clinical Key Resources.

Pro Quest serves its resources almost every field of education system. However, in pharmacy there are more important resources are included in HELINET.

It reveals from the Table 5.6 the highly satisfied respondents to the Pro Quest are 1212 (56%) and the least number of respondents who are not satisfied are 39 (2%) and the average i.e., moderately satisfied

respondents on Pro Quest are 611 (28%). It shows the majority number of respondents are satisfied with the Pro Quest Resources.

Resources of the Oxford University press are also included in HELINET Consortia.

It can be inferred from table 5.6 that a huge amount of respondents, 1579(73%) are not satisfied with the Oxford University Press and the least number of respondents who are moderately satisfied are 69(3%) and number of respondents highly satisfied is 104 (5%). It shows that majority of the respondents are not satisfied with the Oxford University Press Resources.

Jay Pee digital resources are referred by the students and faculty members more frequently.

The table 5.6 highlights that majority of the respondents 763 (35%) are highly satisfied with the Jay Pee digital resources and the least number of respondents who are moderately satisfied are 580 (27%) and the least satisfied respondents are 272 (13%). It shows from the result that only 35% of the respondents are satisfied with the Jay Pee digital resources.

Springer has a very good name in the field of Nursing. Even though it's being used by Pharmacy field.

It indicates from the Table 5.6. Majority of the respondents 1528 (71%) are not satisfied and moderately satisfied are 40 (2%) and followed by highly satisfied respondents are 27(1%). It shows the majority number of respondents is not satisfied with the Springer Resources.

6.Findings

With the help of above data analysis and discussion we can determine some important findings are as follows.

- ❖ It is found that, 66.27% of population of the study was Males, and only 33.73% of total respondents were Females, who can use e-resources available through library for different purposes.
- ❖ The highest number of respondents are PG Students 1297(60%) and second highest is Faculty Members 826 (38%) and the least 35 (2%) of the respondents are research scholars responded to the questionnaire.
- ❖ The awareness of e-resources among the respondents available through the library 100 % of the PG Students, Faculty members and research scholars are aware about the e-resources available in their field of study and research.
- ❖ The highest number of respondents which includes PG Students, Faculty and Researchers 2057 (95%) is aware on the HELINET online database and the lowest number of respondents including Faculty, PG Students and Researchers 52 (3%) are aware on the CINHAL online database.
- ❖ It also indicates that the highest number of respondents says low internet speed 2108 (98%) is a very critical problem to access e-resources. Followed by other problems were limited number of systems by 1312 (61%) and overload of information by 763 (35%) of the respondents
- ❖ The highly satisfied respondents to the Science Direct are 1532 (71%) and the least number of respondents who are not satisfied are 15 (1%) and the average i.e., moderately satisfied respondents on Science direct are 378 (18%). It shows the majority number of respondents is satisfied with the Science Direct Resources.
- ❖ The highly satisfied respondents to the Pro Quest are 1212 (56%) and the least number of respondents who are not satisfied are 39 (2%) and the average i.e., moderately satisfied respondents on Pro Quest are 611 (28%). It shows the majority number of respondents are satisfied with the Pro Quest Resources.
- ❖ Majority of the respondents 1528 (71%) are not satisfied with the Springer Resources and moderately satisfied are 40 (2%) and followed by highly satisfied respondents are 27(1%). It shows the majority number of respondents is not satisfied with the Springer Resources.

7. Conclusion and Suggestions

Study shows the use of e-resources is very common among the PG Students, Faculty members and Research scholars and majority of the respondents are dependent on e-resources to get the desired and relevant information. But practical use of e-resources is not up-to the worth in comparison to investments made in HELINET Consortia acquiring these resources; secondly infrastructure and training programs should also be revised as per requirements. It is observed that the availability of e-resources on the HELINET Consortia is almost sufficient for the Pharmacy disciplines but the infrastructure to use these resources is not adequate and can hinder the ability to meet the requirements of users.

References

1. Lwoga and Sife (2018). Impacts of quality antecedents on faculty members' acceptance of electronic resources. *Library Hi Tech*, 36 (2), 289-305.
2. Aquil Ahmed and Sulaiman Al-Reyaee(2017). Knowledge and Use of Electronic Information Resources by Medical Students at Al-Jouf University in Saudi Arabia. *Philosophy and Practice (e-journal)*.
3. Ruchi Jain Garg, Vinod Kumar, Vandana, (2017). Factors affecting usage of e-resources: scale development and validation. *Aslib Journal of Information Management*,69(1), pp.64-75.<https://doi.org/10.1108/AJIM-07-2016-0104>
4. Msiska, Kunitawa, & Kumwenda, (2017). Factors affecting the utilisation of electronic medical records system in Malawian central hospitals. *Malawi Medical Journal*, 29 (3).
5. Egle (2014). The Internet School of Medicine: Use of Electronic Resources by Medical Trainees and the Reliability of those Resources. *Journal of Surgical Education*.
6. Thompson. (2014). Identifying and evaluating electronic learning resources for use in adult-gerontology nurse practitioner education. *Journal of Professional Nursing*, 30(2), (March/April), 155-16.
7. Thomas, D., Davidson, C., Kyrillidou, M., & Plum, T. (2012). Measuring use of licensed electronic resources. *Library Management*, 33 (6/7), 374-388.
8. Urs, Rama Raj R.. (2000). *Networking of Health Science Libraries: Resources and standards*, Jaypee Brothers, New Delhi, p-147.
9. HELINETconsortium. (2015). Retrieved from <http://www.rguhs.ac.in/HELINETHOSTCONSORTIUM/homehelinethost.htm> on 15th January 2015.
10. Basiru Adetomiwa, Andrew Oshiotse Okwilagwe, (2018). Awareness and use of electronic databases as determinants of research productivity of academic staff in Nigerian private universities, *Global Knowledge, Memory and Communication*,
11. <https://doi.org/10.1108/GKMC-03-2018-0027>
12. <http://www.rguhs.ac.in/>

SENTIMENT ANALYSIS USING DEEP LEARNING

Rekha Raichal¹ & Rahul .U² & ³Gandikota Ayyappa

Seshadripuram First Grade College, Yelahanka
Bangalore-64.

ABSTRACT: *Deep Learning classification algorithms aim at categorizing the data from prior information. This paper discusses the efficiency of sentiment analysis in deep learning algorithms using neural networks in terms of accuracy, speed of learning and complexity.*

Keywords:

Introduction:

Deep learning also known as **Deep Structured learning** or **Hierarchical Learning** is a subset of Machine Learning in Artificial Intelligence (AI). It's an AI function that mimics the working of the human brain in processing the data for use in decision making. In broader terms, Deep learning refers to training the systems capable of learning and imitating the human behavior. It works with large volumes of data (both structured and unstructured) and uses complex algorithms to train a model or machine. Neural Networks are helpful in implementing the Deep learning. Deep learning consists of a multiple of machine learning algorithms fed with inputs in the form of multiple layered models. Deep learning (DL) is applied in many areas of artificial intelligence (AI) such as speech recognition, image recognition and natural language processing (NLP) and many more such as robot navigation systems, self-driving cars etc.,

Types of learning:

1. supervised learning:

Supervised Learning is the one, where you can consider the learning is guided by a teacher. We have a dataset which acts as a teacher and its role is to train the model or the machine. Once the model gets trained it can start making a prediction or decision when new data is given to it.

2. Unsupervised Learning: The model learns through observation and finds structures in the data. Once the model is given a dataset, it automatically finds patterns and relationships in the dataset by creating clusters in it. What it cannot do is add labels to the cluster, like it cannot say this a group of apples or mangoes, but it will separate all the apples from mangoes. Based on some patterns and relationships it creates clusters and divides the dataset into those clusters.

3. Reinforcement Learning:

It is the ability of an agent to interact with the environment and find out what is the best outcome. It follows the concept of hit and trial method. The agent is rewarded or penalized with a point for a correct or a wrong answer, and on the basis of the positive reward points gained the model trains itself. And again once trained it gets ready to predict the new data presented to it.

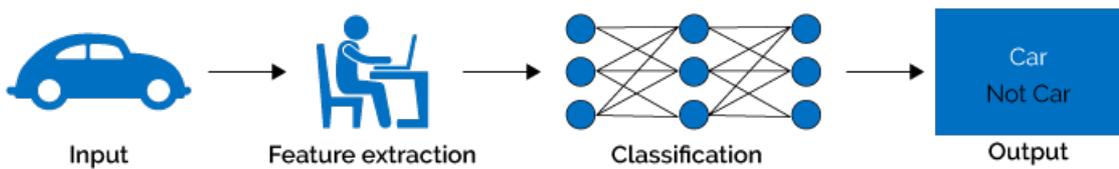
Machine Learning vs. Deep Learning:

Machine learning and deep learning are two subsets of artificial intelligence.

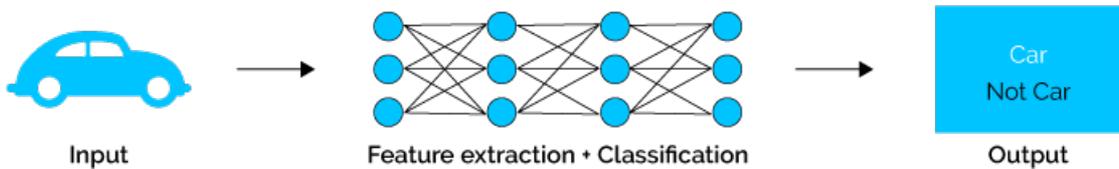
Machine Learning- A subset of artificial intelligence involved with the creation of algorithms which can modify itself without human intervention to produce desired output- by feeding itself through structured data.

Deep Learning- A subset of machine learning where algorithms are created and function similar to those in machine learning, but there are numerous layers of these algorithms- each providing a different interpretation to the data it feeds on. Such a network of algorithms are called artificial neural networks, being named so as their functioning is an inspiration, or you may say; an attempt at imitating the function of the human neural networks present in the brain.

Machine Learning



Deep Learning



Deep Learning -Applications:

1.Self-Driving Cars – Deep Learning is the force that is bringing autonomous driving to life. A million sets of data are fed to a system to build a model, to train the machines to learn, and then test the results in a safe environment. Data from cameras, sensors, geo-mapping is helping create succinct and sophisticated models to navigate through traffic, identify paths, signage, pedestrian-only routes, and real-time elements like traffic volume and road blockages. A system like this that can navigate just with on-board sensors shows the potential of self-driving cars being able to actually handle roads beyond the small number that tech companies have mapped.

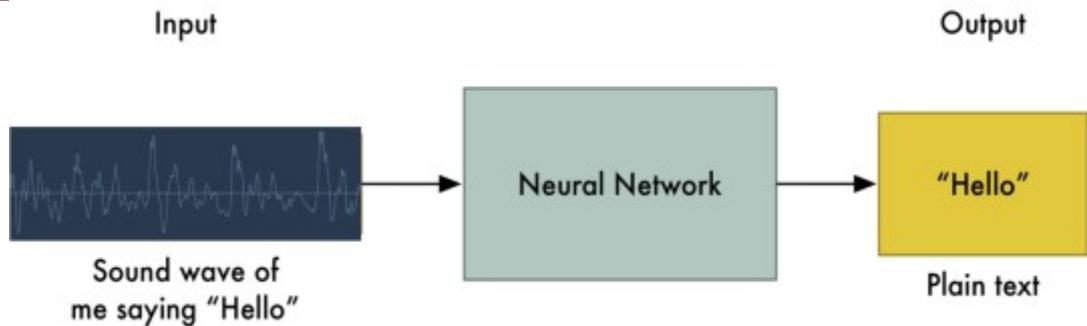
2.News Aggregation and Fraud News Detection – There is now a way to filter out all the bad and ugly news from your news feed. Extensive use of deep learning in news aggregation is bolstering efforts to customize news as per readers. Fraud news detection, on the other hand, is an important asset in today's world where the internet has become the primary source of all genuine and fake information. The Cambridge Analytica is a classic example of how fake news, personal information, and statistics can influence reader perception (Bhartiya Janta Party vs Indian National Congress), elections (Read Donald Trump Digital Campaigns), and exploit personal data (Facebook data for approximately 87 million people was compromised). Deep Learning helps develop classifiers that can detect fake or biased news and remove it from your feed and warn you of possible privacy breaches.

3.Natural Language Processing (NLP) – Understanding the complexities associated with language whether it is syntax, semantics, expressions, or even sarcasm is one of the hardest tasks for humans to learn. NLP through Deep Learning is trying to achieve appropriate responses and a personalized form of expression to every scenario by training machines to catch linguistic differences and frame appropriate responses.

4.Virtual Assistants – The most popular application of deep learning is virtual assistants ranging from Alexa to Siri to Google Assistant. Each interaction with these assistants provides them with an opportunity to learn more about your voice and accent, thereby providing you a secondary human interaction experience. Virtual assistants use deep learning to know more about their subjects. They learn to understand your commands by evaluating natural human language to execute them. Another capability virtual assistants are endowed with is to translate your speech to text, make notes for you, and book appointments.

5.Speech Recognition:

Here the sound waves need to be represented as a spectrogram which is like a time-snapshot of different frequencies and their intensities something like the cochlea in the human hear. This spectrogram is a spatial-temporal signal, thus it varies with time so a typical deep neural network won't do, thus one needs a neural network capable of remembering sequence inputs and thankfully there is such a neural net called the long-short-term-memory (LSTM) deep neural network. LSTMs are capable of recognizing sequences of spatial-temporal input signals.

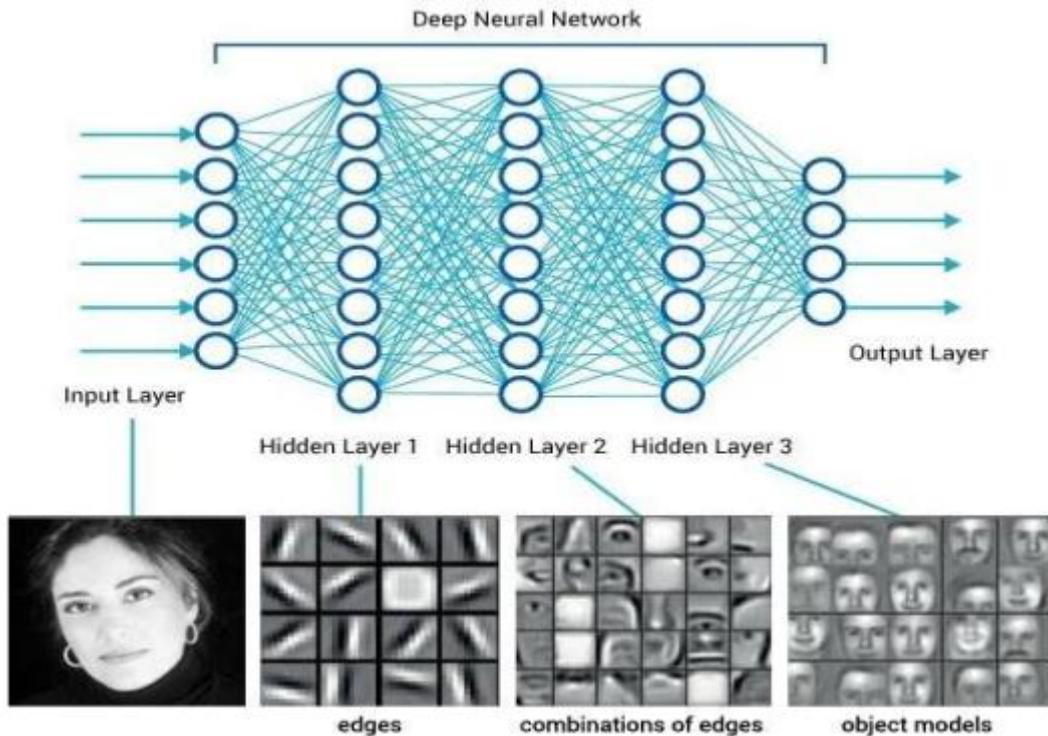


They learn to map the spectrogram feeds to words. The actual real-life products using deep speech recognition systems are:

Google assistant: Google now, for older devices before Android Nougat.

Amazon Echo: uses deep learning for speech recognition.

6. Image recognition: Image recognition is another interesting area of application. Here images are represented as a 2D array of pixels, each pixel with RGB-channels or grayscale, feed directly into a convolutional neural network (CNN) which is trained end-to-end. A CNN consists of alternating layers of convolutions, called convolutional layers, and pooling & subsampling layers. The result is a deep abstract representation of images at the output layer, thus CNNs or convNets are powerful tools for classifying the contents of images. Such networks are behind the success of:



Google photos: Powered by a large scale CNN in the cloud running on powerful Google servers with tensor processing units (TPU) and developed using TensorFlow.

Microsoft How-Old: Though not very accurate at determining a persons age from photos, even humans find it difficult to do so.

Clarifai: Another interesting cloud-based image recognition service.

Face detection: In cameras for snapping photos when someone smiles. **Face recognition:** Such as on Facebook automatic face tagging feature.

SENTIMENT ANALYSIS:

Sentiment Analysis is a classic example of machine learning.

Sentiment analysis is the automated process of understanding an opinion about a given subject from written or spoken language.

Sentiment Analysis also known as Opinion Mining within Natural Language Processing (NLP) that builds systems that try to identify and extract opinions within text. Usually, besides identifying the opinion, these systems extract attributes of the expression e.g.:

Polarity: if the speaker express a positive or negative opinion,

Subject: the thing that is being talked about,

Opinion holder: the person, or entity that expresses the opinion.

What Is an Opinion?

Text information can be broadly categorized into two main types: facts and opinions. Facts are objective expressions about something. Opinions are usually subjective expressions that describe people's sentiments, appraisals, and feelings toward a subject or topic.

Sentiment analysis, just as many other NLP problems, can be modeled as a classification problem where two sub-problems must be resolved:

Classifying a sentence as subjective or objective, known as subjectivity classification.

Classifying a sentence as expressing a positive, negative or neutral opinion, known as polarity classification.

Scope of Sentiment Analysis :

Sentiment analysis can be applied at different levels of scope:a

Document level sentiment analysis obtains the sentiment of a complete document or paragraph.

Sentence level sentiment analysis obtains the sentiment of a single sentence.

Sub-sentence level sentiment analysis obtains the sentiment of sub-expressions within a sentence.

Why sentiment analysis is important?

It's estimated that 80% of the world's data is unstructured and not organized in a pre-defined manner. Most of this comes from text data, like emails, support tickets, chats, social media, surveys, articles, and documents. These texts are usually difficult, time-consuming and expensive to analyze, understand, and sort through.

Advantages of sentiment analysis:

1.Scalability:manually sorting through thousands of tweets, customer support conversations, or customer reviews is highly difficult. There's too much data to process manually. Sentiment analysis allows to process data at scale in an efficient and cost-effective way.

2.Real-time analysis:

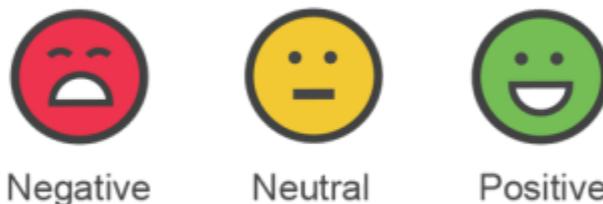
We can use sentiment analysis to identify critical information that allows situational awareness during specific scenarios in real-time.

3.Consistent criteria:

Humans don't observe clear criteria for evaluating the sentiment of a piece of text. It's estimated that different people only agree around 60-65% of the times when judging the sentiment for a particular piece of text. It's a subjective task which is heavily influenced by personal experiences, thoughts, and beliefs. By using a centralized sentiment analysis system, companies can apply the same criteria to all of their data. This helps to reduce errors and improve data consistency.

How does sentiment analysis work, generally?

Generally, sentiment analysis aim to detect emotional polarity of text - in most popular case - if text is positive, negative or neutral.



There are mostly 2 kinds of sentiment analysis methods:

1. lexicon-based

2. machine learning

1.Lexicon based methods store defined list of positive and negative words, with their valence - (eg 'nice': +2, 'good': +1, 'terrible': -1.5 etc).

Algorithm lookup text to find all known words, and just combines their individual results (summing or averaging). There can be some extensions, to incorporate some grammatical rules, like negation or sentiment modifier (like word but, which weights sentiment values in text differently, to emphasize end of text).

Example: if we would analyze sentence I don't like you, but you acted in nice way yesterday, having lexicon like: +2, nice: +1, overall sentiment would be +3, which is positive.If we incorporate negation-check, we would negate `like`, changing it's sign, so overall sentiment would be negative -1.

If we add sentiment modifier rule, which lowers sentiment value before but word by 0.5 and uppers afterward by 1.5, it would be $-2 * 0.5 + 1 * 1.5 = 0.5$, which is rather neutral, and so do I recognize this sentence

2.Machine learning methods require annotated data sets - list of texts with sentiment manually recognized. If we take huge amount of such texts, and feed some machine learning algorithm (like neural networks or SVM) with them, it will learn how to recognize sentiment automatically.



Sentiment Analysis Algorithms:

There are many methods and algorithms to implement sentiment analysis systems, which can be classified as:

1.Rule-based systems that perform sentiment analysis based on a set of manually crafted rules.

- rule-based approaches define a set of rules in some kind of scripting language that identify subjectivity, polarity, or the subject of an opinion.
- It uses variety of inputs like Classic NLP techniques like stemming, tokenization, part of speech tagging and parsing.

2.Automatic systems :They don't rely on manually crafted rules but on machine learning techniques to learn from data.

- The sentiment analysis task is usually modeled as a classification problem where a classifier is fed with a text and returns the corresponding category, e.g. positive, negative, or neutral which includes:
- *training process*-The feature extractor transfers the text input into a feature vector.Pairs of feature vectors and tags are fed into the machine learning algorithm to generate a model.
prediction process- the feature extractor is used to transform unseen text inputs into feature vectors.
These feature vectors are then fed into the model, which generates predicted tags (again, positive, negative, or neutral).

3.Hybrid systems that combine both rule based and automatic approaches where it can improve accuracy and precision.

SENTIMENT ANALYSIS-APPLICATIONS:

1.SOCIAL MEDIA MONITORING:

Analyzes tweets and facebook posts over a period of time to see opinions of a particular audience.It helps to Prioritize action which is more urgent and tracks the trends over time.

2.Brand Monitoring:

Instead of focusing on specific social media platforms such as Facebook and Twitter, we can target mentions in places like news, blogs, and forums. Analyzes news articles, blog posts, forum discussions, and other texts on the internet over a period of time to see sentiment of a particular audience.

3.customer feedback:

Targets individuals and Track customer sentiment over time to improve their service. Determines if particular customer segments feel more strongly about your company and how a change in product or service affects how customers feel.

NEURAL NETWORKS:

Neural Networks commonly known as Artificial Neural Networks (ANN) are a family of Machine Learning techniques modeled on the human brain.

Neuron:

This is the building unit of the neural networks, which imitates the functionality of a human neuron. Typical neural networks uses the sigmoid function. This function is used mostly due to its nature of being able to write the derivative in terms of $f(x)$ itself, which comes handy when minimizing error.

Sigmoid function:

$$f(x) = \frac{1}{1 + e^{-x}}$$

Structure of neural networks:

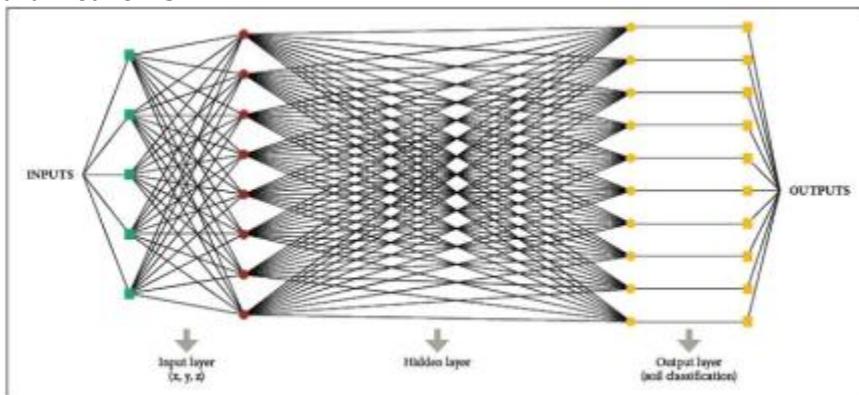


Figure 3 The network structure

Input layer: this reflects the potential descriptive factors that may help in prediction.

Hidden layer: a user-defined number of layers with a specified number of neurons in each layer.

Output layer: this reflects the thing you are trying to predict. For example; this could be a labelling of an image or a more traditional 0/1 outcome.

TYPES OF NEURAL NETWORKS:

1.feed forward neural network:

In a feedforward neural network, the data passes through the different input nodes till it reaches the output node.

Ex:Feedforward neural networks are used in technologies like face recognition and computer vision.

2.Radial Basis Function Neural Network:A radial basis function considers the distance of any point relative to the centre. Such neural networks have two layers. In the inner layer, the features are combined with the radial basis function.

Ex:This neural network is used in the power restoration systems in order to restore power in the shortest possible time

3.Multilayer Perceptron:

every single node in a layer is connected to each node in the following layer. It is used to classify data that cannot be separated linearly.

Ex: speech recognition and machine translation technologies.

4.Convolutional Neural Network:

A CNN contains one or more than one convolutional layers. These layers can either be completely interconnected or pooled. Due to this ability, convolutional neural networks show very effective results in image and video recognition, natural language processing, and recommender systems.

Ex: image analysis and recognition in agriculture where weather features are extracted from satellites

5.Recurrent Neural Network(RNN) - Long Short Term Memory:

output of a particular layer is saved and fed back to the input. This helps predict the outcome of the layer. If the prediction is wrong, the system self-learns and works towards making the right prediction during the backpropagation. This type of neural network is very effective in text-to-speech conversion technology.

6.Modular Neural Network:

A modular neural network has a number of different networks that function independently and perform sub-tasks. The different networks do not really interact with or signal each other during the computation process. They work independently towards achieving the output.

7. Sequence-To-Sequence Models:

A sequence to sequence model consists of two recurrent neural networks. There's an encoder that processes the input and a decoder that processes the output. The encoder and decoder can either use the same or different parameters. This model is particularly applicable in those cases where the length of the input data is not the same as the length of the output data.

Ex: chatbots, machine translation, and question answering systems.

Conclusion:

Over the last few years Deep Learning was applied to hundreds of problems, ranging from computer vision to natural language processing. In many cases Deep Learning outperformed previous work. Deep Learning is heavily used in both academia to study intelligence and in the industry in building intelligent systems to assist humans in various tasks. The goal of this post is to share amazing applications of Deep Learning.

References:

1. <https://towardsdatascience.com/deep-learning-for-sentiment-analysis-7da8006bf6c1>
2. <https://medium.com/@ritidass29/the-essential-guide-to-how-nlp-works-4d3bb23faf76>
3. <https://www.quora.com/How-is-deep-learning-used-in-sentiment-analysis>
4. https://en.wikipedia.org/wiki/Deep_learning
5. <https://www.kaggle.com/bertcarremans/deep-learning-for-sentiment-analysis>
6. <https://machinelearningmastery.com/predict-sentiment-movie-reviews-using-deep-learning>
7. <https://underthehood.meltwater.com/blog/2019/08/22/deep-learning-models-for-sentiment-analysis>

Impact of Artificial intelligence in 21st century business

Mukunda.G¹ & Punitha.G²

¹Assistant Professor, Department of Commerce and Management, Seshadripuram First Grade College
Yelahanka Bangalore 64, Karnataka India

²Associate Professor, Department of Commerce and Management Seshadripuram Institute of commerce and
management, Seshadripuram Bangalore 20, Karnataka India.

ABSTRACT: This paper mainly emphasis on artificial intelligence terminology and its impact in business application various internet sources articles have been studied on this aspect the outcome is based on secondary data and the paper depicts the transparency of A.I in present business scenario.

A.I uses more smartness in tremendous 5th generation technology and it has impacted much on present business situation. In this technological era it serves the purpose of organization and enables the business opportunities in large. Today in 21st century business is depended upon technology and some industries adopt robotic engineering application to face global competition based on the survival strategy and tool for decision making. Technology is the future of all business ventures globally.

Keywords: Artificial intelligence, 5th generation technology, Robotic engineering application, Survival strategy, Decision making.

1. Introduction:

Artificial intelligence (AI), sometimes called machine intelligence, is intelligence demonstrated by machines, in contrast to the natural intelligence displayed by humans. Colloquially, the term "artificial intelligence" is often used to describe machines (or computers) that mimic "cognitive" functions that humans associate with the human mind, such as "learning" and "problem solving".

Artificial intelligence can be classified into three different types of systems: analytical, human-inspired, and humanized artificial intelligence. Analytical AI has only characteristics consistent with cognitive intelligence; generating a cognitive representation of the world and using learning based on past experience to inform future decisions. Human-inspired AI has elements from cognitive and emotional intelligence; understanding human emotions, in addition to cognitive elements, and considering them in their decision. Humanized AI shows characteristics of all types of competencies (i.e., cognitive, emotional, and social intelligence), is able to be self-conscious and is self-aware in interactions.

The traditional problems (or goals) of AI research include reasoning, knowledge representation, planning, learning, natural language processing, perception and the ability to move and manipulate objects. General intelligence is among the field's long-term goals. Approaches include statistical methods, computational intelligence, and traditional symbolic AI. Many tools are used in AI, including versions of search and mathematical optimization, artificial neural networks, and economics. The AI field draws upon computer science, information engineering, mathematics, psychology, linguistics, philosophy, and many other fields.

AI is incorporated into a variety of different types of technology. Here are six examples.

- **Automation:** What makes a system or process function automatically? For example, robotic process automation (RPA) can be programmed to perform high-volume, repeatable tasks that humans normally performed. RPA is different from IT automation in that it can adapt to changing circumstances.
- **Machine learning:** The science of getting a computer to act without programming. Deep learning is a subset of machine learning that, in very simple terms, can be thought of as the automation of predictive analytics. There are three types of machine learning algorithms:
 - Supervised learning: Data sets are labeled so that patterns can be detected and used to label new data sets
 - Unsupervised learning: Data sets aren't labeled and are sorted according to similarities or differences
 - Reinforcement learning: Data sets aren't labeled but, after performing an action or several actions, the AI system is given feedback

- **Machine vision:** The science of allowing computers to see. This technology captures and analyzes visual information using a camera, analog-to-digital conversion and digital signal processing. It is often compared to human eyesight, but machine vision isn't bound by biology and can be programmed to see through walls, for example. It is used in a range of applications from signature identification to medical image analysis. Computer vision, which is focused on machine-based image processing, is often conflated with machine vision.
- **Natural language processing (NLP):** The processing of human -- and not computer -- language by a computer program. One of the older and best known examples of NLP is spam detection, which looks at the subject line and the text of an email and decides if it's junk. Current approaches to NLP are based on machine learning. NLP tasks include text translation, sentiment analysis and speech recognition.
- **Robotics:** A field of engineering focused on the design and manufacturing of robots. Robots are often used to perform tasks that are difficult for humans to perform or perform consistently. They are used in assembly lines for car production or by NASA to move large objects in space. Researchers are also using machine learning to build robots that can interact in social settings.
- **Self-driving cars:** These use a combination of computer vision, image recognition and deep learning to build automated skill at piloting a vehicle while staying in a given lane and avoiding unexpected obstructions, such as pedestrians.

2. Review of literature

In the 21st century artificial intelligence (AI) has become an important area of re- search in virtually all fields: engineering, science, education, medicine, business, account- ing, finance, marketing, economics, stock market and law, among others (Halal (2003), Masnikosa (1998), Metaxiotis et al. (2003), Raynor (2000), Stefanuk and Zhzhikashvili (2002), Tay and Ho (1992) and Wongpinunwatana et al. (2000)).

The field of AI has grown enormously to the extent that tracking proliferation of studies becomes a difficult task (Ambite and Knoblock (2001), Balazinski et al. (2002), Cristani (1999) and Goyache(2003)).

Apart from the application of AI to the fields mentioned above, studies have

been segregated into many areas with each of these springing up as individual fields of knowledge (Eiter et al. (2003), Finkelstein et al. (2003), Grunwald and Halpern (2003), Guestrin et al. (2003), Lin (2003), Stone et al. (2003) and Wilkins et al. (2003)

3. Research problem

Artificial intelligence is flexible for any business operations particularly this paper is focused on Indian business organizations. "Every startup in India needs compactable technology but they fail to adopt it for their business development which directly affects decision making" the main obstacle faced in cost factor for acquiring those technologies and lack of professional skilled resources and economic conditions might affect them.

4. Objectives of Artificial intelligence in business

- To understand the A.I applications in the business.
- To know how A.I promotes small business in global standards.
- To analyse the practical situations in facing global competition.

Merits of Artificial intelligence in Business

- Improving customized and shopping experience.
- Client's interactions.
- Real time assistance
- Information mining
- Automation

Demerits of Artificial intelligence in Business

- Highly Expensive to adopt technology.
- No original creativity.
- Unemployment
- No improvement with experience
- Difficulty in software development

5. Limitations of the study

- This study is based on secondary data only.
- Time Constraint.

6. AI applications in different fields.

Artificial intelligence has made its way into a number of areas. Here are six examples.

- **AI in healthcare.** The biggest bets are on improving patient outcomes and reducing costs. Companies are applying machine learning to make better and faster diagnoses than humans. One of the best known healthcare technologies is IBM Watson. It understands natural language and is capable of responding to questions asked of it. The system mines patient data and other available data sources to form a hypothesis, which it then presents with a confidence scoring schema. Other AI applications include chatbots, a computer program used online to answer questions and assist customers, to help schedule follow-up appointments or aid patients through the billing process, and virtual health assistants that provide basic medical feedback.
- **AI in business.** Robotic process automation is being applied to highly repetitive tasks normally performed by humans. Machine learning algorithms are being integrated into analytics and CRM platforms to uncover information on how to better serve customers. Chatbots have been incorporated into websites to provide immediate service to customers. Automation of job positions has also become a talking point among academics and IT analysts.
- **AI in education.** AI can automate grading, giving educators more time. AI can assess students and adapt to their needs, helping them work at their own pace. AI tutors can provide additional support to students, ensuring they stay on track. AI could change where and how students learn, perhaps even replacing some teachers.
- **AI in finance.** AI in personal finance applications, such as Mint or Turbo Tax, is disrupting financial institutions. Applications such as these collect personal data and provide financial advice. Other programs, such as IBM Watson, have been applied to the process of buying a home. Today, software performs much of the trading on Wall Street.
- **AI in law.** The discovery process, sifting through of documents, in law is often overwhelming for humans. Automating this process is a more efficient use of time. Startups are also building question-and-answer computer assistants that can sift programmed-to-answer questions by examining the taxonomy and ontology associated with a database.
- **AI in manufacturing.** This is an area that has been at the forefront of incorporating robots into the workflow. Industrial robots used to perform single tasks and were separated from human workers, but as the technology advanced that changed.

7. Security and ethical concerns

The application of AI in the realm of self-driving cars raises security as well as ethical concerns. Cars can be hacked, and when an autonomous vehicle is involved in an accident, liability is unclear. Autonomous vehicles may also be put in a position where an accident is unavoidable, forcing the programming to make an ethical decision about how to minimize damage.

Another major concern is the potential for abuse of AI tools. Hackers are starting to use sophisticated machine learning tools to gain access to sensitive systems, complicating the issue of security beyond its current state.

Deep learning-based video and audio generation tools also present bad actors with the tools necessary to create so-called deep fakes, convincingly fabricated videos of public figures saying or doing things that never took place.

8. Data analysis

The information is extracted from the secondary source via internet and other published sources.

Conclusion

Artificial intelligence is building the enterprise of the 21st century creating next generation solution that offer ever increasing business value.

Conclusion is drawn on start ups and mid turnovers companies as these range of organization has to upgrade to latest A.I technologies for facing global competition. However tech giants like apple and Samsung would be the best examples for 5th generation technologies and their survival strategy in artificial arena.

References:

1. <https://searchenterpriseai.techtarget.com/definition/AI-Artificial-Intelligence>
2. https://en.wikipedia.org/wiki/Artificial_intelligence
3. <https://www.flatworldsolutions.com/IT-services/>

Correlation between Big Data and Cloud Computing

¹Navatha. S, ²Kavitha. M,

¹Asst. Professor, ² Asst. Professor,

¹Department of Computer Science, ²Department of Computer Science

¹SB College of Management Studies, Yelahanka Newtown, Bengaluru-65

²SB College of Management Studies, Yelahanka Newtown, Bengaluru-65

ABSTRACT: *Big Data is an enormous amount of the unrestricted redundant and noisy data and information from which the useful knowledge has to be extracted which requires processing and storage. To perform the above function cloud computing provides various flexible and techniques to tackle a huge amount of data. The Cloud is an online storage model on multiple virtual servers. Big Data has attracted a lot of attention from academia, industry as well as government. As large amount of data which is not possible in traditional database, cloud computing as a basic level is using network of remote servers hosted on internet. Data processing involves data acquisition, storage and analysis, with this aspect in this paper we are discussing regarding the correlation between big data and cloud computing and also reviewing the architecture of cloud computing with big Data. Integrating big data with Cloud computing technologies in business and education can have a better future. The capability to store large amounts of data in different forms and process with high speed will results in the rapid development of business, education etc. Furthermore, research challenges are investigated, with focus on scalability, availability, data integrity, data transformation, data quality, data heterogeneity, privacy, legal and regulatory issues, and governance.*

Keywords: *BigData, CloudComputing, virtual servers.*

I. Introduction

Data is the raw material for information before sorting, arranging and processing. It cannot be used in its primary form prior to processing. Information represents data after processing and analysis. Big data is associated with the storage of massive loads of data and the ways to extract information from it.

II. BIG DATA

Big data is a term which encompasses all sorts of data which exists today, from hospital records (digital data) to the government paperwork. In big data era, the data may be structured, unstructured and semi structured. Big data is one of the technologies which is used to manage, store and data analysis. Therefore storage management is one of the important processes in big data management to ensure that data are stored correctly, safely and easily accessed. If we relate Big and Cloud such as data security is very important providing the data security. The five aspects with which Big Data is commonly described are

- Volume: the size of data.
- Variety: different types of data.
- Velocity: rate at which data goes in and out of the system.
- Value: the value of data based on the information contained within.
- Veracity: data confidentiality and availability.

Big data requirement is same where distributed processing of massive data is abstracted from the end users.

III. CLOUD COMPUTING:

Cloud computing is a technology used to store data and information on a remote server. It uses the servers hosted on the internet to store, manage and process the data. Cloud computing offers services to its users on a pay-as-you-go model. Cloud providers provide three main services. These services are outlined below:

- **Infrastructure as a Service (IAAS)**

It is the complete infrastructure will be offered to user. Tasks relating to maintenance will be catered to by the cloud provider based on user requirements.

- **Platform as a Service (PaaS)**

The cloud service provider will offer resources such as operating system and middleware., with resources that enable you to deliver everything from simple cloud-based apps to sophisticated object storage, queuing,

runtime, databases etc. But the responsibility of configuring and implementing the resources should be done by the user.

- **Software as a Service (SaaS)**

This service does not offer a user any responsibilities. Only user can make use of the application running on the cloud. The service provider has the responsibility of setting up the necessary infrastructure. Office software is an example of businesses that make us of SaaS as tasks relating to accounting, sales and planning can all be performed through SAAS.

- **Desktop as a Service (DaaS)**

It differs from traditional models like (SAAS, IAAS, PAAS) in providing data to users through the network, as data is considered the value of this model in conjunction with cloud computing based on solving some of the challenges in managing a huge amount of data. For these reasons, DaaS is closely related to big data whose technologies must be utilized. DaaS provides highly efficient methods of data distribution and processing.

IV. CLOUD FOR BIG DATA

The relationship between big data and the cloud computing is based on integration in that the cloud represents the storehouse and the big data represents the product that will be stored in the storehouse, since it is not possible to create storehouses without storing any product in them. Emergence of cloud computing which made it easier to provide the best of technology in most cost effective packages available even to the smaller companies.

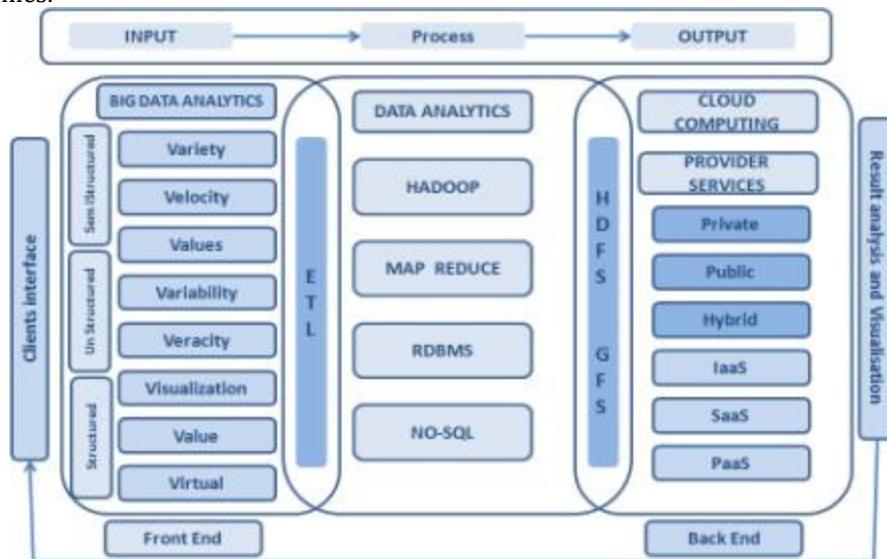


Fig.4.1 Framework of Big Data with Cloud Computing(Source: www.Whizlabs.com)

Cloud computing and big data are complementary to each other. Clouds are evolving and providing solutions for the appropriate environment of big data while traditional storage cannot meet the requirements for dealing with big data, in addition to the need for data exchange between various distributed storage locations. The cloud computing environment is expanding to be able to absorb big amounts of data as it follows the policy of data splitting, that is, to store data in more than one location or availability area. Cloud computing environments are built for general purpose workloads and resource pooling is used to provide flexibility on demand. Therefore, the cloud computing environment seems to be well suited for big data. Big data processing and storage require expansion as the cloud provides expansion through virtual machines and helps big data evolve and become accessible. This is a consistent relationship between them. Google, IBM, Amazon and Microsoft are examples of the success in using big data in the cloud environment [50]. In order for the cloud environment to fit with big data the cloud computing environment must be modified to suit data and cloud work together. Many changes are needed to be made on the cloud: CPUs to handle big data and others. The most common models for providing big data analytics solution on clouds are PaaS and SaaS. IaaS is usually not used for high-level data analytics applications but mainly to handle the storage and computing needs of data, Cloud computing models can help accelerate the potential for scalable analytics solutions [52]. Cloud computing is a member of distributed computing family that provides resources in the form of user services such as (SaaS), infrastructure like (IaaS) and a platform as

service like (PaaS), but with the advent of big data, the cloud computing model is gradually moving to big database service including (AaaS,BDaaS) known as (DaaS) database as a service which means that database services are available for applications that are deployed in any implementation environment.

Cloud can be used for Big Data:

- **IaaS in Public Cloud:** Using the infrastructure provided by the cloud for Big Data services will enable people to access limitless storage and compute power. IaaS can be used by enterprise customers to create cost effective solutions to problems of IT where cloud providers bear the expenses of managing the underlying hardware.
- **PaaS in Private Cloud:** PaaS vendors are presently incorporating Big Data technologies into the service they offer thereby eliminating the need to deal with the complexities of managing individual software and hardware elements.
- **SaaS in Hybrid Cloud:** Quite a number of businesses deem it necessary to analyze the voice and opinion of customers especially on social media. SaaS vendors provide the ideal platform to conduct the analysis as well as social media data. Office software is an example of businesses that make use of SaaS as tasks relating to accounting, sales and planning can all be performed through SAAS.

Benefits of Big data analysis in Cloud

- **Simplified Infrastructure**

Analyzing a Big Data as the data comes in large volumes with varying speeds, and types which traditional infrastructures usually cannot keep up with. As the Cloud computing provides flexible infrastructure, which we can scale according to the needs at the time, it is easy to manage workloads.

- **Improved analysis**

As Cloud integrate data from multiple sources, big data analysis has become more improved causing better results. Hence, many companies and organization prefer to perform big data analysis in the Cloud.

- **Lowering the cost**

Both Big data and Cloud technology delivers value to organizations by reducing the ownership. (Pay-per-user model of Cloud). Cloud enables customers for big data processing without large-scale big data resources. Hence, both Big Data and Cloud technology are driving the cost down for enterprise purposes and bringing value to the enterprise.

- **Security and Privacy**

Data security and privacy are two major concerns when dealing with enterprise data. When user application is hosted on a Cloud platform due to its open environment and limited user control security becomes a primary concern. On the other hand, being an open source application, Big data solution like Hadoop uses a lot of third-party services and infrastructure. Hence, nowadays system integrators bring in Private Cloud Solution that is Elastic and Scalable. Along with it the service provider and the customer signs a service level agreement (SLA) to gain the trust between them. If require the provider also leverages required advanced level of security control. This enables the security of big data in Cloud computing covering the issues such as protecting big data from advanced threats.

Virtual Machine (VM) between the cloud and big data:

Virtual Machine (VM) is a software application that simulates a virtual computing environment that can run the operating system (OS) and its associated applications with multiple virtual machines installed on a single machine. By using Virtualization technology, it provides the ability to reduce workload in virtual metering devices and unify them into one physical server. Consolidation has become particularly effective after the adoption of multi-core CPUs in computing environments, where many virtual machines can be allocated to a single physical node that improves resource utilization and reduces power consumption compared to multi-node setup. Virtualization technology is the best platform for big data as well as traditional applications. Assuming big data applications simplifies managing your big data infrastructure, providing faster results and is more cost-effective. The role of infrastructure, whether real or virtual, is to support applications. This includes important traditional business applications, modern cloud, and mobile and big data applications. Virtualized big data applications, such as (Hadoop), provide many benefits that cannot be accessed on physical infrastructure but helps simplify big data management. Big data and cloud computing point to the convergence of technologies and trends that make IT infrastructure and their applications more dynamic, more modular and more expendable. Currently, the virtual platform building technology is only in the primary stage, which is mainly based on cloud data center integration technology. Cloud computing and big

data projects rely heavily on virtualization. Virtual data is the only way to access and improve heterogeneous environments, such as environments used in big data projects.

V. CHALLENGES IN BIG DATA AND CLOUD COMPUTING

It was the emergence of cloud computing which made it easier to provide the best of technology in the most cost-effective packages. Cloud computing not only reduced costs, but also made a wide array of applications available to the smaller companies. Organizations and institutions are also creating data on a daily basis, which can eventually become difficult to manage. Take a look at these statistics on Big Data generation in the last five years: 2.5 quintillion bytes (2.3 Trillion Gigabytes) of data are created every day, 40 zettabytes (43 Trillion Gigabytes) of data will be created by 2020, Most companies in the US have at least 100 Terabytes (100,000 Gigabytes) of stored data. Few Challenges are listed below:

- **Agility:**
The traditional infrastructure of storing and managing data is now proving to be slower and harder to manage. It can literally take weeks to just install and run a server. Cloud computing is here now, and it can provide your company with all the resources you need. A cloud database can enable your company to have thousands of virtual servers and get them working seamlessly in only a matter of minutes.
- **Affordability:** Cloud computing is a blessing in disguise for a company that wishes to have updated technology under a budget. The resources required to manage Big Data are easily available and they don't cost much. Before the cloud, companies used to invest huge sums of money in setting up IT departments and then paid more money to keep that hardware updated. Now the companies can host their Big Data on off-site servers or pay only for storage space and power they use every hour.
- **Data processing:** The explosion of data leads to the issue of processing it. Social media alone generates a load of unstructured, chaotic data like tweets, posts, photos, videos and blogs which can't be processed under a single category. With Big Data Analytics platforms like Apache Hadoop, structured and unstructured data can be processed. Cloud computing makes the whole process easier and accessible to small, medium and larger enterprises.
- **Feasibility:** The cloud, enterprises can scale up or down to the desired level of processing power and storage space easily and quickly.

Big Data analytics require new processing requirements for large data sets. The demand for processing this data can raise or fall at any time of the year, and cloud environment is the perfect platform to fulfill this task. There is no need for additional infrastructure, since cloud can provide most solutions in SaaS models.

VI. CONCLUSION

Though issues such as data storage capabilities still exist, it is easy to see that effectively combining Big data and cloud computing will enable companies and organisations to reap their unique benefits. Big Data and the cloud are essential components needed in institutions that want to move their businesses to the next level. Though few challenges exist there like data storage capabilities, however, these are negligible before the offered beneficial outcomes. So, we can conclude that Big Data and Cloud Computing is the perfect combination.

References

1. <https://bigdata-madesimple.com/big-data-and-cloud-computing-challenges-and-opportunities>
2. <https://www.ripublication.com>
3. <https://exceltip.com/theme/understanding-the-relationship-between-big-data-and-cloud-computing>
4. <https://www.google.com/url?sa=t&source=web&rct=j&url=https://arxiv.org/pdf/1712.05233&ved=2ahUKEwj026XlmjTlAhXj7HMBHQeUD8cQFjARegQIBBAB&usq=A0vVaw2gxNmx3DD4haXEiqDhlfmE>
5. <https://optic-fibre-tutorial.com>

Research Paper on Basic of Artificial Neural Network

Netra Sanjeev Mirji & Shivam Kumar

Professor, Department of Computer Science,
Seshadripuram First Grade College, Bengaluru, Karnataka, India

ABSTRACT: An Artificial Neural Network (ANN) is an information processing paradigm that is inspired by the way biological nervous systems, such as the brain, process information. It is also called parallel distributed processing systems (PDPs) and connectionist system, are intended for modelling the organizational principles of the central nervous system. The key element of this paradigm is the novel structure of the information processing system. It is composed of a large number of highly interconnected processing elements (neurons) working in unison to solve specific problems. ANNs, like people, learn by example. An ANN is configured for a specific application, such as pattern recognition or data classification, through a learning process. Learning in biological systems involves adjustments to the synaptic connections that exist between the neurons. This is true of ANNs as well. This paper gives overview of Artificial Neural Network, working & training of ANN. It also explains the application and advantages of ANN.

Keywords: ANN (Artificial Neural Network), Neurons, pattern recognition, PDP

I. Introduction

The study of the human brain is thousands of years old. The first step toward artificial neural networks came in 1943 when Warren McCulloch, a neurophysiologist, and a young mathematician, Walter Pitts, wrote a paper on how neurons might work. They modelled a simple neural network with electrical circuits. Neural networks, with their remarkable ability to derive meaning from complicated or imprecise data, can be used to extract patterns and detect trends that are too complex to be noticed by either humans or other computer techniques. A trained neural network can be thought of as an "expert" in the category of information it has been given to analyse. Other advantages include:

1. Adaptive learning: An ability to learn how to do tasks based on the data given for training or initial experience.
2. Self-Organization: An ANN can create its own organization or representation of the information it receives during learning time.
3. Real Time Operation: ANN computations may be carried out in parallel, and special hardware devices are being designed and manufactured which take advantage of this capability.
4. Fault Tolerance via Redundant Information Coding: Partial destruction of a network leads to the corresponding degradation of performance. However, some network capabilities may be retained even with major network damage.

Neural networks take a different approach to problem solving than that of conventional computers. Conventional computers use an algorithmic approach i.e. the computer follows a set of instructions in order to solve a problem. Unless the specific steps that the computer needs to follow are known the computer cannot solve the problem. That restricts the problem solving capability of conventional computers to problems that we already understand and know how to solve. But computers would be so much more useful if they could do things that we don't exactly know how to do. Neural networks process information in a similar way the human brain does. The network is composed of a large number of highly interconnected processing elements (neurons) working in parallel to solve a specific problem. Neural networks learn by example. They cannot be programmed to perform a specific task. The examples must be selected carefully otherwise useful time is wasted or even worse the network might be functioning incorrectly. The disadvantage is that because the network finds out how to solve the problem by itself, its operation can be unpredictable. On the other hand, conventional computers use a cognitive approach to problem solving; the way the problem is to solve must be known and stated in small unambiguous instructions. These instructions are then converted to a high level language program and then into machine code that the computer can understand. These machines are totally predictable; if anything goes wrong is due to a software or hardware fault. Neural networks and conventional algorithmic computers are not in

competition but complement each other. There are tasks are more suited to an algorithmic approach like arithmetic operations and tasks that are more suited to neural networks. Even more, a large number of tasks, require systems that use a combination of the two approaches (normally a conventional computer is used to supervise the neural network) in order to perform at maximum efficiency.

What is Neuron?

A **neuron** (also called neurone or **nerve cell**) is a cell that carries electrical impulses. **Neurons** are the basic (functional & structural) units of our nervous system. Every **neuron** is made of a cell body (also called soma), dendrites and an axon. ... **Neurons** are connected to one another and tissues.

Neurons are specialized to transmit information throughout the body. **These** highly specialized nerve cells are responsible for communicating information in both chemical and electrical forms. ... Sensory **neurons** carry information from the sensory receptor cells throughout the body to the brain

What is Artificial Neural Network?

Artificial Neural Networks are relatively crude electronic models based on the neural structure of the brain. The brain basically learns from experience. It is natural proof that some problems that are beyond the scope of current computers are indeed solvable by small energy efficient packages. This brain modelling also promises a less technical way to develop machine solutions. This new approach to computing also provides a more graceful degradation during system overload than its more traditional counterparts. These biologically inspired methods of computing are thought to be the next major advancement in the computing industry. Even simple animal brains are capable of functions that are currently impossible for computers. Computers do rote things well, like keeping ledgers or performing complex maths. But computers have trouble recognizing even simple patterns much less generalizing those patterns of the past into actions of the future. Now, advances in biological research promise an initial understanding of the natural thinking mechanism. This research shows that brains store information as patterns. Some of these patterns are very complicated and allow us the ability to recognize individual faces from many different angles. This process of storing information as patterns, utilizing those patterns, and then solving problems encompasses a new field in computing. This field, as mentioned before, does not utilize traditional programming but involves the creation of massively parallel networks and the training of those networks to solve specific problems. This field also utilizes words very different from traditional computing, words like behave, react, self-organize, learn, generalize, and forget.

ANN are computers whose architecture is modelled after the brain. They typically consist of hundreds of simple processing units which are wired together in a complex communication network. Each unit or node is a simplified model of real neuron which sends off a new signal or fires if it receives a sufficiently strong Input signal from the other nodes to which it is connected.

Traditionally neural network was used to refer as network or circuit of biological neurons, but modern usage of the term often refers to ANN. ANN is mathematical model or computational model, an information processing paradigm i.e. inspired by the way biological nervous system, such as brain information system. ANN is made up of interconnecting artificial neurons which are programmed like to mimic the properties of m biological neurons. These neurons working in unison to solve specific problems. ANN is configured for solving artificial intelligence problems without creating a model of real biological system. ANN is used for speech recognition, image analysis, adaptive control etc. These applications are done through a learning process, like learning in biological system, which involves the adjustment between neurones through synaptic connection. Same happen in the ANN.

Working of ANN:

The other parts of the –art|| of using neural networks revolve around the myriad of ways these individual neurons can be clustered together. This clustering occurs in the human mind in such a way that information can be processed in a dynamic, interactive, and self-organizing way. Biologically, neural networks are constructed in a three-dimensional world from microscopic components. These neurons seem capable of nearly unrestricted interconnections. That is not true of any proposed, or existing, man-made network. Integrated circuits, using current technology, are two-dimensional devices with a limited number of layers for interconnection. This physical reality restrains the types, and scope, of artificial neural networks that can be implemented in silicon. Currently, neural networks are the simple clustering of the primitive artificial neurons. This clustering occurs by creating layers which are then connected to one another. How these layers connect is the other part of the "art" of engineering networks to resolve real world problems.

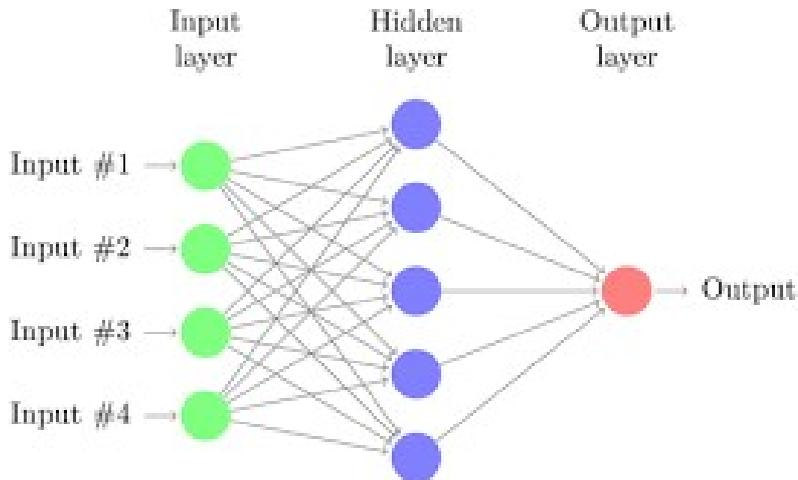


Fig 1: A Simple Neural Network with single layer

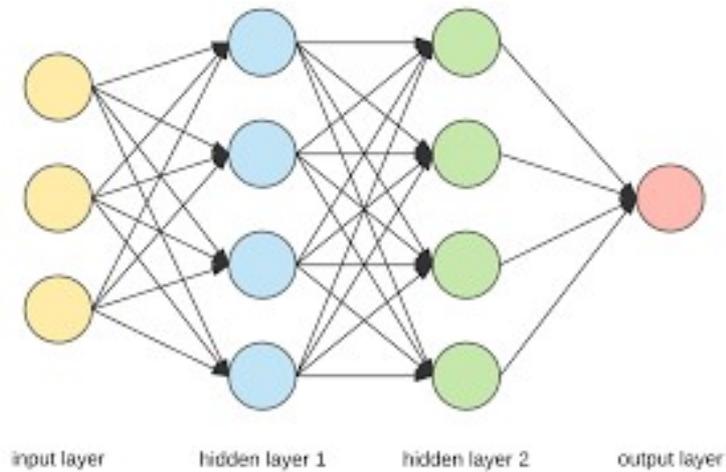


Fig 2: Multilayered Simple Neural Network

Basically, all artificial neural networks have a similar structure or topology as shown in Figure1. In that structure some of the neurons interfaces to the real world to receive its inputs. Other neurons provide the real world with the network's outputs. This output might be the particular character that the network thinks that it has scanned or the particular image it thinks is being viewed. All the rest of the neurons are hidden from view. But a neural network is more than a bunch of neurons. Some early researchers tried to simply connect neurons in a random manner, without much success. Now, it is known that even the brains of snails are structured devices. One of the easiest ways to design a structure is to create layers of elements. It is the grouping of these neurons into layers, the connections between these layers, and the summation and transfer functions that comprises a functioning neural network. The general terms used to describe these characteristics are common to all networks. Although there are useful networks which contain only one layer, or even one element, most applications require networks that contain at least the three normal types of layers - input, hidden, and output. The layer of input neurons receive the data either from input files or directly from electronic sensors in real-time applications. The output layer sends information directly to the outside world, to a secondary computer process, or to other devices such as a mechanical control system. Between these two layers can be many hidden layers. These internal layers contain many of the neurons in various interconnected structures. The inputs and outputs of each of these hidden neurons simply go to other neurons. In most networks each neuron in a hidden layer receives the signals from all of the neurons in a layer above it, typically an input layer. After a neuron performs its function it passes its output to all of the neurons in the layer below it, providing a feed forward path to the output. (Note: in section 5 the drawings are reversed, inputs come into the bottom and outputs come out the top)

These lines of communication from one neuron to another are important aspects of neural networks. They are the glue to the system. They are the connections which provide a variable strength to an input. There are two types of these connections. One causes the summing mechanism of the next neuron to add while the other causes it to subtract. In more human terms one excites while the other inhibits. Some networks want a neuron to inhibit the other neurons in the same layer. This is called lateral inhibition. The most common use of this is in the output layer. For example in text recognition if the probability of a character being a "P" is .85 and the probability of the character being an "F" is .65, the network wants to choose the highest probability and inhibit all the others. It can do that with lateral inhibition. This concept is also called competition. Another type of connection is feedback. This is where the output of one layer routes back to a previous layer. An example of this is shown in Figure 2.

Figure 2:- Simple Network with Feedback and Competition. The way that the neurons are connected to each other has a significant impact on the operation of the network. In the larger, more professional software development packages the user is allowed to add, delete, and control these connections at will. By "tweaking" parameters these connections can be made to either excite or inhibit.

Training an Artificial Neural Network

Once a network has been structured for a particular application, that network is ready to be trained. To start this process the initial weights are chosen randomly. Then, the training, or learning, begins. There are two approaches to training - supervised and unsupervised. Supervised training involves a mechanism of providing the network with the desired output either by manually "grading" the network's performance or by providing the desired outputs with the inputs. Unsupervised training is where the network has to make sense of the inputs without outside help. The vast bulk of networks utilize supervised training. Unsupervised training is used to perform some initial characterization on inputs. However, in the full blown sense of being truly self learning, it is still just a shining promise that is not fully understood, does not completely work, and thus is relegated to the lab.

1. Supervised Training

In supervised training, both the inputs and the outputs are provided. The network then processes the inputs and compares its resulting outputs against the desired outputs. Errors are then propagated back through the system, causing the system to adjust the weights which control the network. This process occurs over and over as the weights are continually tweaked. The set of data which enables the training is called the "training set." During the training of a network the same set of data is processed many times as the connection weights are ever refined. The current commercial network development packages provide tools to monitor how well an artificial neural network is converging on the ability to predict the right answer. These tools allow the training process to go on for days, stopping only when the system reaches some statistically desired point, or accuracy. However, some networks never learn. This could be because the input data does not contain the specific information from which the desired output is derived. Networks also don't converge if there is not enough data to enable complete learning. Ideally, there should be enough data so that part of the data can be held back as a test. Many layered networks with multiple nodes are capable of memorizing data. To monitor the network to determine if the system is simply memorizing its data in some non significant way, supervised training needs to hold back a set of data to be used to test the system after it has undergone its training. If a network simply can't solve the problem, the designer then has to review the input and outputs, the number of layers, the number of elements per layer, the connections between the layers, the summation, transfer, and training functions, and even the initial weights themselves. Those changes required to create a successful network constitute a process wherein the "art" of neural networking occurs. Another part of the designer's creativity governs the rules of training. There are many laws (algorithms) used to implement the adaptive feedback required to adjust the weights during training. The most common technique is backward-error propagation, more commonly known as back-propagation. These various learning techniques are explored in greater depth later in this report.

Yet, training is not just a technique. It involves a "feel," and conscious analysis, to insure that the network is not over trained. Initially, an artificial neural network configures itself with the general statistical trends of the data. Later, it continues to "learn" about other aspects of the data which may be spurious from a general viewpoint. When finally the system has been correctly trained, and no further learning is needed, the weights can, if desired, be "frozen." In some systems this finalized network is then turned into hardware so that it can be fast. Other systems don't lock themselves in but continue to learn while in production use.

2. Unsupervised, or Adaptive Training.

The other type of training is called unsupervised training. In unsupervised training, the network is provided with inputs but not with desired outputs. The system itself must then decide what features it will use to

group the input data. This is often referred to as self-organization or adaption. At the present time, unsupervised learning is not well understood. This adaption to the environment is the promise which would enable science fiction types of robots to continually learn on their own as they encounter new situations and new environments. Life is filled with situations where exact training sets do not exist. Some of these situations involve military action where new combat techniques and new weapons might be encountered. Because of this unexpected aspect to life and the human desire to be prepared, there continues to be research into, and hope for, this field. Yet, at the present time, the vast bulk of neural network work is in systems with supervised learning. Supervised learning is achieving results. *Application* The various real time application of Artificial Neural Network are as follows:

1. Function approximation, or regression analysis, including time series prediction and modelling.
2. Call control- answer an incoming call (speaker-ON) with a wave of the hand while driving.
3. Classification, including pattern and sequence recognition, novelty detection and sequential decision making.
4. Skip tracks or control volume on your media player using simple hand motions- lean back, and with no need to shift to the device- control what you watch/ listen to.
5. Data processing, including filtering, clustering, blind signal separation and compression.
6. Scroll Web Pages, or within an eBook with simple left and right hand gestures, this is ideal when touching the device is a barrier such as wet hands are wet, with gloves, dirty etc.
7. Application areas of ANNs include system identification and control (vehicle control, process control), game-playing and decision making (backgammon, chess, racing), pattern recognition (radar systems, face identification, object recognition, etc.), sequence recognition (gesture, speech, handwritten text recognition), medical diagnosis, financial applications, data mining (or knowledge discovery in databases, "KDD").
8. Another interesting use case is when using the Smartphone as a media hub, a user can dock the device to the TV and watch content from the device- while controlling the content in a touch-free manner from afar.
9. If your hands are dirty or a person hates smudges, touch-free controls are a benefit

Advantages

1. Adaptive learning: An ability to learn how to do tasks based on the data given for training or initial experience.
2. Self-Organisation: An ANN can create its own organisation or representation of the information it receives during learning time.
3. Real Time Operation: ANN computations may be carried out in parallel, and special hardware devices are being designed and manufactured which take advantage of this capability.
4. Pattern recognition is a powerful technique for harnessing the information in the data and generalizing about it. Neural nets learn to recognize the patterns which exist in the data set.
5. The system is developed through learning rather than programming.. Neural nets teach themselves the patterns in the data freeing the analyst for more interesting work.
6. Neural networks are flexible in a changing environment. Although neural networks may take some time to learn a sudden drastic change they are excellent at adapting to constantly changing information.
7. Neural networks can build informative models whenever conventional approaches fail. Because neural networks can handle very complex interactions they can easily model data which is too difficult to model with traditional approaches such as inferential statistics or programming logic.
8. Performance of neural networks is at least as good as classical statistical modelling, and better on most problems. The neural networks build models that are more reflective of the structure of the data in significantly less time.

CONCLUSION

In this paper we discussed about the Artificial neural network, working of ANN. Also training phases of an ANN. There are various advantages of ANN over conventional approaches. Depending on the nature of the application and the strength of the internal data patterns you can generally expect a network to train quite well. This applies to problems where the relationships may be quite dynamic or non-linear. ANNs provide an analytical alternative to conventional techniques which are often limited by strict assumptions of normality, linearity, variable independence etc. Because an ANN can capture many kinds of relationships it allows the user to quickly and relatively easily model phenomena which otherwise may have been very difficult or impossible to explain otherwise. Today, neural networks discussions are occurring everywhere.

Their promise seems very bright as nature itself is the proof that this kind of thing works. Yet, its future, indeed the very key to the whole technology, lies in hardware development. Currently most neural network development is simply proving that the principal works.

REFERENCES

1. Bradshaw, J.A., Carden, K.J., Riordan, D., 1991. Ecological –Applications Using a Novel Expert System Shell||. *Comp. Appl. Biosci.* 7, 79–83.
2. Lippmann, R.P., 1987. An introduction to computing with neural nets. *IEEE Accost. Speech Signal Process. Mag.*, April: 4-22.
3. N. Murata, S. Yoshizawa, and S. Amari, –Learning curves, model selection and complexity of neural networks,|| in *Advances in Neural Information Processing Systems* 5, S. Jose Hanson, J. D. Cowan, and C. Lee Giles
4. N. K. Bose AND P. Liang – *Neural Network Fundamentals with Graphs, Algorithms, and Applications.* TATA McGRW-HILL Publishing Company Limited, New Delhi.
5. *A Gentle Introduction to Neural Network Series.*
6. *Artificial Neural Networks - Basic Concepts – Tutorialspoint*

PARTIALLY IMPAIRED STUDENT AND COMPUTER SCREEN MAGNIFIER

Vidhya P¹ & N.Kapilan²

¹ SRSMN Govt. First Grade College & PG Study Centre, Barkur, Udupi 576210

² Nagarjuna College of Engg and Technology, Bengaluru 562 165

ABSTRACT: *In recent years, numbers of assistive technology tools are developed to improve the learning process of partially blind students. Due to the development in information technology and hardware, computer screen magnifiers were developed for the partially impaired students. A screen magnifier is a software that enlarges computer's graphical output or screen to the user. Also, it is possible to preset speed for the screen magnifier to move the cursor automatically across and down a page. A basic screen magnifier can support the viewer by enlarging text, icons, and graphics up to 20 times their original size. It also enables them to type easily and make it easier to read. A number of screen magnifiers are developed and commercially available in the market. However, each screen magnifier has its own merits and demerits. The literature carried out shows that the screen magnifier with the overlapping mode is better than the parallel mode and the yellow-highlighted background is better than the non-highlighted background.*

Keywords: *Partially blind, computer screen, magnifier, review*

Introduction

A partial reduction in eye vision which cannot be corrected by lenses is called as visual impairment. This problem affects an individual's ability to carry out few tasks and the visual impairment may vary depends on the individual. The vision is reduced central acuity of 20/70 or less in the better eye after correction in low vision. Most of the students with visual impairments need support for the effective learning process.

As per the United Nations estimation, 42 million visually impaired people are in the world. It is reported that 40 lakh visually impaired population in India and the visually impaired population in urban and rural distribution is 6.70 lakh and 33.35 lakh respectively. The population of female visually impaired is higher than the male visually impaired. The visually impaired people are higher in rural areas and it is reported that population of visually impaired is higher in Orissa followed by Andhra Pradesh and Himachal Pradesh [1]. India accounts for 20 per cent (**7.8 million**) of global blind population and visually impaired population in India is approximately 285 million. Few types of visually impairment can be curable if proper detection was done in time. It is reported that prevalence of Childhood blindness in India is 3 lakh [2]

The development of a student with a visual impairment is affected by the type and severity of the visual impairment. It affects the students learning process significantly and also development of alternative skills. The students with visual impairments have limited natural learning experiences because they are not able to observe objects and interactions. The areas of learning which are particularly affected are: concept development; interpersonal communication skills; life skills; orientation and mobility skills; and academic development. The visually impaired need higher education which will minimize the effect of their disability and develop their powers and potentials adequately. A number of assistive technology tools are being developed for the visually impaired students.

A screen magnifier is software that enlarges computer's graphical or screen content to the user. This type of assistive technology is useful for people with some functional vision; people with visual impairments and little or no functional vision usually use a screen reader. Also, it is possible to preset speed for the screen magnifier to move the cursor automatically across and down a page. A basic screen magnifier supports the user by enlarging the text, icons, and graphics up to 20 times their original size. It also enables the user to read and write on computer screen easily. Figure 1 shows the image enlarged by the screen magnifier software.



Figure 1 Image magnified by the Screen Magnifier

The magnification helps those with low vision by enlarging text in print and on computer screens. The Microsoft magnifier, is a screen magnifier app intended for visually impaired people to use when running Microsoft windows. When it is running, it creates a bar at the top of the screen that greatly magnifies where the mouse is. It's one of the options which can be used to make text, apps, and other items bigger in Windows 10.

To turn on the magnifying glass, go to Settings, then Accessibility, then Vision, then Magnification and turn it on. When you need to use the magnifying glass, go to the camera app and tap the screen three times. To turn off the magnifying glass, tap the screen three times again. When light bounces off an object and travels to your eyes, those light rays travel parallel to each other. When they pass through a magnifying glass, the convex lens bends the parallel rays so that they converge and create a virtual image on your eyes' retinas [3]. The Microsoft's Windows 7 operating system includes a significantly improved version of Magnifier. It features full-screen magnification which allows a user to pan around the screen at up to 16× magnification.

A screen magnifier and an experimental tool to present stimulus words were developed and the quality of the magnifier was tested with seventy-two elderly Chinese adults. The results show that the screen magnifier with the overlapping mode is better than the parallel mode and the yellow-highlighted background is better than the non-highlighted background. It is recommended that the overlapping mode should be set as the default working mode and yellow could be a reasonable choice of background color for a magnifier when the text is black [4]. The architecture of screen readers and screen magnifiers is important for the implementation of assistive applications on a Windows platform [5].

A key clinical problem in low-vision assessment is finding simple measures that are predictive of real-world performance. Experiments were conducted to determine whether a set of clinical variables could predict how well low-vision subjects read with their magnifiers. It is concluded that a standardized clinical reading test can give a valid prediction of the reading speed a low-vision patient is likely to achieve with a magnifier [6]. Most people with low vision require magnification to read. A magnifier's field of view often contains only a few letters at a time. Page navigation is the process by which the reader moves the magnifier from word to word, and from the end of one line to the beginning of the next line. Page navigation takes time and reduces reading speed [7]. The pointing task is the process of pointing to an object on a computer monitor using a pointing device. It is an important element for users when manipulating visual computer interfaces such as traditional screens. The Fitts' Law can be effectively applied for blind users using a vibrating touch-screen under certain parameters, while it is not verified under others. Hence this law can be used for the experimental evaluation of vibrating touch-screen accessibility, toward designing more adapted interfaces for the blind [8].

A study was carried out to determine the usability of a 3D touch screen kiosk system for way-finding at a shopping mall in Ankara, Turkey. The main findings of the study show that prior experience using the kiosk and giving guidance during usage reduces the duration of the tasks, that there are certain problems with the touch screen and its 3D properties, participants' transfer of the types of interaction with which they are familiar to the kiosk experience leads them to make mistakes, and there are some usability problems related to the interface and content design [9].

To examine whether objective performance of near tasks is improved with various electronic vision enhancement systems (EVES) compared with the subject's own optical magnifier. This was a prospective study, conducted in a hospital ophthalmology low-vision clinic. The patient population comprised 70 sequential visually impaired subjects. The magnifying devices examined were: patient's optimum optical

magnifier; magnification and field-of-view matched mouse EVES with monitor or head-mounted display (HMD) viewing; and stand EVES with monitor viewing. The tasks performed were: reading speed and acuity; time taken to track from one column of print to the next; follow a route map, and locate a specific feature; and identification of specific information from a medicine label [10].

Interaction on the Web is often problematic for visually disabled users. In order to analyse how visually disabled users deal with problematic situations we carried out a secondary analysis of 2 independent datasets containing the interaction of 24 users. Therefore, these tactics are behavioural markers of cognitive processes that indicate problematic situations. We highlight the importance of these behavioural markers for designers and tools in order to remove the need to cope, evaluate accessibility-in-use and inform navigation models [11].

The key limitation of handheld technology for the delivery of learning objects is the small screen that is available for effective display. The handheld devices are likely to change further in size in the future with consumer demand for less bulky but more powerful devices. The user response to learning object design possibilities and provides a set of recommendations to guide improved utility and future research [12].

Assistive Technology (AT) includes hardware peripherals, software applications and systems that enable a user with a disability to use a PC. Thus, when a disabled user needs to work in a particular environment he/she has to properly configure the used PC. The main objective of such an architecture is to provide a new type of software human-computer interaction for accessing AT services over the cloud. Thus, end users can interact with their personalized computer environments using any physical networked PC. The advantage of this approach is that users do not have to install and/or setup any additional software on physical PCs and they can access their own AT virtual environments from everywhere [13].

The results of conducted research confirm good understanding of math formulae described according to elaborated rules. The proposed solution enables alternative descriptions of math formulae. Based on the research results, the tool for computer-aided interactive learning of mathematics adapted to the needs of the blind has been designed, implemented and deployed as a platform for on-site and online and distance learning. The designed solution can be very helpful in overcoming many barriers that occur while teaching impaired students [14].

The screen magnifiers, which often result in the need for horizontal scrolling, and enlarging content through the browser itself are two magnification methods used by computer-users with low vision. Results showed that when using responsive web design (RWD), participants completed the reading comprehension tasks more quickly and accurately compared to when using screen magnifiers. Participants were also able to complete data input more quickly with RWD than with the screen magnifier. The results of this study have implications for further developments of web accessibility guidelines [15].

People with low vision who use screen magnification software to access computers running the Windows operating system are often shocked by the cost of these programs. Full-featured screen magnifiers cost \$500 to \$700; moderately priced programs are in the \$300 to \$400 range; lower-cost programs are around \$100. People often ask if there are more affordable alternatives, and the answer is yes. Freeware and shareware programs don't offer the variety of features available in commercial screen magnification programs, but they may be adequate for some users who are on a tight budget. The Freeware programs are free, but shareware programs allow the user to "try before you buy." If a shareware program meets your needs and you wish to continue to use it, you are asked to register the program and pay approximately \$50 or less [16].

Freeware Programs [17]

1. Magnifier

This freeware program is simple and handy and runs in windows systems. These magnifiers are suitable for visually impaired students. Its is easy to use and the magnification area is resizable. It magnifies the screen on mouse move. I can also capture images.

2. Dragnifier 2.5

The Dragnifier is a handy freeware that starts a the computerized lens on click, which enlarges the screen at 2x, 4x, even 8x the original size. It is suitable for the students with partial blindness

3. Magnifixer 3.2

The Magnifixer is an open source software and freeware that zooms in on anything you hover the mouse over. It opens in the system tray and the only way to access options is by right clicking on the small icon. The context menu brings up a number of choices, such as making the main window stay on top of all

other applications, showing or hiding the cursor, smoothening the display, and inverting image colors. The program supports zooming up to 40x and the update frequency about 30 times per second. It cannot be customized but the zoom factor can be controlled using mouse scroll-wheel now controls

4. Zoom+

Zoom+ supports software developers and web designers with an easy method of grabbing screen elements such as toolbar buttons and icons from running programs or web sites. User can zoom in on the area of interest and copy the view to the clipboard, or for more precision, click the right mouse button on the Zoom+ window and drag a selection rectangle. When you release the right mouse button you can copy a selection of the screen to the clipboard or save it to file. Zoom+ also provides easy pixel counting by giving a selection marquee on dragging, when the right mouse button clicked. This selection can then be copied to clipboard or saved to file.

Shareware Programs

1. ABF Magnifying Tool

It has a set of useful graphics tools for viewing the screen area in different zooms. Each tool has its own unique behavior and usability. All tools supplement each other and allow designers and people with poor eyesight to work with computers better.

2. DesktopZoomer

It is a portable computer screen magnifier that enlarges the screen content of your computer. It also has a multi language and hotkeys support.

The programs in the shareware category have many of the same strengths and weaknesses of the freeware programs, but some offer additional features and better usability for people with low vision. ABF Magnifying Tools, Screen Loupe for Windows 95/NT, and Zoom+ do not offer any additional features or ease of use that make them a better choice than Lightning Express. They are adequate for viewing information but offer weak support for word processing and e-mail applications.

Conclusion

The learning process and learning skills of visual impairment in students is affected by the type and severity of the visual impairment. The development in information technology and hardwares helps the development of assistive technology tools which can be used by the partially impaired students. A screen magnifier is software and used as an assistive tool as this software interfaces with a computer's graphical output to present enlarged screen content. It is possible to preset speed for the screen magnifier to move the cursor automatically across and down a page. A basic screen size can be magnified up to 20 times their original size. A number of screen magnifiers are available commercially and each screen magnifier has its own merits and demerits.

References

1. <http://www.bpaindia.org/pdf/VIB%20Chapter-III.pdf>
2. <http://www.deccanherald.com/content/240119/india-accounts-20-per-cent.html>
3. [https://en.wikipedia.org/wiki/Magnifier_\(Windows\)](https://en.wikipedia.org/wiki/Magnifier_(Windows))
4. Zhao, Z., Rau, P.-L. P., Zhang, T., & Salvendy, G. (2009). Visual search-based design and evaluation of screen magnifiers for older and visually impaired users. *International Journal of Human-Computer Studies*, 67(8), 663–675. doi: 10.1016/j.ijhcs.2009.03.006 <https://doi.org/10.1016/j.ijhcs.2009.03.006>
5. Evans, G., & Blenkhorn, P. (2003). Architectures of assistive software applications for Windows-based computers. *Journal of Network and Computer Applications*, 26(2), 213–228. doi: 10.1016/s1084-8045(03)00002-x
6. Ahn, S. J., & Ledge, G. E. (1995). Psychophysics of reading—XIII. Predictors of magnifier-aided reading speed in low vision. *Vision Research*, 35(13), 1931–1938. doi: 10.1016/0042-6989(94)00293-u
7. Beckmann, P. J., & Legge, G. E. (1996). Psychophysics of Reading—XIV. The Page Navigation Problem in Using Magnifiers. *Vision Research*, 36(22), 3723–3733. doi: 10.1016/0042-6989(96)00084-3
8. Lahib, M. E., Tekli, J., & Issa, Y. B. (2018). Evaluating Fitts' law on vibrating touch-screen to improve visual data accessibility for blind users. *International Journal of Human-Computer Studies*, 112, 16–27. doi: 10.1016/j.ijhcs.2018.01.005
9. Tüzün, H., Telli, E., & Ahr, A. (2016). Usability testing of a 3D touch screen kiosk system for way-finding. *Computers in Human Behavior*, 61, 73–79. doi: 10.1016/j.chb.2016.03.006
10. Peterson, R. C., Wolffsohn, J. S., Rubinstein, M., & Lowe, J. (2003). Benefits of electronic vision enhancement systems (EVES) for the visually impaired. *American Journal of Ophthalmology*, 136(6), 1129–1135. doi: 10.1016/s0002-9394(03)00567-1

11. Vigo, M., & Harper, S. (2013). Coping tactics employed by visually disabled users on the web. *International Journal of Human-Computer Studies*, 71(11), 1013–1025. doi: 10.1016/j.ijhcs.2013.08.002
12. Churchill, D., & Hedberg, J. (2008). Learning object design considerations for small-screen handheld devices. *Computers & Education*, 50(3), 881–893. doi: 10.1016/j.compedu.2006.09.004
13. Mulfari, D., Celesti, A., & Villari, M. (2015). A computer system architecture providing a user-friendly man machine interface for accessing assistive technology in cloud computing. *Journal of Systems and Software*, 100, 129–138. doi: 10.1016/j.jss.2014.10.035
14. Maćkowski, M. S., Brzoza, P. F., & Spinczyk, D. R. (2018). Tutoring math platform accessible for visually impaired people. *Computers in Biology and Medicine*, 95, 298–306. doi: 10.1016/j.compmiomed.2017.06.003
15. Hallett, E. C., Arnsdorff, B., Sweet, J., Roberts, Z., Dick, W., Jewett, T., & Vu, K.-P. L. (2015). The Usability of Magnification Methods: A Comparative Study Between Screen Magnifiers and Responsive Web Design. *Human Interface and the Management of Information. Information and Knowledge Design Lecture Notes in Computer Science*, 181–189. doi: 10.1007/978-3-319-20612-7_18
16. <https://www.afb.org/aw/14/4/15707> <http://www.iconico.com/magnifier/>

COMPARATIVE STUDY ON WEB DEVELOPMENT - WEB 1.0, WEB 2.0 & WEB 3.0

Vsantha S¹ & Raghavendra Rao B G²

¹Assistant Professor, Department of Computer Applications, Sir MVIT, Bengaluru, Karnataka, India

²Assistant Professor, Department of Computer Applications, Sir MVIT, Bengaluru, Karnataka, India

ABSTRACT: *Most people today can hardly conceive of life without the internet. The web of documents has morphed into a web of data. The semantic wave embraces three stages of internet growth. The first stage, Web 1.0 started as a Read only medium. The second stage, Web 2.0 established itself as Read/Write medium. The third stage currently evolving version of web, viz., Web 3.0 is said to be a technologically advanced medium which allows the users to Read/Write/Execute and also allows the machines to carry out some of the thinking so far expected only from the human beings.*

Keywords: *WWW, Web 1.0, Web 2.0, Web 3.0, Web services, Web Technology, Web Application*

INTRODUCTION

World Wide Web(WWW) is being used to improve communication, collaboration, sharing of resources. The web was created in 1989 by Sir Tim Berners-Lee, working at CERN (The European Organization for Nuclear Research) in Geneva, Switzerland. Since then, Berners-Lee has played an active role in guiding the development of web standards, in recent years has advocated his vision of a Semantic web.

Since the 1990s when the World Wide Web was established, it has evolved from the earlier versions, viz. Web 1.0 to Web 2.0, and finally is evolving into the newest version, viz., Web 3.0. In respect of different versions of web. Currently we have many popular Web 2.0 interactive applications like *Blog, Podcast, Mashup, Tag, RSS/Atom, Wiki, P2P, Moblog, AdSense* and soon. Web 3.0 has emerging technologies such as the *Semantic Web* will transform the way the Web is used, and lead to new possibilities in artificial intelligence based applications.

WEB 1.0

Web 1.0 refers to the first stage of the World Wide Web evolution. Earlier, there were only few content creators in Web 1.0 with the huge majority of users who are consumers of content. Personal web pages were common, consisting mainly of static pages. It can be used as personal websites. It costs to user as per pages viewed. It has directories which enable user to retrieve a particular piece of information.

Four design essentials of a Web 1.0 site include:

- I. Static pages.
- II. Content is served from the server's file-system.
- III. Pages built using Server Side Includes or Common Gateway Interface (CGI).
- IV. Frames and Tables used to position and align the elements on a page.

Example:

Craigslist - It is one of the most famous Web 1.0 Example

WEB 2.0

Web 2.0 is the name used to describe the second generation of the World Wide Web, where it moved static HTML pages to a more interactive and dynamic *web* experience. *Web 2.0* is focused on the ability for people to collaborate and share information online via social media, blogging and *Web*-based communities. Web 2.0 applications tend to interact much more with the end user. As such, the end user is not only a user of the application but also a participant/participant by these 8 tools mentioned below:

- 1 Podcasting
- 2 Blogging
- 3 Tagging
- 4 Curating with RSS
- 5 Social bookmarking
- 6 Social networking

Figure: Web 2.0 Services

Examples:

1. YouTube
2. Wiki
3. WordPress
4. Wix
5. Weebly

WEB 3.0

Web 3.0 is a term which is used to describe many evolutions of web usage and interaction among several paths.

Web 3.0 is an era in which we will upgrade the back-end of the Web, after a decade of focus on the front-end. By extending Tim Berners-Lee's explanations, the Web 3.0 would be something akin to a "read-write-execute" web. Web 3.0 is defined as the creation of high-quality content and services produced by gifted individuals using web 2.0 technologies as an enabling platform.

Web 3.0 is a term that is used to describe various evolutions of Web usage and interaction along with several paths. These include transforming the Web into a database, a move towards making content accessible by multiple non-browser applications, the leveraging of artificial intelligence technologies, the Semantic web, the Geospatial Web, or the 3D web. Gartner suggests the need to differentiate incremental changes to Web 2.0 from Web 3.0. The extension of the World Wide Web that provides an efficient & easier way to share, find and combine data & information from distinct sources is called Semantic Web.

Below are 5 main features that can help us define Web 3.0:

- Semantic Web
- Artificial Intelligence
- 3D Graphics
- Connectivity
- Ubiquity



Figure: Web 3.0 Services

Examples:

- Tivo - A Digital Video Recorder

COMPARISION OF WEB 1.0 WEB 2.0 AND WEB 3.0:



S.No	Web 1.0	Web 2.0	Web 3.0
1.	1996	2006	2016
2.	The Web	The Social Web	The Semantic Web
3.	Tim Berners Lee	Tim O'Reilly	Sir Tim Berners Lee
4.	Read only web	Read and write web	Read, write and execute web
5.	Information sharing	Interaction	Immersion.
6.	Million of users	Billion of users	Trillion of users
7.	Ecosystem	Participation	Understanding itself
8.	Connect information	Connect people	Connect knowledge

CONCLUSION

This paper provided an overview from the evolution of the web. Web 1.0, web 2.0 and web 3.0 were described as three generations of the web. The characteristics of the generations are introduced and compared. It is concluded web as an information space has had much progress since 1989 and it is moving toward using artificial intelligent techniques to be as a massive web of highly intelligent interactions in close future.

REFERENCES:

1. Jennifer Lang. Libraries and the Social Web: Using Web 2.0 Applications to DeliverInformation in the 21st Century. Available at <http://jenniferlang.net/lib20/> (Accessed on 05/01/2008)
2. Abram, S. Web 2.0, Library 2.0, and Librarian 2.0: Preparing for the 2.0 World. SirsiDynixOneSource 2. Available at http://www.imakenews.com/sirsi/e_article000505688.cfm?x=b6yRqLJ,b2rpQhRM(Accessed on 06/01/2008)
3. Jeffrey Zeldman. Web 3.0. Available at <http://www.alistapart.com/articles/web3point>(Accessed on 05/01/2008)
4. IIA Blog .The Semantic Web: Web 3.0?. Available at <http://blog.iiia.ie/2007/the-semanticweb-web-30/> (Accessed on 04/01/2008)
5. Steve Spalding. How to Define Web 3.0. Available at <http://howtosplitanatom.com/news/howto-define-web-30-2/> (Accessed on 04/01/2008)
6. Brian Getting. Basic Definitions: Web 1.0, Web. 2.0, Web 3.0. Available at <http://www.practicalecommerce.com/articles/464/Basic-Definitions-Web-10-Web-20-Web-30/>(Accessed on 06/01/2008)
7. Wikipedia. Web 2.0. Available at http://en.wikipedia.org/wiki/Web_2 (Accessed on 06/01/2008)
8. Web 3.0 Wikipedia Definitions. http://en.wikipedia.org/wiki/Web_3.0 (visited on 4/08/10)
9. [Han Xiaoting, Niu Li," Subject Information Integration of Higher Education Institutions in the Context of web3.0", 2nd International Conference on Industrial Mechatronics and Automation, 978-1-4244-7656-5/10, 2010, IEEE
10. Russell K, "Semantic Web", Computer world, 2006(9):32.

11. Zhang Yang, "The Development of Web and Library Reference Service-from Web 1.0 to Web3.0,"Sci-Tech Information Development & Economy, vol.18, 2009.
12. Sourav Sharma Dot Com. Web 1.0, Web 2.0, Web 3.0, Web N.0. Available at <http://souravsharma.com/blog/webnpointzero.html> (Accessed on 05/01/2008)
13. Miller, P. Web 2.0: Building the New Library. Available at <http://www.ariadne.ac.uk/issue45/miller/> (Accessed on 05/01/2008)

Influence of AJAX Technology in Web Applications

THIMMAPPA NT¹ & RAMESHA S.²

¹Associate Professor Dept of Computer Science, Seshadripuram First. Grade College, Yelahanaka Bengaluru.

¹Assistant Professor Dept of Computer Science, Seshadripuram First. Grade College, Yelahanaka Bengaluru.

ABSTRACT: *The AJAX is acronym for Asynchronous Javascript and Xml. It is a set of web development techniques that allow software engineers to create interactive web applications. The AJAX is usually used to update parts of the HTML page without causing a redirect or a page refresh. Also the AJAX methods allow you to create fast web applications that reduce significantly the loading time and provide a better user experience. Ajax is client side script which communicates to and from a server or database without need to post back or a complete page refresh. The best definition I've read for Ajax is "the method of exchanging data with a server, and updating parts of a web page – without reloading the entire page." jQuery is a fast, small, and feature-rich JavaScript library. It makes Ajax much simpler with an easy-to-use API that works across a multitude of browsers. JSON or JavaScript Object Notation is a lightweight text-based open standard designed for human-readable data interchange.*

Keywords: *Component, AJAX, Javascript, jQuery, JSON, GeoJSON, AJAX Engine, Web, Web Application.*

Introduction

Today the consumer of a Web site can be as responsible for its content, direction, and success as the publisher. Social networking sites, blogs, online photo journals are just a few of the new styles of Websites springing up every day. We have seen many web sites are slow and takes much time to load. As a user nobody wants to wait bit longer to just open the page. In this fast paced world everybody is in hurry and everybody wants their work to be done in minimal amount of time. Normally what happens when we hit the refresh button, it will reload the whole page and all the contents of the web page will load again. This takes times and as a user has to wait till the whole content are load. Imagine a situation when the web page contains some flash or big image with some animation. It takes time for reloading all these things. Every time you do not want to load the whole page again, instead people will prefer for loading the only some content which are changing frequently. The new trends work into that direction, now a days the web sites are build in such a way that it will refresh only those part which are required and which can be updated without refreshing the whole page. In the traditional Web application, the interaction between the customer and the server goes like this:

- In normal web applications, User accesses web application
- Interaction between the user and the server is synchronous. This means that one has to happen after the other. If a user clicks a link, the request is sent to the server, which then sends the result back.
- Server processes request and sends data to the browser while the user waits
- User clicks on a link or communicate with the application
- Server processes request and sends data back to the browser while the user waits.

This is a long process and user has to wait a lot. To avoid this scenario AJAX is useful.

Ajax

Ajax is not a programming language or a tool to use, but it is a concept. Ajax is a client-side script that communicates to and from a server/database without the need for a post back or a complete page refresh. Ajax is not new framework, new technology. It is a new way of thinking, designing and developing web based applications.

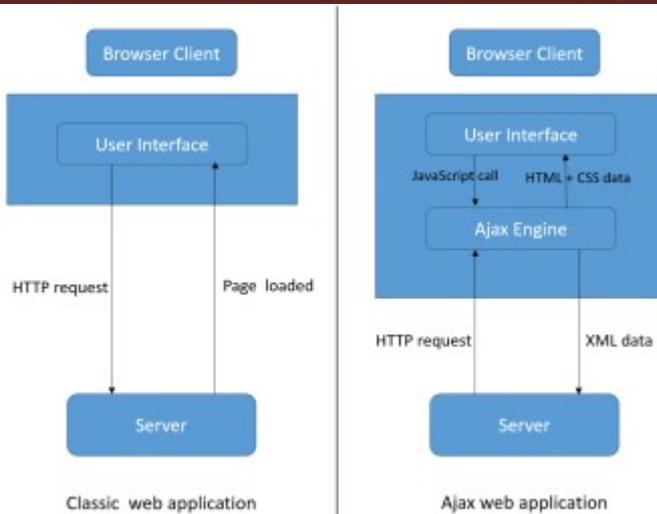


Fig. 1. Working Flow of Classic & Ajax web application

Benefits Of Ajax

There are 4 main benefits of using Ajax in web applications:

A. Callbacks:

Ajax is used to perform callback, making a quick round trip to and from the server to retrieve and save data without posting the entire page back to server. By not performing a full postback and sending all form data to the server, network utilization is minimized and quicker operations occur. In sites with restricted bandwidth, it can greatly improve network performance. Most of the time, the data being sent to and from the server is minimal. By using callbacks, server is not required to process all form elements. By sending only the necessary data, there is limited processing on the server.

B. Making Asynchronous Calls:

Ajax allows us to make asynchronous calls to a server. This allows the client browser to avoid waiting for all data to arrive before allowing the user to act once more.

C. User-Friendly:

Page post back are eliminated, Ajax enabled applications will always be faster, responsive and user friendly.

D. Increased Speed:

The benefits of Ajax are to improve the performance, speed and usability of the web applications. An example of Ajax is the user rates a movie and their personal rating for that movie will be saved to their database without waiting for the page to refresh or reload. This movie rating is saved to the database without posting the entire page back to the server.

Advances Made To Ajax

JavaScript is a client side programming language and XML is the markup language which is used to define the data. JSON is another markup language to define data. JSON (JavaScript Object Notation) is much easier to use with JavaScript than XML. When it comes to Javascript and AJAX, JSON Web Services are replacing XML Web Services.

Another advance to Ajax and Javascript is the JavaScript object library called jQuery. This free, open-source software is a wrapper around JavaScript. JQuery is used to easily write the client side JavaScript to manipulate and navigate a page and make asynchronous Ajax callbacks. By JQuery and JSON Web Services, Ajax callbacks have become a standard programming methodology for designing and developing web applications.

The Ajax Control Toolkit is the main suite of controls created by the Microsoft which is integrated in the Visual Studio and can be dragged and dropped onto web forms just like html and server controls. These controls are intended to be used for Ajax callbacks. However, it can also be used as a normal client and or server controls. For example, Asp.Net does not come with the Tabs controls. However, the Ajax Control Toolkit does. The Tab control can also post back to the server which is just like the server controls.

GeoJSON

GeoJSON (pronounced jee-oh-jay-son), will result in a viable software messaging language that can be simultaneously more compact than XML and more readable by a human. Compactness increases in

importance when considering the large amount of geospatial data that must be shared in some system integrations.

Proposed Methodology And Discussion

Ajax is used in a web application where small amount of the information will be saved or retrieved from the server without posting back the entire pages. A good example of this is data validation on save actions.

Other features include text and image hints and auto complete text boxes. The client types in a couple of letters and a list of all values that start with those letters appear below. A callback is made to a web service that will retrieve all values that will begin with these many characters. This is a fantastic feature that would be impossible without Ajax and is also part of the Ajax Control Toolkit.

Segue used Ajax to support client application that had problems due to less bandwidth and page size. The combination caused the application to take too long to retrieve data and display it on the page. Sometimes, the web server would not have the proper resources to handle the request and timeout. The best solution for this issue was Ajax.

To solve this problem, JSON Web Services was created on the web server in order to retrieve the details about the selected item. The JSON web service would retrieve the data and it used to convert into JSON and return a JSON string. Instead of posting back to the server, the client would call the web services when an item was selected from the list. We used jQuery to make an asynchronous Ajax call to the web service. Once the client retrieved the data back from the web service, more client side processes was done to display the information on the page. The time it took to display the details on the page after the item was selected was instantaneous. There was no page refresh or postback involved.

A. JSON vs. XML

While the ability to dynamically exchange data with a server expands the capability for the Web developer, the resulting desire to push more and more data over the Internet to build "cooler" applications forces developers to examine the quantity and the mechanisms for sending messages across the Web. Although the "X" in AJAX stands for "XML," the use of XML requires that developers translate programming, or "object," data into XML, send them across the Web, and then translate them back to object data on the other side. XML, by design, also includes a large amount of extra characters that may drastically increase the size of the message. It turns out that AJAX techniques didn't really require XML. Just about any text, whether formatted or not, could be passed between a browser and server using some of the same tools. Developers began exploring alternatives to XML for messaging and an obvious candidate arose out of the "J" in AJAX, which stands for JavaScript.

Compile and run dynamically through a browser application, JavaScript can be easily modified dynamically during a Web page operations such that any changes in program operation may be intentionally caused by a developer while the program is running. Dynamic change might happen, for example, when a JavaScript call checks a server to see what menus should be drawn on the screen, then draws the menus that are allowed for the current user. This ability to write code that modifies itself implies that, at some level, the structure of data or "objects" that are manipulated in the code must be readable to a human. Indeed, JavaScript objects have a specific, fixed text representation called JavaScript Object Notation (JSON). JSON happens to be quite compact compared with XML, although it has some limitations that XML has been adapted to overcome. However, when developers realized that they were converting data from Python, Java or .NET into XML, then converting them to JSON to be used in a Web page, they naturally began to cut out the middleman and went straight from Python to JSON.

experimental results

Web application before 2000, website uses traditional paradigm. In this approach user sends a request to server, until the response come back from the server user cannot perform further task. If the processing speed is slow than user has to wait for long duration of time.

After 2000, website changed the approach from synchronous to asynchronous model. In the approach user is given more preference using AJAX approach user can interact and collaborate.

A. 1993

Web applications were still a tightly bound to the server hosting type. Java, Python, PHP and Ruby were a few years from becoming realities for web development. Perl perhaps was a possibility for web development and usage, but we were most likely a C++ developer if you were making web apps.. JavaScript was a year away, and wouldn't be called JavaScript for another two. If we submitted a form and hit the back button, we had little hope of anything useful happening. Beyond the declarative nature of HTML programming, and the understanding of the contracts behind URLs, there was no functionality in any turing complete manner present in web pages.

B. 2000

In the year 2000, Sun's Java Server Pages (JSP) or Java Servlets apps were a possibility with Model View Controller (MVC) being the recommended pattern. Microsoft had recovered from the mistake of ignoring the web in 1995, and had made Active Server Pages (ASP) the most popular enterprise solution. PHP had comeback from nowhere as a CGI solution and Apache with that mechanism was the most popular web server. You might have even seen /cgi-bin/ in the URLs of web applications, though rewrites were possible. Allaire's Cold Fusion (an independent IIS data-binding solution) had by then been snubbed when Microsoft didn't buy the 90% of the company they didn't already own and launched ASP instead. ASP apps followed the data-binding solution that fatter MS-Access solutions had pioneered for years. ASP.Net was still two years away though. Python and Ruby may have been used in CGI mode, but Rails (in 2003 I foolishly told DHH it wouldn't scale in the enterprise) was still three years away, and Django two more. Microsoft had pioneered AJAX style functionality in ActiveX controls, and you might have encountered applications that used them. Similarly Sun could still make a claim as that Java Applets were a reality on the web at large. Macromedia's Shockwave/Flash was a viable platform that competed with, and would ultimately beat both ActiveX & Java Applets.

C. 2006

AJAX was the big thing. Between them Google, Netscape and Microsoft had made it popular. Most enterprise teams were building apps that were somewhere between Web 1.0 and Web 2.0. Roy Fielding's REST is huge but it required some decoding for the layman to use. Ruby on Rails had been a significant productivity force for a year or two. The .Net offerings for the web were solid 2.0 a year before and before the end of the year 3.0 would be released. Model-View-Presenter (MVP) was the paradigm, and Martin talked about it after some initial Thought Works projects with .Net. Microsoft's practices and patterns group would later talk about it too. That's not to say that MVC is dead - most of the non-.Net frameworks are coded in accordance with it. All web app best practices were now doing POST redirect GET and you finally hit the back button after posting a form - take that Tim Berners-Lee. Thought Works had a year or two before pushed out Selenium for web-testing (and was one of the early pioneers of Comet as a result), then Sahi for another go at the same idea, with Web Driver (now Selenium2) to come a year later. Web applications are now beautifully decomposed solutions, Inversion of Control, if not Dependency injection in particular.

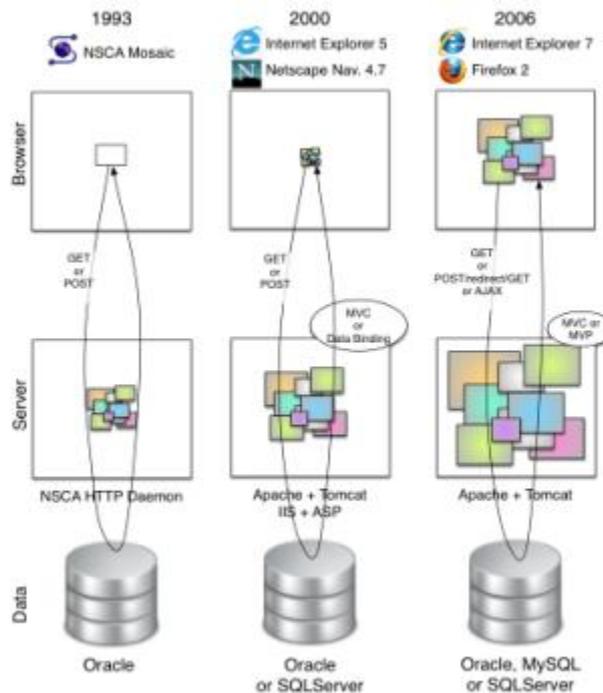


Fig. 2. Web application development in 1993, 2000 and 2006

CONCLUSION

The paper has highlighted AJAX a new and successful paradigm for web development. We can process user request faster in AJAX compared to classic model. Advance made in AJAX by jQuery and GeoJSON. We can conclude that AJAX has very high impact on web application development.

REFERENCES

1. Dr. SamratVivekanand Omprakash Khanna, Mr Mijal Mistry "IMPACT OF AJAX IN WEB APPLICATIONS", IJAET/Vol.III/ Issue I/January-March 2012.
2. Ravi Kumar Sachdeva, Dr. Sawtantar Singh, "Use of AJAX to Improve Usability of OnlineInformation Systems", Global Journal of Computer Science and Technology Volume XIII Issue VIII Version I ,Year 2013.
3. Sneha K. Ankurkar,D. M. Khatwar,"Evolving Web Applications with AJAX- A Review",IJIRSET, Vol. 4, Issue 11, November 2015.
4. Nalaka R. Dissanayake and G. K. A. Dias, "Essential Features a General AJAX Rich InternetApplication Architecture Should Have in Order to Support Rapid Application Development",International Journal of Future Computer and Communication, Vol. 3, No. 5, October 2014.
5. Rajendra Kachhwaha, Priyadarshi Patni,"Ajax Enabled Web Application Model with Comet Programming",International Journal of Engineering and Technology Volume 2 No. 7, July, 2012.
6. <http://www.seguetech.com/ajax-technology/>
7. <http://www.directionsmag.com/entry/emerging-technology-ajax-and-geojson/122845>.
8. <https://paulhammant.com/2012/02/06/previous-web-architectures/>

A Comparative Study on Big Data with Various Technologies

¹Archana M, & ²Sushmitha U, & ³Flora Princess

¹Assistant Professor,
¹Department of Computer Science,
¹Seshadripuram First Grade College Yelahanka Bangalore

ABSTRACT: Big Data describes any massive volume of structured, semi structured and unstructured data that are difficult to process using traditional database system such as RDBMS [1]. An example of big data may be Exabyte's (1024 terabytes) of data consisting of trillions of records of millions of people from different sources such as websites, social media, mobile data, web servers, online transactions and so on [2]. Earlier, the type of information available was very limited and easily accessible and there was a well-defined set of methods and various approaches for managing the information. But in today's world, the amount of data has been exploding. It has grown to terabytes and petabytes. Analyzing Big Data is a challenging task as it involves large distributed file systems which should be fault tolerant, flexible and scalable. The technologies used by big data application to handle the massive data are Hadoop, Map Reduce, Apache Hive, No SQL and HPC, Overflow. In this research paper we have discussed various technologies to handle this bigdata and also the classifications and characteristics are discussed in brief.

Keywords: Big Data, Hadoop, HDFS, YARN, SPARK, PIG, Map Reduce, Apache Hive, No SQL, ZooKeeper. and Oozie.

I. Introduction

Big Data is also **data** but with a **huge size**. Big Data is a term used to describe a collection of data that is huge in size and yet growing exponentially with time. In short such data is so large and complex that none of the traditional data management tools are able to store it or process it efficiently.

"**Big data**" is a field that treats ways to analyse, systematically extract information from, or otherwise deal with data sets that are too large or complex to be dealt with by traditional application software, data-processing. Data with many cases (rows) offer greater statistical power, while data with higher complexity (more attributes or columns) may lead to a higher false discovery rate. Big data challenges include capturing data, data storage, data analysis, search, sharing, transfer, visualization, querying, updating, information privacy and data source. Big data was originally associated with three key concepts: *volume*, *variety*, and *velocity*. When we handle big data, we may not sample but simply observe and track what happens. Therefore, big data often includes data with sizes that exceed the capacity of traditional usual software to process within an acceptable time and *value*.

Current usage of the term *big data* tends to refer to the use of predictive analytics, and user behaviour analytics, or certain other advanced data analytics methods that extract value from data, and seldom to a particular size of data set. "There is little doubt that the quantities of data now available are indeed large, but that's not the most relevant characteristic of this new data ecosystem." Analysis of data sets can find new correlations to "spot business trends, prevent diseases, combat crime and so on." Scientists, business executives, practitioners of medicine, advertising and governments alike regularly meet difficulties with large data-sets in areas including Internet searches, fintech, urban informatics, and business informatics. Scientists encounter limitations in e-Science work including meteorology, genomics, complex physics simulations, biology and environmental research

II. Classifications of Big Data

a) Structured

Any data that can be stored, accessed and processed in the form of fixed format is termed as a 'structured' data. Over the period of time, talent in computer science has achieved greater success in developing techniques for working with such kind of data (where the format is well known in advance) and also deriving value out of it. However, nowadays, we are foreseeing issues when a size of such data grows to a huge extent, typical sizes are being in the range of multiple zettabytes.

b) Unstructured

In terms of its processing for deriving value out of it. A typical any data with unknown form or the structure is

classified as unstructured data. In addition to the size being huge, unstructured data poses multiple challenges example of unstructured data is a heterogeneous data source containing a combination of simple text files, images, videos etc. Now day organizations have wealth of data available with them but unfortunately, they don't know how to derive value out of it since this data is in its raw form or unstructured format.

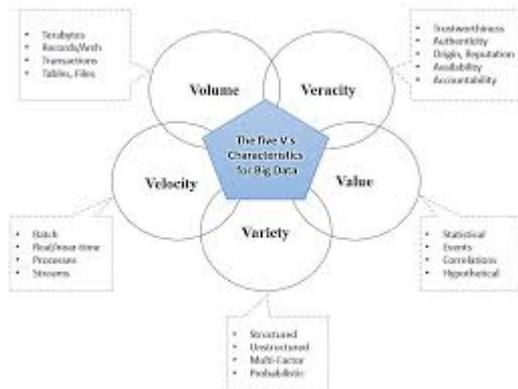
c)Semi-structured

Semi-structured data can contain both the forms of data. We can see semi-structured data as a structured in form but it is actually not defined with e.g. a table definition in relational DBMS. Example of semi-structured data is a data represented in an XML file.

There is the need of Big Data Analytics that is the processing of the complex and massive datasets. This data is different from structured data (which is stored in relational database systems) in terms of five parameters – variety, volume, value, veracity and velocity (5V's). The five V's (volume, variety, velocity, value, veracity) are the challenges of big data management are [3]:

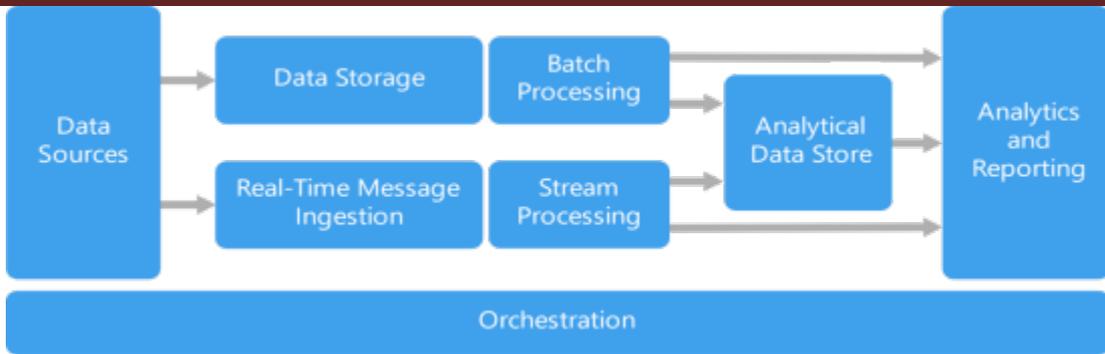
Characteristics of Big Data

1. **Volume:** Information is steadily developing step by step of different types ever MB, PB, YB, ZB, KB, TB of data. The data results into large files. Excessive volume of data is main issue of storage. This main issue is resolved by reducing storage cost. Data volumes are expected to grow 50 times by 2020.
2. **Variety:** Information sources are amazingly heterogeneous. The records comes in different configurations and of any sort, it may be structured or unstructured such as text, audio, videos, log files and then some. The assortments are interminable, and the information enters the system without having been measured
3. **Velocity:** The information comes at fast. Now and then 1 moment is past the point of no return so big data is time delicate.. Some organizations data velocity is main challenge. The social media messages and credit card transactions done in millisecond and data generated by this putting in to databases.
4. **Value:** It is a most important v in big data. Value is main buzz for big data because it is important for businesses, IT infrastructure system to store large amount of values in database.
5. **Veracity:** The expansion in the scope of qualities run of the mill of an extensive information set. When we managing high volume, velocity and variety of data, the all of data are not going 100% correct, there will be messy information. Big data and examination innovations work with these sorts of information. Immense volume of data (both structured and unstructured) is management by organization, administration and administration. Unstructured information is an information that is not present in a database. Unstructured data may be text, verbal data or in another form. Textual unstructured data is like power point presentation, email messages, word reports, and moment kneads. Information in another arrangement can be.jpg images, .png images and audiofiles [Sagiroglu, 2013]



ARCHITECTURE OF BIG DATA

Big data architecture is designed to handle the ingestion, processing, and analysis of data that is too large or complex for traditional database systems.



Big data solutions typically involve one or more of the following types of workload:

- Batch processing of big data sources at rest.
- Real-time processing of big data in motion.
- Interactive exploration of big data.
- Predictive analytics and machine learning.

Most big data architectures include some or all of the following components:

Data sources: All big data solutions start with one or more data sources. Examples include:

- Application data stores, such as relational databases.
- Static files produced by applications, such as web server log files.
- Real-time data sources, such as IoT devices.

Data storage: Data for batch processing operations is typically stored in a distributed file store that can hold high volumes of large files in various formats. This kind of store is often called a *data lake*.

Batch processing: Because the data sets are so large, often a big data solution must process data files using long-running batch jobs to filter, aggregate, and otherwise prepare the data for analysis. Usually these jobs involve reading source files, processing them, and writing the output to new files.

Real-time message ingestion: If the solution includes real-time sources, the architecture must include a way to capture and store real-time messages for stream processing. This might be a simple data store, where incoming messages are dropped into a folder for processing. However, many solutions need a message ingestion store to act as a buffer for messages, and to support scale-out processing, reliable delivery, and other message queuing semantics.

- **Stream processing:** After capturing real-time messages, the solution must process them by filtering, aggregating, and otherwise preparing the data for analysis. The processed stream data is then written to an output sink. Azure Stream Analytics provides a managed stream processing service based on perpetually running SQL queries that operate on unbounded streams. You can also use open source Apache streaming technologies like Storm and Spark Streaming in an HDInsight cluster.

- **Analytical data store:** Many big data solutions prepare data for analysis and then serve the processed data in a structured format that can be queried using analytical tools. The analytical data store used to serve these queries can be a Kimball-style relational data warehouse, as seen in most traditional business intelligence (BI) solutions. Alternatively, the data could be presented through a low-latency NoSQL technology such as HBase, or an interactive Hive database that provides a metadata abstraction over data files in the distributed data store. Azure SQL Data Warehouse provides a managed service for large-scale, cloud-based data warehousing. HDInsight supports Interactive Hive, HBase, and Spark SQL, which can also be used to serve data for analysis.

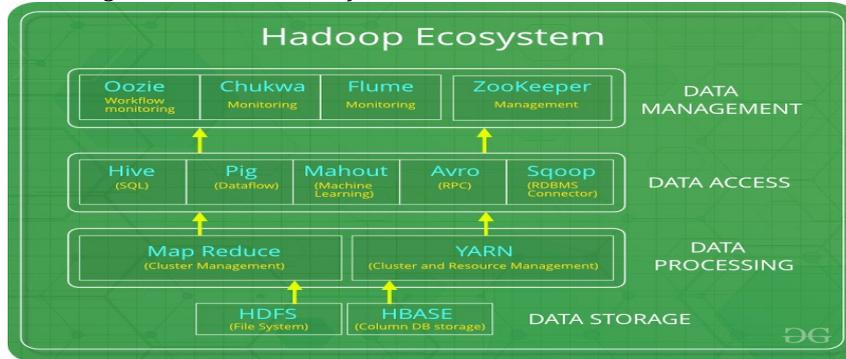
- **Analysis and reporting:** The goal of most big data solutions is to provide insights into the data through analysis and reporting. To empower users to analyse the data, the architecture may include a data modelling layer, such as a multidimensional OLAP cube or tabular data model in Azure Analysis Services. It might also support self-service BI, using the modelling and visualization technologies in Microsoft Power BI or Microsoft Excel. Analysis and reporting can also take the form of interactive data exploration by data scientists or data analysts. For these scenarios, many Azure services support analytical notebooks, such as Jupyter, enabling these users to leverage their existing skills with Python or R. For large-scale data exploration, you can use Microsoft R Server, either standalone or with Spark.

- **Orchestration:** Most big data solutions consist of repeated data processing operations, encapsulated in workflows, that transform source data, move data between multiple sources and sinks, load the processed data into an analytical data store, or push the results straight to a report or dashboard.[4]

BIG DATA TECHNOLOGY

The Hadoop Ecosystem

*Introduction: **Hadoop Ecosystem** is a platform or a suite which provides various services to solve the big data problems. It includes Apache projects and various commercial tools and solutions. There are **four major elements of Hadoop** i.e. **HDFS, MapReduce, YARN, and Hadoop Common**. Most of the tools or solutions are used to supplement or support these major elements. All these tools work collectively to provide services such as absorption, analysis, storage and maintenance of data etc.*



Following are the components that collectively form a Hadoop ecosystem

1. HDFS: Hadoop Distributed File System.
2. YARN: Yet Another Resource Negotiator
3. MapReduce: Programming based data-processing
4. Spark: In Memory data-processing
5. PIG, HIVE: Query based processing of data services
6. HBase: NoSQL Database
7. Solr, Lucene: Searching and Indexing
8. Zookeeper: Managing cluster
9. Oozie: Job Scheduling

HDFS:Hadoop is a framework that can run applications on systems with thousands of nodes and terabyt*es. It distributes the file among the nodes and allows to system continue work in case of a node failure. This approach reduces the risk of catastrophic system failure. In which application is broken into smaller parts (fragments or blocks).Apache Hadoop consists of the Hadoop kernel, Hadoop distributed file system (HDFS), map reduce and related projects are zookeeper, Hbase, Apache Hive. Hadoop Distributed File System (HDFS) consists of three Components: the Name Node, Secondary Name Node and Data Node [4]. The multilevel secure (MLS) environmental problems of Hadoop by using security enhanced Linux (SE Linux) protocol. In which multiple sources of Hadoop applications run at different levels. This protocol is an extension of Hadoop distributed file system (HDFS) .Hadoop is commonly used for distributed batch index building; it is desirable to optimize the index capability in near real time. Hadoop provides components for storage and analysis for large scale processing [5].

YARN:

Yet Another Resource Negotiator, as the name implies, YARN is the one who helps to manage the resources across the clusters. In short, it performs scheduling and resource allocation for the Hadoop System.

Consists of three major components i.e.

1. Resource Manager
2. Nodes Manager
3. Application Manager

Resource manager has the privilege of allocating resources for the applications in a system whereas Node managers work on the allocation of resources such as CPU, memory, bandwidth per machine and later on acknowledges the resource manager. Application manager works as an interface between the resource manager and node manager and performs negotiations as per the requirement of the two.

MapReduce:

1. By making the use of distributed and parallel algorithms, MapReduce makes it possible to carry over the processing's logic and helps to write applications which transform big data sets into a manageable one.
2. MapReduce makes the use of two functions i.e. Map() and Reduce() whose task is:
Map() performs sorting and filtering of data and thereby organizing them in the form of group. Map generates a key-value pair based result which is later on processed by the Reduce() method.
Reduce(), as the name suggests does the summarization by aggregating the mapped data. In simple, Reduce() takes the output generated by Map() as input and combines those tuples into smaller set of tuples.

PIG:

1. Pig was basically developed by Yahoo which works on a pig Latin language, which is Query based language similar to SQL.
2. It is a platform for structuring the data flow, processing and analysing huge data sets.
3. Pig does the work of executing commands and in the background, all the activities of MapReduce are taken care of. After the processing, pig stores the result in HDFS.
4. Pig Latin language is specially designed for this framework which runs on Pig Runtime. Just the way Java runs on the JVM.
5. Pig helps to achieve ease of programming and optimization and hence is a major segment of the Hadoop Ecosystem.

HIVE:

1. With the help of SQL methodology and interface, HIVE performs reading and writing of large data sets. However, its query language is called as HQL (Hive Query Language).
2. It is highly scalable as it allows real-time processing and batch processing both. Also, all the SQL data types are supported by Hive thus, making the query processing easier.
3. Similar to the Query Processing frameworks, HIVE too comes with two components: *JDBC Drivers* and *HIVE Command Line*.
4. JDBC, along with ODBC drivers work on establishing the data storage permissions and connection whereas HIVE Command line helps in the processing of queries.

Mahout:

1. Mahout, allows Machine Learnability to a system or application. Machine Learning, as the name suggests helps the system to develop itself based on some patterns, user/environmental interaction or on the basis of algorithms.
2. It provides various libraries or functionalities such as collaborative filtering, clustering, and classification which are nothing but concepts of Machine learning.
3. It allows invoking algorithms as per our need with the help of its own libraries.

Apache Spark:

1. It's a platform that handles all the process consumptive tasks like batch processing, interactive or iterative real-time processing, graph conversions, and visualization, etc.
2. It consumes in memory resources hence, thus being faster than the prior in terms of optimization.
3. Spark is best suited for real-time data whereas Hadoop is best suited for structured data or batch processing; hence both are used in most of the companies interchangeably.

Apache HBase:

1. It's a NoSQL database which supports all kinds of data and thus capable of handling anything of Hadoop Database. It provides capabilities of Google's BigTable, thus able to work on Big Data sets effectively.
2. At times where we need to search or retrieve the occurrences of something small in a huge database, the request must be processed within a short quick span of time. At such times, HBase comes handy as it gives us a tolerant way of storing limited data.

Other Components: Apart from all of these, there are some other components too that carry out a huge task in order to make Hadoop capable of processing large datasets. They are as follows:

Solr, Lucene: These are the two services that perform the task of searching and indexing with the help of some Java libraries, especially Lucene is based on Java which allows spell check mechanism, as well. However, Lucene is driven by Solr.

Zookeeper: There was a huge issue of management of coordination and synchronization among the resources or the components of Hadoop which resulted in inconsistency, often. Zookeeper overcame all the problems by performing synchronization, inter-component based communication, grouping, and maintenance.

Oozie: Oozie simply performs the task of a scheduler, thus scheduling jobs and binding them together as a single unit. There is two kinds of jobs .i.e Oozie workflow and Oozie coordinator jobs. Oozie workflow is the jobs that need to be executed in a sequentially ordered manner whereas Oozie Coordinator jobs are those that are triggered when some data or external stimulus is given to it.[5]

CONCLUSION

In this paper we have tried to survey the various technologies to handle the big data. Also in this paper we have discussed the characteristics of Big data (volume, variety, velocity, value, veracity) and various technologies and also architecture of bigdata.. The main goal of our paper was to make a survey of various big data handling techniques those handle a massive amount of data from different sources and improves overall performance of systems.

References

1. S.Vikram Phaneendra & E.Madhusudhan Reddy “Big Data- solutions for RDBMS problems-A Survey” In 12th IEEE/IFIP Network Operations & Management Symposium (NOMS 2010) (Osaka, Japan, Apr 19{23 2013).
2. Mrigank Mridul, Akashdeep Khajuria, Snehasish Dutta, Kumar N “ Analysis of Bidgata using Apache Hadoop and Map Reduce” Volume 4, Issue 5, May 2014” 27
3. Sagioglu, S.Sinanc, D.,||Big Data: A Review||,2013, 20-24.
4. Kyuseok Shim, MapReduce Algorithms for Big Data Analysis, DNIS 2013, LNCS 7813, pp. 44– 48, 2013
5. Yuri Demchenko “The Big Data Architecture Framework (BDAF)” Outcome of the Brainstorming Session at the University of Amsterdam 17 July 2013

Recent Advances in Applications of Augmented Reality

Pavana B.S¹ & Prabhal subbaiah P² & Mohan G.K³

¹Asst prof, Seshadripuram First Grade College, Dept of computer science, Bangalore, India

^{2,3}Seshadripuram First Grade College, Dept of computer science(6th sem), Bangalore, India

ABSTRACT: *This paper explores the current developments as well as the future scope of Augmented Reality. How the modern human beings have been using the 3D viewing techniques as a gateway to virtual reality and how virtual reality has led to augmented reality; ways to augment the reality – these have been discussed in this paper. This paper also mentions a survey which showed how augmented reality can make us understand something in the easiest way, thus reducing errors. The hardware technology used, developing platforms and various applications of augmented reality have been mentioned. Apart from this, this paper also mentions some limitations of this technology, the barriers in front of it as well as its future scope.*

Keywords:

INTRODUCTION

Augmented reality augments the real world with the synthetic electronic data. It is a live direct or indirect view of a physical, real-world environment whose elements are augmented (or supplemented) by computer-generated sensory input such as sound, video, graphics or GPS data. It is related to a more general concept called mixed reality. Virtual reality replaces the real world with a simulated one. Augmentation is conventionally in real-time and in semantic context with environmental elements, such as sports scores on TV during a match. With the help of advanced AR technology (e.g. adding computer version and object recognition) the information about the surrounding real world of the user becomes interactive and digitally manipulable. Information about the environment and its objects is overlaid on the real world., in which a view of reality is modified by a computer. Augmented Reality is a field which has originated from the field of virtual reality. Augmented Reality concerns with integration of electronic information back to the real world. Through augmented reality applications, particular spaces can be recognized and through the use of computationally enhanced viewing screens, new images (virtual) are superimposed into the real space.

The basic concept of a 3D display is they are designed to convince your brain that your monitor is showing a real, three dimensional object. In order to understand quite how it works, we need to know what sort of work our brain does with the information our eyes give it . Once we know about that, we'll be able to understand just how 3-D augmented reality does its job.

Seeing in three dimensions

Human beings, like most other creatures, are equipped with two eyes, situated close together and side by side .This positioning means that each eye has a view of the same area from a slightly different angle. We can check this out by focusing on a distant object and viewing through each eye alternately. The brain takes the information from each eye and unites them into one picture, interpreting the slight differences between each view as depth. This produces

Three-dimensional picture: one with height, width and depth.

- We can position our eye in such a way that we can see partially around solid objects without needing to move our heads.
- It is the added perception of depth that makes 3D, or stereoscopic vision so important. With stereoscopic vision, we see exactly where the objects and surroundings are.

But nowadays, every single frame of animation with every different angle is designed in 3-D graphic package. In fact nowadays everything we see on computer screen in modern 3-D games is produced the same way. The game is like a gigantic 3-D model the computer works out with. It needs to display on your screen and generates the appropriate view. Getting synched its all down to the power of liquid crystal display LCD. Just like a watch can be changed from transparent to black, the lens of pc 3-D glasses can be transparent or translucent or opaque. The glasses can control which eye sees the image on the screen and, with careful timing.

1. The images are prepared by the computer and displayed:

The two images are generated, representing the views seen by each eye:

Both of these views are presented on screen in rapid sequence:

2. While the left view is presented, the right eye is blocked by the LCD glasses. Similarly, when the right view is presented, the left eye is blocked.

all of this happens so fast that the brain is entirely unaware of the two images merging together into a stereoscopic view.



Development platforms of Augmented Reality

To develop augmented reality apps, We first need to choose development tools. There are two major forms of augmented reality, marker- based AR and marker-less AR.

1. A marker-based AR works on concept of target recognition. The target can be 3D object, text, image, QR Code or human-face called markers. After detection of the target by AR engine, you can embed the virtual object on it and display it on your camera screen. Qualcomm Vuforia SDK is our recommended framework to develop native apps.

2. Marker-less AR, also known as location-based AR, uses GPS of mobile devices to record the device position and displays information relative to that location. Some of the examples of marker-less AR are apps like Layar and Wikitude that let you view information of nearby restaurants and other establishments, Pokémon go is also one of its kind.

Technology used:

• Hardware

Hardware components for augmented reality are: processor, display, sensors and input devices. Modern mobile computing devices like smartphones and tablet computers contain these elements which often include a camera and sensors such as accelerometer, GPS, and solid state compass, making them suitable AR platforms.

• Head mounted

Displays a head-mounted display (HMD) is a display device paired to the forehead such as a harness or helmet. HMDs place images of both the physical world and virtual objects over the user's field of view. Modern HMDs has sensors for six degrees of freedom monitoring that allow the system to align virtual information to the physical world and adjust accordingly with the user's head movements.

• Meta announced their second-generation product at TED, Meta 2. The Meta 2 head mounted display headset uses a sensory array for hand interactions and positional tracking, visual field view of 90 degrees , and resolution display of 2560 x 1440 (20 pixels per degree), which is considered the largest field view currently available.



Classifications of Augmented Reality:

1. By augmenting the user

A person can wear a special kind of device, on the head or hand, which will give some information about the object, for example - a head mounted display (HMD). Starting with earliest head mounted display invented by Ivan Sutherland 1968, today researchers have developed a variety of devices used to wear, letting us to see, hear, touch artificially created objects which gives us the idea of how to interact with virtual objects. It can be said that the idea of virtual reality has been incorporated in augmented reality in order to combine the user's interaction with the virtual object. For example, a system called Charade distinguishes between natural gestures the human makes when just talking or describing something and a set of specialized gestures can be recognized by the system, such as "show the next slide" or "start the video".

2. By augmenting the physical object

This approach involves modification done in physical objects, for example a cell phone. The physical object is changed by augmenting input, output or other devices like GPS in it. For example, there are many smartphone applications today like Layar, Yelp, etc. Using Layer application, one can point the phone camera towards a restaurant and it will show the location based information about that restaurant.

3. By augmenting the environment

Surrounding the user and the object neither the user nor the object is affected directly. Instead, independent devices provide and collect

Information about the surrounding environment, displaying information onto objects and capturing information about the user's interaction with them. For example, there are various kinds of "Interactive Papers" on which information can be displayed plus interaction with that information can also be done by using hands.

Some real world examples

1. Education

AR applications can become the backbone of the education industry. Apps are being developed which embed text, images, and videos, as well as real-world curriculums. Students can participate interactively with computer generated simulations of historical events, exploring and learning details of each significant area of the event site.

Study can be more of fun It can be more interactive if, students can get clear visualization of what they have to study the whole content of the books can be displayed augmented means combining bookish language with real time examples or real time working models.

Mobile apps using augmented reality are emerging in the classroom. The mix of real life and virtual reality displayed by the apps using the mobile phone's camera allows information to be manipulated and seen like never before. Many such apps have been designed to create a highly engaging environment and transform the learning experience. Examples of the mobile apps, that leverage augmented reality to aid learning, include SkyView for studying astronomy and AR Circuits for building simple electric circuits.



2. Medical field

There have been really interesting advances in medical application of augmented reality. Medical students use the technology to practice surgery in a controlled environment. Visualizations aid in explaining complex medical conditions to patients. Augmented reality can reduce the risk of an operation by

giving the surgeon improved sensory perception. This technology can be combined with MRI or X-ray systems and bring everything into a single view for the surgeon. Neurosurgery is at the forefront when it comes to surgical applications of augmented reality. The ability to image the brain in 3D on top of the patient's actual anatomy is very powerful for the surgeon



3. Gaming industry

Augmented reality allows video game players to experience digital game play in a real world environment. Companies and platforms like Niantic and Eyeshot emerged as augmented reality gaming creators. Niantic is notable for releasing the record-breaking Pokémon Go game.



4. Navigation

Augmented reality is very effective on navigation devices Information can be displayed on mobile phones indicating destination directions and meter ,weather ,terrain ,road condition and traffic information as well as alerts of potential hazard in its path.

GPS has widespread One annoying aspect is that we generally have to take your eyes off the road to see the directions on map, along with turn-by-turn directions being difficult to line up to the actual road at times. Mish or 3D an application based on augmented reality is currently working on 3D navigation driver's aid to solve that.



5. Construction and architecture

With the continual improvements to GPS accuracy, businesses are able to use augmented reality to visualize models of construction sites, underground structures, cables and pipes using mobile devices. Augmented reality is applied to present new projects, to solve on-site construction challenges, and to enhance promotional materials. Industrial workers are able to correlate the visual instructions, real time alerts, and 3D mapping.

Future technology

The augmented reality projects a new age of AR that has brought the technology from the level in the lab to a level that could be used in our daily life. Augmented reality is promising technology for fields such as medicine, welfare, architecture and urban planning, education and training. Entertainment industry also shows greater interest in augmented reality. Augmented reality can be used as a sixth sense technology for those people who are having missing sense so that it will be more innovative and useful for them in their day to day life.

Conclusion

This paper provides evidence to support the proposition that AR systems improve task performance and can relieve mental workload on assembly tasks. And yet this technology has not been fully developed but it will be very useful in developing sixth sense technology. The most innovative aspect of augmented reality is not the technology: it is the objective. Instead of replacing physical objects with a computer, we create systems that allow people to interact with the real world in natural ways and at the same time, benefit from enhanced capabilities from the computer. The future we think of is not a strange world in which we are immersed in "virtual reality". Instead, we see our familiar world, enhanced in numerous, often invisible ways.

REFERENCES

1. "Augmented Reality: Linking Real and Virtual Worlds, A new Paradigm for interacting with Computers", Wendy E. Mackay
2. "Comparative effectiveness of Augmented Reality in object assembly", Arthur Tang, Charles Owen, Frank Biocca, Weimin Mou
3. "Mixed Reality: Future Dreams seen at the Border between Real and Virtual Worlds", Hideyuki Tamura, Hiroyuki Yamamoto, Akihiro Katayama
4. "Augmented Reality", Wikipedia, the free encyclopedia
5. Images courtesy Pinterest.

OBJECT ORIENTED APPLICATION FRAMEWORKS

AMITHA K.N¹ & FARHEEN KHANUM

¹ASSOCIATE PROFESSOR, DEPARTMENT OF COMPUTER SCIENCE
SESHADRIPURAM FIRST GRADE COLLEGE, YELAHANKA, BANGALORE, KARNATAKA, INDIA

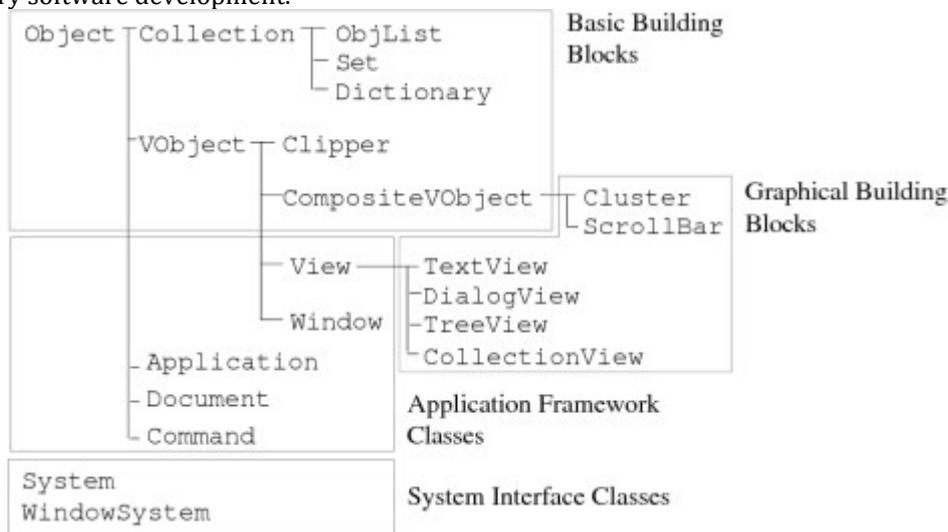
ABSTRACT: Computing power and network bandwidth have increased dramatically over the past decade. However, the design and implementation of complex software remains expensive and error-prone. Much of the cost and effort stems from the continuous re-discovery and re-invention of core concepts and components across the software industry. In particular, the growing heterogeneity of hardware architectures and diversity of operating system and communication platforms makes it hard to build correct, portable, efficient, and inexpensive applications from scratch

In this paper we have researched about the primary benefits of OO Application Frameworks, Scope and reusability approach of the OO Application Framework, the challenges that can appear and their avoidance and the future of the OO Application Software.

Keywords:

INTRODUCTION

Object-oriented (OO) application frameworks are a promising technology for reifying proven software designs and implementations in order to reduce the cost and improve the quality of software. A framework is a reusable, "semi-complete" application that can be specialized to produce custom applications. In contrast to earlier OO reuse techniques based on class libraries, frameworks are targeted for particular business units (such as data processing or cellular communications) and application domains (such as user interfaces or real-time avionics). Frameworks like MacApp, ET++, Interviews, ACE, Microsoft's MFC and DCOM, JavaSoft's RMI, and implementations of OMG's CORBA play an increasingly important role in contemporary software development.



1. The primary benefits of Object Oriented application frameworks are :

- Less code to design and implement. Much of the program's code already exist in the framework (figure) So the framework dramatically decreases the amount of code that you must design, code, test, debug and maintain. Because the infrastructure of the framework is already in place, you write code only as required by the framework or to override some default behaviour of the framework that is inappropriate for the application. So the amount of code required for a specific implementation of a project is a small fraction of the code required to write the same application from scratch.

- More reliable and robust code. Code reused in frameworks has already been tested and during the reuse of the code in a lot of projects, the stability of the code increases. This allows an organization to build their implementations from a base that has been proven to work in the past, and minimizes the amount of testing required.
- More focus on areas of expertise. In the way programming interfaces of operating systems insulate software routines from system dependencies, frameworks provide standard solutions for specific areas by capture of expertise within patterns and strategies of object interaction. Considering this benefits, with object-oriented frameworks, reuse of software won't remain a „cut and paste“ of fractions of code, moreover reuse will become a methodical approach.

2.Scope of the object oriented application frameworks

Although the benefits and design principles underlying frameworks are largely independent of domain to which they are applied, we've found it useful to classify frameworks by their scope as follows:

- **System infrastructure frameworks** -- These frameworks simplify the development of portable and efficient system infrastructure such as operating system and communication frameworks, and frameworks for user interfaces and language processing tools. System infrastructure frameworks are primarily used internally within a software organization and are not sold to customers directly.
- **Middleware integration frameworks** -- These frameworks are commonly used to integrate distributed applications and components. Middleware integration frameworks are designed to enhance the ability of software developers to modularize, reuse, and extend their software infrastructure to work seamlessly in a distributed environment. There is a thriving market for Middleware integration frameworks, which are rapidly becoming commodities. Common examples include ORB frameworks, message-oriented middleware, and transactional databases.
- **Enterprise application frameworks** -- These frameworks address broad application domains (such as telecommunications, avionics, manufacturing, and financial engineering) and are the cornerstone of enterprise business activities. Relative to System infrastructure and Middleware integration frameworks, Enterprise frameworks are expensive to develop and/or purchase. However, Enterprise frameworks can provide a substantial return on investment since they support the development of end-user applications and products directly. In contrast, System infrastructure and Middleware integration frameworks focus largely on internal software development concerns. Although these frameworks are essential to rapidly create high quality software, they typically don't generate substantial revenue for large enterprises. As a result, it's often more cost effective to buy System infrastructure and Middleware integration frameworks rather than build them in-house

3.Reusability approaches of the frame work

- **Patterns** -- Patterns represent recurring solutions to software development problems within a particular context. Patterns and frameworks both facilitate reuse by capturing successful software development strategies. The primary difference is that frameworks focus on reuse of concrete designs, algorithms, and implementations in a particular programming language. In contrast, patterns focus on reuse of abstract designs and software micro-architectures.

Frameworks can be viewed as a concrete reification of families of design patterns that are targeted for a particular application-domain. Likewise, design patterns can be viewed as more abstract micro-architectural elements of frameworks that document and motivate the semantics of frameworks in an effective way. When patterns are used to structure and document frameworks, nearly every class in the framework plays a well-defined role and collaborates effectively with other classes in the framework.

- **Class libraries** -- Frameworks extend the benefits of OO class libraries in the following ways:
 - **Frameworks define "semi-complete" applications that embody domain-specific object structures and functionality** -- Components in a framework work together to provide a generic architectural skeleton for a family of related applications. Complete applications can be composed by inheriting from and/or instantiating framework components. In contrast, class libraries are less domain-specific and provide a smaller scope of reuse. For instance, class library components like classes for Strings, complex numbers, arrays, and bit sets are relatively low-level and ubiquitous across many application domains.
 - **Frameworks are active and exhibit "inversion of control" at run-time** -- Class libraries are typically *passive*, i.e., they perform their processing by borrowing threads of control from self-directed application objects. In contrast, frameworks are *active*, i.e., they control the flow of control

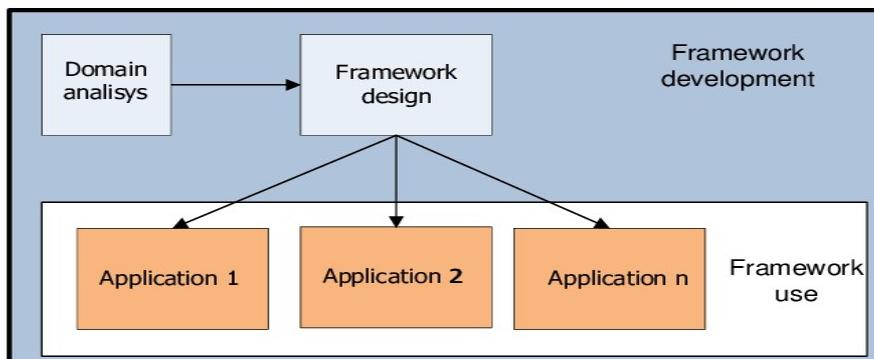
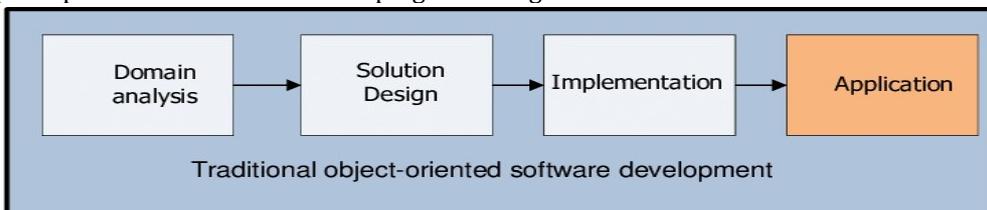
within an application via event dispatching patterns like Reactor and Observer. In practice, frameworks and class libraries are complementary technologies. For instance, frameworks typically utilize class libraries like the C++ Standard Template Library (STL) internally to simplify the development of the framework. Likewise, application-specific code invoked by framework event handlers can utilize class libraries to perform basic tasks such as string processing, file management, and numerical analysis.

- **Components** -- Components are self-contained instances of abstract data types (ADTs) that can be plugged together to form complete applications. Common examples of components include VBX controls and CORBA Object Services. In terms of OO design, a component is a black box that defines a cohesive set of operations, which can be reused based solely upon knowledge of the syntax and semantics of its interface. Compared with frameworks, components are less tightly coupled and can support binary-level reuse. For example, applications can reuse components without having to subclass from existing base classes.

4.Challenges to be resolved

When used in conjunction with patterns, class libraries, and components, OO application frameworks can significantly increase software quality and reduce development effort. However, a number of challenges must be addressed in order to employ frameworks effectively. Companies attempting to build or use large-scale reusable framework often fail unless they recognize and resolve challenges such as :

- **Development effort** -- While developing complex software is hard enough, developing high quality, extensible, and reusable frameworks for complex application domains is even harder. The skills required to produce frameworks successfully often remain locked in the heads of expert developers. One of the goals of this theme issue is to demystify the software process and design principles associated with developing and using frameworks.



- **Learning curve** -- Learning to use an OO application framework effectively requires considerable investment of effort. For instance, it often takes 6-12 months become highly productive with a GUI framework like MFC or MacApp, depending on the experience of developers. Typically, hands-on mentoring and training courses are required to teach application developers how to use the framework effectively. Unless the effort required to learn the framework can be amortized over many projects, this investment may not be cost effective. Moreover, the suitability of a framework for a particular application may not be apparent until the learning curve has flattened.
- **Integra ability** -- Application development will be increasingly based on the integration of multiple frameworks (e.g. GUIs, communication systems, databases, etc.) together with class libraries, legacy systems, and existing components. However, many earlier generation frameworks were designed for internal extension rather than for integration with other frameworks developed externally. Integration problems arise at several levels of abstraction, ranging from documentation issues , to

the concurrency/distribution architecture, to the event dispatching model. For instance, while inversion of control is an essential feature of a framework, integrating frameworks whose event loops are not designed to interoperate with other frameworks is hard.

- **Maintainability** -- Application requirements change frequently. Therefore, the requirements of frameworks often change, as well. As frameworks invariably evolve, the applications that use them must evolve with them.

Framework maintenance activities include modification and adaptation of the framework. Both modification and adaptation may occur on the *functional level* (i.e., certain framework functionality does not fully meet developers' requirements), as well as on the *non-functional level* (which includes more qualitative aspects such as portability or reusability).

Framework maintenance may take different forms, such as adding functionality, removing functionality, and generalization. A deep understanding of the framework components and their interrelationships is essential to perform this task successfully. In some cases, the application developers and/or the end-users must rely entirely on framework developers to maintain the framework.

- **Validation and defect removal** -- Although a well-designed, modular framework can localize the impact of software defects, validating and debugging applications built using frameworks can be tricky for the following reasons:
 - **Generic components are harder to validate in the abstract** -- A well-designed framework component typically abstracts away from application-specific details, which are provided via subclassing, object composition, or template parameterization. While this improves the flexibility and extensibility of the framework, it greatly complicates module testing since the components cannot be validated in isolation from their specific instantiations.

Moreover, it is usually hard to distinguish bugs in the framework from bugs in application code. As with any software development, bugs are introduced into a framework from many possible sources, such as failure to understand the requirements, overly coupled design, or an incorrect implementation. When customizing the components in framework to a particular application, the number of possible error sources will increase.

- **Inversion of control and lack of explicit control flow** -- Applications written with frameworks can be hard to debug since the framework's "inverted" flow of control oscillates between the application-independent framework infrastructure and the application-specific method callbacks. This increases the difficulty of "single-stepping" through the run-time behavior of a framework within a debugger since the control flow of the application is driven implicitly by callbacks and developers may not understand or have access to the framework code. This is similar to the problems encountered trying to debug a compiler lexical analyser and parser written with LEX and YACC. In these applications, debugging is straightforward when the thread of control is in the user-defined action routines. Once the thread of control returns to the generated DFA skeleton, however, it is hard to trace the program's logic.
- **Efficiency** -- Frameworks enhance extensibility by employing additional levels of indirection. For instance, dynamic binding is commonly used to allow developers to subclass and customize existing interfaces. However, the resulting generality and flexibility often reduce efficiency. For instance, in languages like C++ and Java, the use of dynamic binding makes it impractical to support Concrete Data Types (CDTs), which are often required for time-critical software. The lack of CDTs yields (1) an increase in storage layout (e.g., due to embedded pointers to virtual tables), (2) performance degradation (e.g. due to the additional overhead of invoking a dynamically bound method and the inability to inline small methods), and (3) a lack of flexibility (e.g., due to the inability to place objects in shared memory).
- **Lack of standards** -- Currently, there are no widely accepted standards for designing, implementing, documenting, and adapting frameworks. Moreover, emerging industry standard frameworks (such as CORBA, DCOM, and Java RMI) currently lack the semantics, features, and interoperability to be truly effective across multiple application domains. Often, vendors use industry standards to sell proprietary software under the guise of open systems. Therefore, it's essential for companies and developers to work with standards organizations and middleware vendors to ensure the emerging specifications support true interoperability and define features that meet their software needs.

5.Future of object oriented software application:

Over the next several years, we expect the following framework-related topics will receive considerable attention by researchers and developers:

- **Reducing framework development effort** -- Traditionally, reusable frameworks have been developed by generalizing from existing systems and applications. Unfortunately, this incremental process of organic development is often slow and unpredictable since core framework design principles and patterns must be discovered "bottom-up." However, since many good framework exemplars now exist, we expect that the next generation of developers will leverage this collective knowledge to conceive, design, and implement higher quality frameworks more rapidly.
- **Greater focus on domain-specific enterprise frameworks** -- Existing frameworks have focused largely on system infrastructure and middleware integration domains (such as user interfaces and OS/communication systems. In contrast, there are relatively few widely documented exemplars of enterprise frameworks for key business domains such as manufacturing, banking, insurance, and medical systems. As more experience is gained developing frameworks for these business domains, however, we expect that the collective knowledge of frameworks will be expanded to cover an increasing wide range of domain-specific topics and an increasing number of Enterprise application frameworks will be produced. As a result, benefits of frameworks will become more immediate to application programmers, as well as to infrastructure developers.
- **Black box frameworks** -- Many framework experts favor black-box frameworks over white-box frameworks since black-box frameworks emphasize dynamic object relationships (via patterns like Bridge and Strategy) rather than static class relationships. Thus, it is easier to extend and reconfigure black-box frameworks dynamically. As developers become more familiar with techniques and patterns for factoring out common interfaces and components, we expect that an increasing percentage of black-box frameworks will be produced.
- **Framework documentation** -- Accurate and comprehensible documentation is crucial to the success of large-scale frameworks. However, documenting frameworks is a costly activity and contemporary tools often focus on low-level method-oriented documentation, which fails to capture the strategic roles and collaborations among framework components. We expect that the advent of tools for reverse-engineering the structure of classes and objects in complex frameworks will help to improve the accuracy and utility of framework documentation. Likewise, we expect to see an increase in the current trend of using design patterns to provide higher-level descriptions of frameworks.
- **Processes for managing framework development** -- Frameworks are inherently abstract since they generalize from a solution to a particular application challenge to provide a family of solutions. This level of abstraction makes it difficult to engineer their quality and manage their production. Therefore, it is essential to capture and articulate development processes that can ensure the successful development and use of frameworks. We believe that extensive prototyping and phased introduction of framework technology into organizations is crucial to reducing risk and helping to ensure successful adoption.
- **Framework economics** -- The economics of developing framework includes activities such as the following:
 - **Determining effective framework cost metrics** -- which measure the savings of reusing framework components vs. building applications from scratch;
 - **Cost estimation** -- which is the activity of accurately forecasting the cost of buying, building, or adapting a particular framework;
 - **Investment analysis and justification** -- which determines the benefits of applying frameworks in terms of return on investment;

CONCLUSION:

We expect that the focus on framework economics will help to bridge the gap among the technical, managerial, and financial aspects of making, buying, or adapting frameworks. Object-oriented programming provides a way to express a design so that it can be instantiated, customized and extended if we take collaboration of objects as a main part of reusable software in consideration. Frameworks make extended use of this feature in a way to provide an already successful used approach to a better reuse of software.

References:

1. [Birrer:93] Eggenschwiler T. Birrer "Frameworks in the Financial Engineering Domain: An Experience Report" ECOOP '93 Proceedings, Lecture Notes in Computer Science nr. 707, Springer-Verlag, 1993.
2. [Johnson:88] Ralph Johnson and Brian Foote. "Designing Reusable Classes." Journal of Object-Oriented Programming. SIGS, 1, 5 (June/July. 1988), 22-35.
3. [Campbell-Islam:93] Roy H. Campbell and Nayeem Islam "A Technique for Documenting the Framework of an Object-Oriented System", Computing Systems, Vol. 6, No. 4, Fall 1993
4. [Fayad-Hamu:97] Mohamed E. Fayad and David S. Hamu "Object-Oriented Enterprise Frameworks: Make vs. Buy Decisions and Guidelines for Selection", The Communications of ACM, 1997, to appear.
5. [Gamma:95] Erich Gamma, Richard Helm, Ralph Johnson, and John Vlissides, "Design Patterns: Elements of Reusable Software Architecture", Addison-Wesley, 1995.
6. [Hamu-Fayad:97] David S. Hamu and Mohamed E. Fayad, "Achieve Bottom-Line Improvements with Enterprise Frameworks," The Communications of ACM, October 1997.
7. [Johnson:95] Herman Hueni and Ralph Johnson and Robert Engel, "A Framework for Network Protocol Software," Proceedings of OOPSLA, Austin, Texas, October 1995.
8. [Pree:94] Wolfgang Pree, Design Patterns for Object-Oriented Software Development, Addison-Wesley, Reading, MA, 1994.
9. [Schmidt:97] Douglas C. Schmidt, "Applying Design Patterns and Frameworks to Develop Object-Oriented Communication Software," Handbook of Programming Languages, Volume I, edited by Peter Salus, MacMillan Computer Publishing, 1997.
10. [semanticscholar.org/d7d5/93f2ad01cae655476c307af146dc2658ac34.pdf](https://www.semanticscholar.org/d7d5/93f2ad01cae655476c307af146dc2658ac34.pdf)

A Survey on Artificial Intelligence and Its Applications

Jyothsna A.N, Manoj Kumar G.A, Jafur , Dhanush R

Assistant Professor,, Department of Computer Science,
Seshadripuram First Grade College, Yelahanka, Bangalore, Karnataka, India

ABSTRACT: *Artificial Intelligence (AI) is more advancing technology, which may have impact on everyday lives. AI refers to a creation of artificially human-like intelligence that can learn, plan, or process natural language. AI is an approach to make a computer, a robot, or a product to think how smart human think, learn, decide and work. A Survey is made to bring a brief introduction of AI, types of AI, its applications, Advantages and Disadvantages of using AI. This paper gives an insight of very basic introduction to AI.*

Keywords: *Artificial Intelligence, Machine Learning, Deep Learning, BigData.*

I. Introduction

The term “Artificial intelligence” [1] was coined by John McCarthy, professor emeritus of computer science at Stanford University. AI is “the study of ideas that enable computers to be intelligent” [2]. Artificial Intelligence (AI) is a Machine Intelligence, the intelligence shown by machines. AI field is making a tremendous impact in recent years in various sectors including Health care, Financial services, Retail, Marketing, Transport, Security etc. The advent of BigData has enabled AI algorithms in particular from Machine Learning (ML) and Deep Learning (DL) to leverage BigData to perform the tasks more optimally.

The advances, alongside interest in the technology’s potential socio-economic and ethical impacts, brings AI to the forefront of many contemporary debates. Industry investments in AI are rapidly increasing [3], and governments are trying to understand what the technology could mean for their citizens. [4].

II. Types of Artificial Intelligence

There are four types of artificial intelligence: reactive machines, limited memory, theory of mind and self-awareness [5].

1. **Reactive Machines:** The most basic types of AI systems are purely reactive, and have the ability neither to form memories nor to use past experiences to inform current decisions. Deep Blue, IBM’s chess-playing supercomputer, the examples of this type of machine.
2. **Limited Memory:** This type as the name suggests, tells the memory in such systems are short lived. Such systems can go back to their past for a short time and learn from it. This concept is incorporated in self-driving cars, where the sensors detect instances of a pedestrian crossing, bad road conditions, weather, incoming vehicle, lane detection, traffic lights and more to make smarter driving decisions.
3. **Theory of Mind:** If AI systems are indeed ever to walk among us, they’ll have to be able to understand that each of us has thoughts and feelings and expectations for how we’ll be treated. And they’ll have to adjust their behavior accordingly.
4. **Self-awareness:** This type of artificial intelligence, machines or robots are aware of who they are, understand their internal traits, states and conditions and even perceive human emotions. Self-aware artificial intelligence is an extension of the Theory of Mind class of artificial intelligence.

III. Applications of AI

1. **In Healthcare:** This is the most important factor for the human world. An AI system can assist physicians by providing up-to-date medical information from journals, textbooks and clinical practices to inform proper patient care [6].

AI-based applications could improve health outcomes and quality of life for millions of people in the coming years—but only if they gain the trust of doctors, nurses, and patients, and if policy, regulatory, and commercial obstacles are removed [7].

2. **In Business:** AI can help businesses increase sales, detect fraud, improve customer experience, automate work processes and provide predictive analysis.
3. **In Education:** A tedious work for a teacher is to grade homework and tests for large lecture courses. A significant amount of time is consumed to interact with students, to prepare for class, or work on professional development. But, this will not be the case anymore with the advent of AI. The past fifteen years have seen considerable AI advances in education. Applications are in wide use by educators and learners today, with some variation between K-12 and university settings.[7].
4. **In Autonomous Vehicles:** Incorporate speech recognition for advanced communication with passengers. Adjust the trip's directions based on known traffic conditions to find the quickest route. This is where artificial intelligence is used.
5. **In Travel Industry:** With predictive analytics driven by artificial intelligence, the price can be predicted. The application is able to predict price patterns and alert travelers when to buy the tickets. So, the cheapest rate can be known before you book the flights to your destination.
6. **In Social Media:** Instagram, Snapchat, Facebook, Twitter, the world today is changing and everyone is using these social media apps to stay connected with the virtual world. Starting from notifications, to upgradations, everything is curated by AI. It considers all the past web searches, behaviors, interactions.



Applications of Artificial Intelligence in various fields

IV. Advantages and Disadvantages of AI

Advantages of AI

1. Decision taken by a machine are based on a set of algorithms which reduces room for errors.
2. Situations where the safety of a human is unsecure ,an AI machine that is fitted with predefined algorithms can be used.
3. Artificial intelligence extends the human experience.
4. In business ,AI is used to automate customer interactions ,real time assistance.
5. Robotic pets can help patients with despair and also save them active [8].
6. They need not stop at any time as the machines no need to sleep, because they don't get ill, there is no need for breaks [9].

Compared to traditional programming techniques, expert-system approaches provide the added flexibility (and hence easier modifiability) with the ability to model rules as data rather than as code. In situations where an organization's IT department is overwhelmed by a software development backlog, rule-engines, by facilitating turnaround, provide a means that can allow organizations to adapt more readily to changing needs[10].

Disadvantages of Artificial Intelligence:

1. **High Cost:** Creation of artificial intelligence requires huge costs as they are very complex machines. Their repair and maintenance require huge costs.
2. **No Replicating Humans:** Intelligence is believed to be a gift of nature. An ethical argument continues, whether human intelligence is to be replicated or not.

3. **No Improvement with Experience:** Unlike humans, artificial intelligence cannot be improved with experience. With time, it can lead to wear and tear. It stores a lot of data but the way it can be accessed and used is very different from human intelligence.
4. **No Original Creativity:** These are not the forte of artificial intelligence. While they can help you design and create, they are no match to the power of thinking that the human brain has or even the originality of a creative mind.
5. **Unemployment:** Replacement of humans with machines can lead to large-scale unemployment. Unemployment is a socially undesirable phenomenon.

Ease of rule creation and rule modification can be double-edged. A system can be sabotaged by a non-knowledgeable user who can easily add worthless rules or rules that conflict with existing ones. Reasons for the failure of many systems include the absence of (or neglect to employ diligently) facilities for system audit, detection of possible conflict, and rule lifecycle management (e.g. version control, or thorough testing before deployment). The problems to be addressed here are as much technological as organizational.[10].

V.CONCLUSION

We can see that the spread of AI is all pervasive, from education to Healthcare, from home to industry, there is no place where AI is not explored. From the above discussion we can see that Artificial Intelligence Technologies ease human's life and by coming future Artificial Intelligent Technologies can provide more competitive advantage. The great challenge of AI now a days is to the catch methods of demonstrating the consistent data and understanding that people can be able to carry out daily actions such as holding a wide-ranging conversation, or finding their way along a busy street. Conventional digital computers may be accomplished of running such programs. This is not the conclusion of AI, there is further to originate after it.

References

1. Skillings, Jonathan (2006), Newsmaker: Getting machines to think like us, CNET, retrieved 8 October 2008.
2. P.H. Winston, Artificial Intelligence, second ed., Addison-Wesley, Reading, MA, 1984.
3. <https://www.weforum.org/agenda/2016/06/investors-are-backing-more-AI-startups-than-ever-before>
4. UK House of Commons Science and Technology Committee's "Robotics and artificial intelligence", or White House Reports "Preparing for the Future of Artificial Intelligence" or "Artificial Intelligence, Automation, and the Economy".
5. <https://www.govtech.com/computing/Understanding-the-Four-Types-of-Artificial-Intelligence.html>
6. Pearson T. How to replicate Watson hardware and systems design for your own use in your basement. 2011 https://www.ibm.com/developerworks/community/blogs/InsideSystemStorage/entry/ibm_watson_how_to_build_your_own_watson_jr_in_your_basement?lang=en (accessed 1 Jun 2017).
7. Stone, P., Brooks, R., Brynjolfsson, E., Calo, R., Etzioni, O., Hager, G., Hirschberg, J., Kalyan Krishnan, S., Kamar, E., Kraus, S. and Leyton-Brown, K., 2016. Artificial intelligence and life in 2030. One Hundred Year Study on Artificial Intelligence: Report of the 2015-2016 Study Panel.
8. <https://www.linkedin.com/pulse/pros-cons-artificial-intelligencemike-fekety>.
9. <https://praveen1302.wordpress.com/2014/02/11/advantages-and-disadvantages-for-artificial-intelligence/>
10. Kamal Phulera¹, Himanshu Singh¹ and Anurag Bhatt², 2017 Analytical Study on Artificial Intelligence Techniques to Achieve Expert Systems.

Artificial Intelligence in Indian Health Sector

Ms. Shruti D. Nilegaonkar
Seshadripuram First Grade College,
Bengaluru(Karnataka)

ABSTRACT: Artificial intelligence (AI) uses complex algorithms and software for the emulation of human cognition in the area of healthcare. Through Data analysis AI can produce approximate results without human intervention. Various decisive Diseases such as Cancer, Chronic diseases can be analysed precisely in the cases where medical history and complications differs from patient to patient. Various organizations are coming forward to contribute AI in medical Sector.

India having a bulky population with inadequate ration of doctors truly needs use of AI in medical field. The fast developing India has the opportunity to boost the medical sector with the use of AI but at the same time it has challenges to execute it in rural area, Tier II and Tier III cities.

This article discusses a case study on IBM Watson Assistant which was proved very much helpful in Manipal Hospital, Bangalore. Also it throws light on patients' views to switch over to AI for their health from traditional medical practices through interview. The interviews of some medical practitioners have strengthened the views of researcher.

Keywords:

Introduction

Artificial intelligence (AI) uses complex algorithms and software for the emulation of human cognition in the area of healthcare. Through Data analysis AI can produce approximate results without human intervention.

AI technology differs from traditional technologies in health care with its ability to gain information, process it and give a well-defined output to the end-user. AI uses machine learning algorithms for this. These algorithms recognize behavioural patterns and create its own logic. In order to diminish the margin of error, AI algorithms need to be tested constantly. AI algorithms behave differently from humans in two ways: (1) algorithms are literal: if you set a goal, the algorithm can't adjust itself and only understand what it has been told explicitly, (2) and algorithms are black boxes algorithms can predict extremely precise, but not the cause or the why.

One of the key trends is the use of health AI to incite the transition of medicine from reactive to proactive care. Machine learning-based applications will preempt and prevent disease on a more personal level, rather than merely reacting to symptoms. Providers and payers will be better positioned to care for their patients' needs with the tools to delay or prevent the onset of life-threatening conditions. Ultimately, patients will benefit from timely and personalized treatment to improve outcomes and potentially increase survival rates.

Ultimately, AI and data analytics could prove to be the catalyst in addressing some of today's most difficult-to-treat health conditions. By combining genomics with individual patient data from electronic health records and real-world evidence on patient behaviour called from wearable, social media and elsewhere, health care providers can harness the power of precision medicine to determine the most effective approaches for specific patients.

This brings tremendous potential to treating complex conditions such as depression. AI can offer insights into a wealth of data to determine the likelihood of depression—based on the patient's age, gender, co-morbidities, genomics, life style, environment, etc.—and can provide information about potential reactions before they occur, thus enabling clinicians to provide more effective treatment sooner.

Applications of AI

AI is able to do much more than human being. It has a wide range of applications as follows:

1. Healthcare System Analysis
2. Treatment Design
3. Managing Medical Records and Other Data
4. Digital Consultation

5. Virtual Nurses
6. Medication Management
7. Drug Creation
8. Precision Medicine
9. Health Monitoring
10. Doing Repetitive Jobs
11. Radiology
12. Tele-health
13. Electronic Health Records

INDUSTRY

Various industries like IBM, Google, Microsoft, Intel and various start ups are coming ahead to contribute in the field of AI. Number of tools are developed by these industries which are being used successfully in various hospitals such as IBM's Watson Oncology, Microsoft's Hanover project, Intel's venture capital arm Intel Capital, Google's DeepMind platform etc. Apart from this various start ups are coming forward to give their contribution in this zone.

Case Study of 'IBM Watson' in Manipal Hospital, Bangalore

A young female patient from Mauritius was suffering through cancer, but she was not getting exact diagnosis of origin of the cancer from anywhere and her problem remained the same. After visiting Manipal Hospital (Bangalore, India) her accurate diagnosis was done by IBM Watson, an AI tool by performing the data analysis of cell patterns. The cancer was found in her Tibia bone (one of two bones in the lower leg,), which was then treated by a young doctor correctly who made her cancer free. The patient is leading a normal life now.



Analysis through Direct Interviews of Patients

Some patients undergoing conventional methods of treatment were asked their acceptance towards AI. It was found that individuals in the age group below 30 were vigorously ready and inquisitive for the use of AI in their treatment. That of 30 to 60 was hesitating for the same but didn't decline AI entirely. Patients of the age above 60 were not all set for AI. They believed in elderly, experienced doctors more.

At the end it was noticed that there is a mixed response of Indian patients towards AI with more weight to the traditional methods with a little blend of AI. This might be due to lack of awareness about AI. Also as AI is a new comer in the medical field, people will take time to believe in it. Convincing people about it is a major challenge.

Also as AI equipments are expensive currently it is not affordable by most of the hospitals.

Doctor's Views (Through Direct Interview)

Dr. Dheeraj Choudhary, RMO in Arunodaya Hospital, Bangalore in the interview with him stated that AI in some areas is really constructive as it gives accurate data analysis results.

But so far people are not much acquainted with it. They believe more in experienced doctors treating them traditionally. They have misconceptions about AI. Further he said that People can be persuaded for the use of AI, but they should be counselled appropriately by doctors. Before treatment patients should be provided with complete knowledge of AI tools and its accuracy, to change their mindset.

Conclusions

AI is definitely a revolutionary factor in the medical field of India. India having a bulky population with inadequate ration of doctors truly needs use of AI in medical field. The fast developing India has the opportunity to boost the medical sector with the use of AI but at the same time it has challenges to execute it in rural area, Tier II and Tier III cities. Expensive AI tools is also a big challenge

The challenges can be overcome by adequate counselling and spreading awareness among people. Also Expenses of AI equipments may reduce by virtue of time and can be available in multiple hospitals by continuous research in this area.

References

1. www.novatiosolutions.com
2. en.wikipedia.org
3. www.forbes.com

DATA MINING

Earlier Prediction of Heart Disease using Locality Sensitive Hashing

Dr Vinay Ranganathan¹ & S.Geetha Ramesha²

¹Professor, Charan's Degree College, Ulsoor, Bangalore

²Assistant Professor, Charan's Degree College, Ulsoor, Bangalore

ABSTRACT: *Data Mining is an interesting field of research whose significant goal is to discover interesting and useful patterns from large volume of data sets. Although heart diseases were thought to be mainly hereditary until a few years ago, a drastic change in life style along with increase in stress, heart diseases are now extremely common even among the younger generations. About 17.3 million deaths per year are due to heart disease and it is ranked high as the major cause of death in the world. Based on a person's age, blood pressure, cholesterol, pulse, gender etc., heart disease can be predicted using data mining classification technique. The risk level of each person can be easily assessed by using Locality Sensitive Hashing technique. LSH refers to a family of functions (known as LSH families) to hash data points into buckets so that data points near each other are located in the same buckets with high probability, while data points far from each other are likely to be in different buckets. The main application of LSH is the prediction of accuracy by providing an efficient approximate for nearest neighbor search through dimensional reduction of data. This Paper focuses around the prediction of heart disease accuracy value using the LSH technique.*

Keywords: *Data mining, Heart Disease, Heart Disease Dataset, Classification, LSH.*

Introduction

In day to day life many factors that affect a human heart. Many problems are occurring at a rapid pace and new heart diseases are rapidly being identified. In today's world of stress Heart, being an essential organ in a human body which pumps blood through the body for the blood circulation is essential and its health is to be conserved for a healthy living. Heart failure is also an outcome of heart disease, and breathlessness can occur when the heart becomes too weak to circulate blood. Some heart conditions occur with no symptoms at all, especially in older adults and individuals with diabetes. The term 'congenital heart disease' covers a range of conditions, but the general symptoms include sweating, high levels of fatigue, fast heartbeat and breathing, breathlessness, chest pain. However, these symptoms might not develop until a person is older than 13 years. In these type of cases, the diagnosis becomes an intricate task requiring great experience and high skill.

Data Mining is a task of extracting the vital decision making information from a collective of past records for future analysis or prediction. The medical data mining made a possible solution to integrate the classification techniques and provide computerised training on the dataset that further leads to exploring the hidden patterns in the medical data sets which is used for the prediction of the patient's future state.

In this research work, the supervised machine learning concept is utilized for making the predictions. A comparative analysis of the three data mining classification algorithms namely k-NN, SVM and LSH are used to make predictions. **The analysis is done at several levels of Model building time, correctly classified instances, incorrectly classified instance and accuracy %.** The StatLog dataset from UCI machine learning repository is utilized for making heart disease predictions in this research work. The predictions are made using the classification model, Locality Sensitive Hashing that is built from the classification algorithms when the heart disease dataset is used for training. This final model can be used for prediction of any types of heart diseases

Literature Survey

Data mining has been played an important role in the intelligent medical systems. Data mining plays a vital role for the healthcare industry that helps health systems to effectively use data and analytics to recognize inefficiencies and best ways that reduce costs and improve care. The main disadvantage of implementing data mining techniques and analysis strategies effectively is the adoption of technology and the complexity of healthcare. Also, the data generated by the healthcare activities are more complex and

huge, it is impractical for un- automated analysis. For identifying the disease followed by effective treatment, data mining techniques are more important for the entire patient and the stake holders.

The applications of machine learning techniques were examined by various researchers previously. However, most of the studies are focusing on specific impact of those machines learning techniques rather than optimizing these techniques. Hybrid methods were also proposed to enhance the optimization.

Dangare et al. used feature selection for [1] predicting heart disease using Neural network. Jabbar et al. used feature selection methods such as symmetrical uncertainty, information gain and genetic algorithm. His proposed a method uses feature subset selection and associative classification for risk score of disease [2]. Krishnaiah V(3) and Kumar (4) proposed a method that uses fuzzy logic along with KNN for diagnosing of heart disease. The performance of their algorithms was improved by discretization and filtering techniques. Syed et al predicted the heart disease by using genetic neural networks (5). In [6] authors proposed prediction of heart disease using genetic neural networks. Experiments were done on American heart association data set. Their approach recorded an accuracy of 96.2%. Masethe et al. [7] proposed a model using decision tree for heart disease prediction. Following are some of the data mining techniques and its drawbacks while implementing in earlier prediction of diseases.

Palaniappan, et al. [8] have carried out a research work and have built a model known as Intelligent Heart Disease Prediction System (IHDPS) by using several data mining techniques such as Decision Trees, Naïve Bayes and Neural Network.

Shantakumar, et al. [9] have done a research work in which the intelligent and effective heart attack prediction system is developed using Multi-Layer Perceptron with Back-Propagation. Accordingly, the frequency patterns of the heart disease are mined with the MAFIA algorithm based on the data extracted.

Yanwei, et.al [10] have built a classification method based on the origin of multi parametric features by assessing HRV (Heart Rate Variability) from ECG and the data is pre-processed and heart disease prediction model is built that classifies the heart disease of a patient.

Decision Tree

- Some decision trees can only deal with binary – valued target classes. Others are able to assign records to an arbitrary no. of classes, but are error-prone when the no. of training examples per class gets small. This can happen rather quickly in a tree with many levels and/or many branches per node.
- The process of growing a decision tree is computationally expensive. At each node, each candidate splitting field is examined before its best split can be found.

Association Rule

- This algorithm is for discovering frequent sets are not directly suitable, when the underlying database is incremented intermittently.
- Discovery of poorly understandable rules

Naïve Bayes

- The main disadvantage is that it can't learn interactions between features.
- In classification task we need a big data set in order to make reliable estimations of the probability of each class.
- We can use Naïve Bayes classification algorithm with a small data set but precision and recall will keep very low

Support Vector Machines

- Problem need to be formulated as 2-class classification
- Difficult to understand the learned function (weights).
- Learning takes long time (QP Optimization).

Neural Network

- Neural Networks cannot be retrained. If you add data later, this is almost impossible to add to an existing network.
- Handling of time series data in neural networks is a very complicated topic

PROPOSED SYSTEM

One of the major drawbacks of these works is that the main focus has been on the application of classification techniques for heart disease prediction, rather than studying various data cleaning and pruning techniques that prepare and make a dataset suitable for mining. It has been observed that a properly cleaned and pruned dataset provides much better accuracy than an unclean one with missing

values. Selection of suitable techniques for data cleaning along with proper classification algorithms will lead to the development of prediction systems that give enhanced accuracy.

So in our proposed work, we plan to implement Locality Sensitive Hashing technique for better classification. The problem LSH solves is that finding nearest neighbors is a very expensive, both in time and space when operating in large feature spaces. It hashes input vectors (e.g. bag-of-word vectors) in a way such that similar vectors are likely to have the same hashes. Because of this property, lookup of near neighbors becomes a very efficient operation. The most important applications for LSH is usually in high-dimensional spaces. The other applications of the proposed method is

- ✓ Near-duplicate detection: LSH is commonly used to duplicate large quantities of documents, webpages, and other files.
- ✓ Genome-wide association study: Biologists often use LSH to identify similar gene expressions in genome databases.
- ✓ Large-scale image search: Google used LSH along with PageRank to build their image search technology Visual Rank.
- ✓ Audio/video fingerprinting: In multimedia technologies, LSH is widely used as a fingerprinting technique A/V data.

Proposed architecture

The following figure 1 shows the proposed architecture for the early prediction of heart disease.

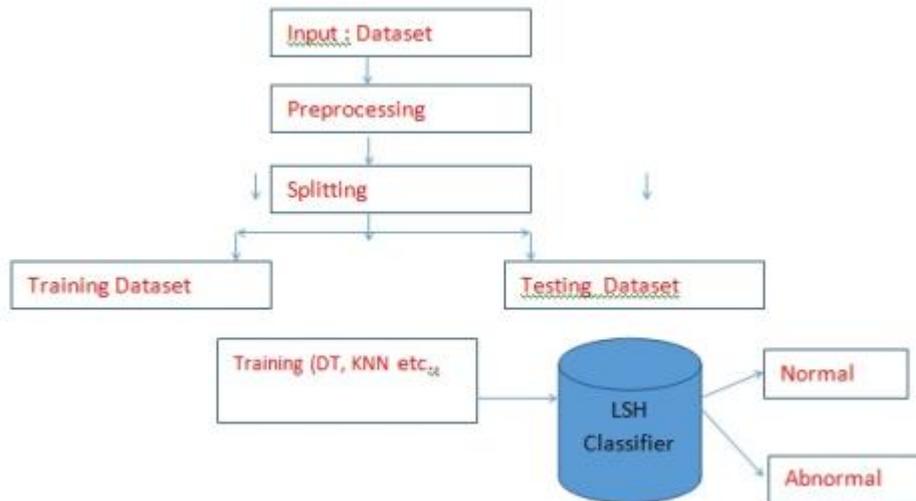


Figure 1. Proposed Architecture

To enhance the performance of the classifier, the following algorithm is proposed.

Input: Heart disease data set HD

Output: Classification of data set into patients with heart disease and normal

Step 1: Input HD

Step 2: Apply pre-processing techniques-Fill in missing values

Step 3: Apply LSH Classifier

Step 4: Hash all n points from the data set S into each of the L hash tables.

Step 6: Based on the query q, the algorithm iterates over the L hash function g.

Step 7: Finally classify the queried data into normal and abnormal.

Algorithm 1. Heart disease prediction using Locality Sensitive Hashing

Algorithm takes the heart disease dataset and classify whether a person is having heart in normal condition or in abnormal condition. The proposed algorithm works in two ways, first , preprocessing is done for filling the missing values followed by feature reduction. Then the dataset is given as input to the proposed method. IN the second phase, LSH will find the similar results based on the given query.

Experimental Results

In this paper, we used Locality Sensitive Hashing classifier for predicting Heart disease. The main goal of this paper is to compare our results with different classification model. For that, we have compared our result with k-Nearest Neighbor and Support Vector Machine. To implement our proposed algorithm, Heart Disease dataset is taken from UCI repository dataset. It consists of 270 instances and 14 features. This is shown in Table 1.

No.	Attribute Name	Type	Description	Range
1	Age	Numeric	Age in years	29-65
2	Sex	Nominal	Sex in number	Male = 0, Female = 1
3	Cp	Nominal	Chest pain type	typical angina = 1, atypical angina = 2, non-anginal pain = 3, asymptomatic = 4
4	Trestbpd	Numeric	Resting blood pressure	92-200
5	serumCho	Numeric	serum cholesterol in mg/dl	126-564
6	Fbs	Nominal	Fasting blood sugar level	Yes =1, No = 0
7	Restecg	Nominal	Resting electrocardiographic results	Normal = 0, having ST-T wave abnormality=1, showing probable or definite left ventricular hypertrophy = 2
8	Thalach	Numeric	Maximum heart rate achieved	82-185
9	Exang	Nominal	Exercise induced angina	Yes = 1, No = 0
10	Oldpeak	Numeric	ST depression induced by exercise	71-202
11	peakSlope	Numeric	the slope of the peak exercise ST segment	1-3
12	numVessels	Numeric	number of major vessels (0-3) coloured by fluoroscopy	0-3
13	Thal	Nominal	The defect type of the heart	3 = normal; 6 = fixed defect; 7 = reversible defect
14	Disease	Nominal	Identification of a heart attack.	Yes=2, No=1

Table 1 Heart Disease Dataset - Attributes.

Table 2 shows the experimental result. Experiments are carried out to evaluate the usefulness and the performance of different classification algorithm for predicting heart disease.

Evaluation Criteria	Classifiers		
	K-NN	SVM	LSH
Model Building Time(in sec)	0.25	0.9	0.6
Correctly classified instances	243	247	262
Incorrectly Classified Instances	27	23	8
Accuracy %	90%	91.48%	97.03%

Table 2 Performance Classifier

The following chart reveals the performance analysis of the LSH compared with the K-NN and SVM models in terms of Model building time, Correctly classified instances, Incorrectly classified instances and Accuracy %.

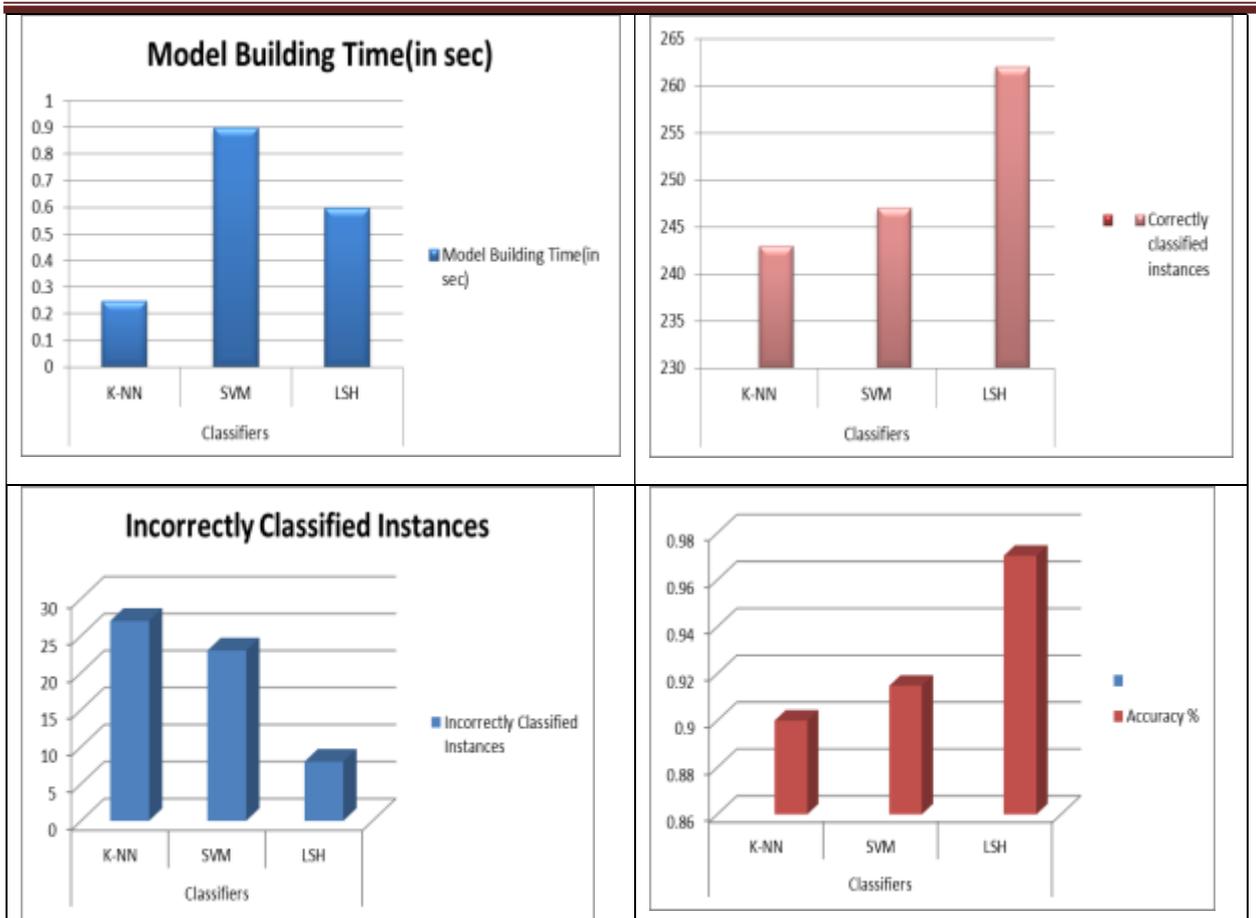


Figure 2 . a) Comparison chart of Model building Time b) Comparison chart of correctly classified instances c) Incorrectly Classified Instances d) Accuracy%

From the above figure, it is clear that Model building time is very less i.e., 0.6 sec in the case of LSH compared to 0.25 of k-NN and 0.9 of SVM. Similarly, out of 270 instances, our proposed method exactly classifies 262 instances with the accuracy of 97.03% compared with 90% and 91.48% of k-NN and SVM.

Conclusion

In this paper, different classifiers are studied and the experiments are conducted to find the best classifier for predicting the patient of heart disease. We proposed an approach to predict the heart diseases using machine learning techniques. Three techniques, k-NN, SVM and LSH are compared. The results show that the proposed method LSH outperforms compared to other two classifiers. Unlike conventional computer hashes that are designed to return *exact* matches in $O(1)$ time, an LSH algorithm uses dot products with random vectors to quickly find *nearest* neighbors. LSH provides a probabilistic guarantee that it will return the correct answer. In systems that have other sources of error (perhaps due to mislabeled data) one can reduce the LSH error below the error due to other sources, while significantly improving the computational performance. This makes LSH in particular and randomized algorithms in general, important in today's world of Internet-sized databases. This study can be improvised by improving in terms of feature reduction and using optimization techniques.

References

1. Dangare A. Data mining approach for prediction of heart disease using neural network. IJCET 2012; 3: 30-40.
2. Jabbar MA, Deekshatulu BL, Priti C. Prediction of risk score for heart disease using associative classification and hybrid feature Selection. IEEE ISDA 2012; 628-634.
3. Krishnaiah V. Diagnosis of heart disease patients using fuzzy classification techniques. ICCCT 2014; 1-7.
4. Kumar. Detection of heart disease using fuzzy logic. IJETT 2013; 4.
5. Syed R, Agarwal B. Genetic neural network based data mining in prediction of heart disease using risk factors. IEEE Conference on ICT 2013.

6. Latha Parthiban and R. Subramanian, "Intelligent Heart Disease Prediction System using CANFIS and Genetic Algorithm", International Journal of Biological, Biomedical and Medical Sciences, Vol. 3, No. 3, pp. 1-8, 2008.
7. Masethe HD, Masathe MA. Prediction of heart disease using classification algorithm. Wcess 2014.
8. Sellappan Palaniappan and Rafiah Awang, "Intelligent Heart Disease Prediction System using Data Mining Techniques", International Journal of Computer Science and Network Security, Vol. 8, No. 8, pp. 1-6, 2008.
9. Shantakumar B. Patil and Y.S. Kumaraswamy, "Intelligent and Effective Heart Attack Prediction System using Data Mining and Artificial Neural Network", European Journal of Scientific Research, Vol. 31, No. 4, pp. 642-656, 2009.
10. X. Yanwei et al., "Combination Data Mining Models with New Medical Data to Predict Outcome of Coronary Heart Disease", Proceedings of International Conference on Convergence Information Technology, pp. 868-872, 2007.

TEXT MINING AND SENTIMENT ANALYSIS DEPICTING STRESS LEVELS AMONG STUDENTS DUE TO EXAMINATIONS USING R PROGRAMMING

Veena.R*1 & Jyothsna.R²

*¹Associate professor , Department of computer science, Seshadripuram college, Bangalore, Karnataka, India

²Assistant professor, Department of computer science, Seshadripuram college, Bangalore, Karnataka, India

ABSTRACT: Exams are an important aspect of the education system , causing a lot of pressure among the students.The objective of this research is to analyze the extent of stress among students due to examinations. Analysis regarding , up to what extent there was a positive or negative impact due to the exams among the students is examined. Tweets on the opinions regarding the exams are retrieved. Text mining is performed on the retrieved tweets. Sentiment analysis is carried out for the pre processed data set. The data mining tool R is used to perform the opinion mining and sentiment analysis.

Keywords: Sentiment Analysis, Text Mining, R language..

I. INTRODUCTION

One among the most famous social networking service is twitter. Twitter is a platform that contains information about the current events going on around the world, breaking news, entertainment. People can express their views, opinions regarding any topic with twitter. Text mining is the technique of obtaining interesting patterns , conclusions and graphs from a highly unstructured and unorganized dataset. Opinions of the people regarding any global issue , could be utilized for mining . R language , is an efficient programming language that helps users to perform text mining from twitter, sentiment analysis and statistical analysis. R Studio is an open IDE for R . Visualization tools are provided by R Studio. Web applications can be built using Shiny , which is an R package. Opinion mining is a system that aims at collecting data (opinion) relating to a subject, cleaning the collected data and categorizing the data. Opinion mining can be implemented using R.

II. LITERATURE REVIEW

Sentiment Analysis Of Demonetization Of 500 & 1000 Rupee Bank Notes By Indian Government

On November 8th, 2016 , Narendra Modi announced that the rupees of 1000 and 500 notes would not be a legal tender and would be changed by an alternate newer currency. There was a mixed response to the demonetization of rupees , 500 and 1000 banknotes. Sentiment Analysis was carried out by P. Singh, R.S. Sawhney, K.S. Kahlon in the year 2017 on demonetization of rupees , 500 and 1000 banknotes. Twitter, is a great platform for expressing our opinions. Twitter was used to obtain data regarding demonetization.

2013-2014 United Kingdom Floods winter floods

Research work on analyzing the United Kingdom floods (2013-2014) was done by Antonia Saravanou, George Valkanas, Dimitrios Gunopulos, Gennady Andrienko. The research work mainly focused on obtaining the tweets from twitter on the United Kingdom floods (2013-2014).The reason for the authors of this research work to choose data from twitter for analysis is the real time nature of twitter, i.e the users of twitter constantly keep updating tweets or their opinions on any particular subject matter. Several disaster management techniques can be adopted by analyzing the tweets. The main aim of this research was to achieve public safety and disaster relief measures.

Sentimental analysis on social media data using R programming

The research work carried out by Mandava Geetha Bhargava and Duvvada Rajeswara Rao focuses on the survey of various types of sentiment analysis methods and the main objective of the research work was to perform sentiment analysis of social media data on crypto currencies based on categorical and various terms of crypto currencies using R programming. The future enhancement work as stated by researchers is to create real time applications along with sentimental analysis on social media.

Sentiment Analysis: An Approach To Opinion Mining From Twitter Data Using R

Pooja Khanna, Sachin Kumar ,Sumita Mishra, and Anant Sinha have performed a research work on sentiment analysis as an approach to achieve mining of opinions from twitter data using R. The research paper focuses on various features of R language. The method for collection of data set on targeted subject

using Twitter is depicted. The major steps involved in sentiment analysis like data extraction , data pre processing using R and the generation of graphs is described in detail.

III. RESEARCH METHODOLOGY

1. Data Extraction

Data Extraction basically deals with retrieving data from different data sources. Usually the data sources are poorly structured. Web pages , PDF documents , text documents can be sources for unstructured data sources. The data on the targeted subject for processing has been collected through the link <https://birdiq.net/twitter-search>.The data available through this web link is in .xlsx form. To use this input to further processing , the data has been converted to text format.

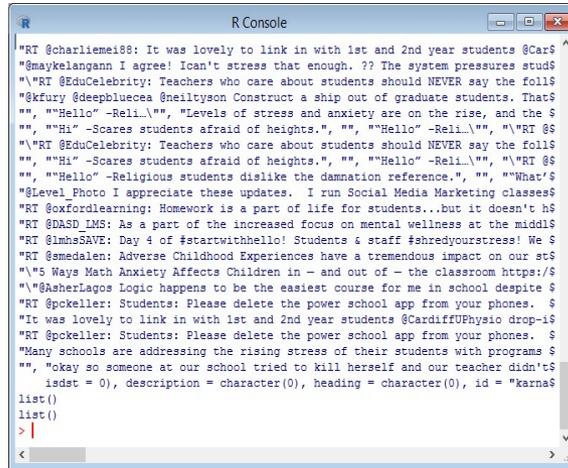


Fig 1 represents the considered data set on the targeted subject i.e stress levels among students due to examinations.

The data set consists of tweets tweeted by several users of twitter on the issue of stress among students due to examinations. The data set represented in Fig 1 has not been processed and hence contains elements that are not essential from the analysis point of view. The data set has to undergo the process of cleaning and stemming to obtain the interesting patterns and important conclusions at the end of the text mining process.

2. Data Pre-processing

Data pre-processing step is used to determine unreasonable data to improve the quality of data. This step involves preparing the data for analysis task by removing numbers , punctuation , stop words (The words that are of no use from analysis point of view), particular words , stripping unnecessary white space from the document. The pre-processing were performed on the targeted data using "tm" and "SnowballC" packages.

This step was processed in two stages : a. Data Cleaning and b. Data Stemming.

a) Data cleaning

Data that is extracted comprises of hyperlink , stopwords , numbers that are irrelevant to the context. Methods namely : gsub() , tm_map() are used to clean the data.

b. Data Stemming

The terms that are incomplete but are relevant to the analysis are obtained using stemming. Stemming is the technique of removing suffixes to get the words of common origin. gsub() is used for stemming.

3. Data Exploration

Data exploration step involves organizing the terms in the data set by their frequency , removing the sparse terms of the data, checking the most and least frequently occurring words , plotting the word frequencies, generating the word clouds. Hierarchical clustering is implemented.

Some of the packages used for data exploration are ggplot2, RColorBrewer, wordcloud etc.

4. Sentiment analysis

Sentiment analysis involves analyzing the opinions in a text . Sentiment analysis involves understanding whether negative , neutral or positive opinion is expressed regarding a particular subject. To classify the tweets as positive(Those tweets that convey the positive effects of examinations taken up by students) or negative (Those tweets that convey the negative effects of examinations) , the positive and negative words that are related to the subject of interest i.e stress among students due to exams, are stored in two text files

namely positive.txt and negative.txt. These 2 text files are used to obtain the scores of each word present in the tweet.



Fig 2: The above image depicts the 2 text files positive.txt and negative.txt

Fig 2 represents 2 text documents positive.txt and negative.txt respectively. The file positive.txt contains the words that convey a positive aspect involved in the scenario of examinations based on the data set considered. The words such as opportunity , pass , succeed etc reflect the positive aspect involved in the examinations.

The file negative.txt represents those words that depict the extent to which the students are stressed due to exams. The words like suicide, fail etc convey the sentiment of agony and suffering. These 2 files are used to obtain sentiment scores for each tweet.

240	-1	anxiety panic disord
241	0	mayb depress na rin
242	0	NA
243	-1	loss appetit
244	-1	loss interest

Fig 2 a : Image representing scores assigned to each tweet.

The two files positive.txt and negative.txt is compared with each tweet and sentiment scores are assigned based on the words present in the positive.txt and negative.txt. The 2 files positive.txt and negative.txt can be considered as a dictionary of words representing positive sentiments and negative sentiments respectively. The excel sheet represented in fig 2 a is the resultant of the sentiment analysis performed using R programming.

score.sentiment() implements a very simple algorithm to estimate sentiment, assigning a integer score by subtracting the number of occurrences of negative words from that of positive words.

score.sentiment() function is implemented in the R code.

IV. SUGGESTED MODEL

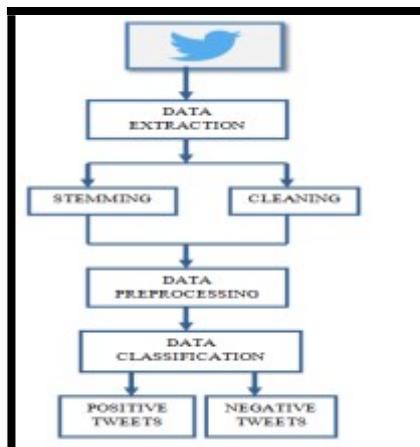


Fig 3: Suggested model for sentiment analysis.

Fig 3 represents the suggested model, that depicts the important steps of performing sentiment analysis. The first step involves collecting tweets from twitter i.e the data extraction. Data is preprocessed by performing stemming and cleaning. Next, the classification of tweets as positive and negative is performed and the sentiment of the text is analyzed.

V. RESULTS AND ANALYSIS

Results of text mining

The word Student appears maximum number of times in the dataset considered. Frequency of the word Student is maximum.

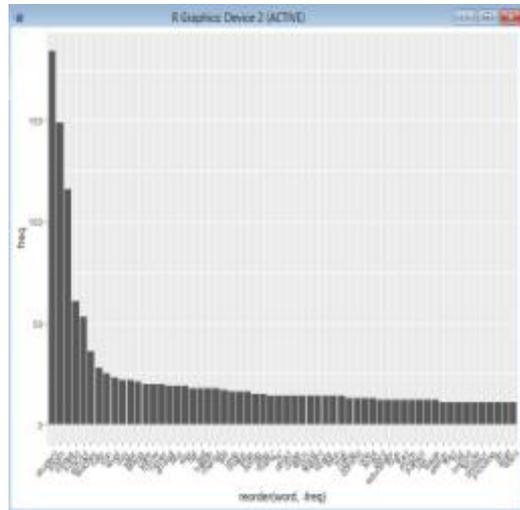


Fig 4: ggplot of the words that appear at least 10 times.

Fig 4 represents the ggplot of the words in the data set that appear at least 10 times. ggplot is obtained for the dataset after pre processing of the considered dataset. The plot shows that the word Student appears maximum number of times, followed by the words exam and stress . ggplot2 is a powerful package available in R language. ggplot2 package helps to create interesting and elegant plots . The package ggplot2 is installed to obtain the ggplot.



Fig 5: 100 most frequent words (word cloud).

Fig 5 represents the word cloud generated for the data set considered. The packages required for obtaining word cloud are "tm" , "RColorBrewer" and "wordcloud". The word cloud in Fig 5 represents that the word Student has appeared maximum number of times followed by the words exam , stress and suicide respectively.

Results of sentiment analysis

POSITIVE TWEETS	NEGATIVE TWEETS	NEUTRL TWEETS	TOTAL TWEETS
16	119	438	573

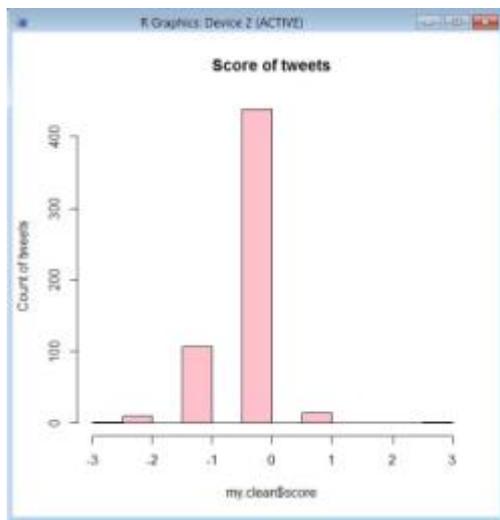


Fig 6: Histogram of sentiment scores

Fig 6 indicates that majority of tweets are neutral . But when compared between the positive and negative tweets, the negative tweets are more in number than positive tweets. Therefore , it can be concluded from the histogram of sentiment scores that , to a greater extent there is a negative impact due to examinations among the students , leading to suicide.

VI. CONCLUSION

The results of text mining indicates that the word Student is repeated the maximum number of times , followed by the word exam. The histogram of sentiment analysis indicates that out of 573 tweets , a majority of them **(438 tweets) are neutral** , whereas **(16 tweets) were having positive sentiments**. Most of the tweets are **negative ones (119 tweets)**.This means that most of the students have experienced negative impact due to examinations. From the histogram plot we can see overall score lies between neutral and negative.

VII. FUTURE ENHANCEMENT

The existing model can be improvised by implementing the algorithms like Support Vector machine, Decision Tree and Naive Bayes. These machine learning algorithms are powerful techniques that helps to perform classification in a better, accurate and efficient manner. Several graphs can be generated that helps to visualize the interesting patterns of the dataset using these machine learning algorithms. Thus machine learning and artificial intelligence can be combined to achieve sentiment analysis. A larger data set can be considered for future work and analysis of the data.

VIII. REFERENCES

1. Myneni Madhu Bala, K. Navya and P. Shruthilaya,"Text Mining On Real Time Twitter Data For Disaster Response", International journal of civil engineering and technology (ijciet), Volume 8, Issue 8, August 2017.
2. Meera.R.Nair, G.R.Ramya and P.Bagavathi Sivakumar," Usage and analysis of Twitter during 2015 Chennai flood towards disaster management", 7th International Conference on Advances in Computing & Communications, ICACC-2017, 22-24 August 2017, Cochin, India.
3. Varsha Sahayak, Vijaya Shete and Apashabi Pathan, "Sentiment Analysis on Twitter Data", (IJIRAE) ISSN: 2349-2163, January 2015.
4. Peiman Barnaghi, John G. Breslin and Parsa Ghaffari, "Opinion Mining and Sentiment Polarity onTwitter and Correlation between Events and Sentiment", 2016 IEEE Second International Conference on Big Data Computing Service and Applications
5. Aliza Sarlan, Chayanit Nadam and Shuib Basri, "Twitter Sentiment Analysis", 2014 International Conference on Information Technology and Multimedia (ICIMU), Putrajaya, Malaysia November 18 – 20, 2014.

6. Neethu M S and Rajasree R, "Sentiment Analysis in Twitter using Machine Learning Techniques", IEEE – 31661, 4th ICCNT 2013.
7. Soo-Min Kim and Eduard Hovy, "Determining the Sentiment of Opinions", Proceedings of the COLING conference, Geneva, 2004
8. Apoorv Agarwal, Boyi Xie, Iliia Vovsha, Owen Rambow and Rebecca Passonneau, "Sentiment Analysis of Twitter Data" Proceedings of the Workshop on Language in Social Media (LSM 2011), 2011.
9. Mondher Bouazizi and Tomoaki Ohtsuki, "Sentiment Analysis: from Binary to Multi-Class Classification", IEEE ICC 2016 SAC Social Networking, ISBN 978-1-4799-6664-6.
10. Nehal Mangain, Ekta Mehta, Ankush Mittal and Gaurav Bhatt, "Sentiment Analysis of Top Colleges in India Using Twitter Data", (IEEE) ISBN -978-1-5090-0082-1, 2016.
11. Eman M.G. Younis, " Sentiment Analysis and Text Mining for Social Media Microblogs using Open Source Tools: An Empirical Study", International Journal of Computer Applications (0975 – 8887) Volume 112 – No. 5, February 2015.
12. Abhishek Kaushik1 , Anchal Kaushik and Sudhanshu Naithani, "A Study on Sentiment Analysis: Methods and Tools", International Journal of Science and Research(IJSR)
13. Mika V. Mäntylä Daniel Graziotin and Miikka Kuutila, " The Evolution of Sentiment Analysis - A Review of Research Topics, Venues, and Top Cited Papers".
14. Oskar Ahlgren, " A Survey Paper on Text Mining - Techniques, Applications And Issues".
15. Mrs.B.Meena Preethi and Dr.P.Radha, "A Survey Paper on Text Mining - Techniques, Applications And Issues", IOSR Journal of Computer Engineering (IOSR-JCE) e-ISSN: 2278-0661,p-ISSN: 2278-8727 PP 46-51 www.iosrjournals.org
16. Krauss, Jonas; Nann, Stefan; Simon, Daniel; Fischbach, Kai , "Predicting movie success and academy awards through sentiment and social network analysis"
17. WuHe, ShenghuaZha and LingLi "Social media competitive analysis and text mining: A case study in the pizza industry", International Journal of Information Management Volume 33, Issue 3, June 2013
18. Bing Liu, Sentiment Analysis and Opinion Mining , "Synthesis Lectures on Human Language Technologies" May 2012, (<https://doi.org/10.2200/S00416ED1V01Y201204HLT016>)
19. Ali Yadollahi, Ameneh Gholipour Shahraki and Ameneh Gholipour Shahraki , "Current State of Text Sentiment Analysis from Opinion to Emotion Mining".
20. Georgios Paltoglou and Mike Thelwall , " A study of information retrieval weighting schemes for sentiment analysis", Proceeding: ACL '10 Proceedings of the 48th Annual Meeting of the Association for Computational Linguistics
21. M Hu and B Liu. 2004. "Mining and summarizing customer reviews. KDD."
22. S M Kim and E Hovy. 2004. "Determining the sentiment of opinions."
23. Dan Klein and Christopher D. Manning. 2003. "Accurate unlexicalized parsing". Proceedings of the 41st Meeting of the Association for Computational Linguistics, pages 423–430.

IOT BASED SMART FARMING: CHALLENGES AND OPPORTUNITIES IN INDIAN PERSPECTIVE

Archana Karnik K.M, Amitha S.K

Assistant Professor, Assistant Professor

Department of Bachelor Of Computer Applications, SB College Of Management Studies, Bengaluru, India

ABSTRACT: *The term Internet of Things (IoT) generally refers to scenarios where network connectivity and computing capability extends to objects, sensors and everyday items not normally considered computers, allowing these devices to generate, exchange and consume data with minimal human intervention. Smart Farming represents the application of modern Internet of things (IoT) into agriculture, leading to what can be called a Third Green Revolution. Farming is one of the major occupations in country like India as majority population depends on it for their livelihood. To improve their traditional farming applying the modern technologies like IoT, which will contribute in improve their style of farming so it will increase the crop yield, less water usage, pest management, increase the efficiency and accuracy. IoT has already introduced in many area, which assisted in increasing effectiveness and less human intervention. In this paper we are discussing about how IoT smart farming is helpful and what challenges the farmers are facing like network problem, smart farming infrastructure, economy factor, power consumption, lack of labour power & technical education. The improving accessibility of low-cost IoT equipment and affordable solutions for smart agriculture has mitigated the challenges associated with adoption of IoT-based agriculture to a large extent.*

Keywords: Smart Farming, IOT, ICT..

I. INTRODUCTION

Internet of things is the next technological revolution that promises to change the way we live and the way we work. IOT is also called Internet of Everything Or Smart Things, means network of interconnecting of devices, these devices are embedded with software, sensors, network connectivity that enable them to exchange the data in smart way. IoT will be successful in the coming years, As the telecommunication sector is becoming more extensive and efficient, broadband internet is widely available. With technological advancement it is now much cheaper to produce necessary sensors with built-in Wi-Fi capabilities making connecting devices less costly. The development of intelligent Smart Farming IoT based devices is day by day turning the face of agriculture production by not only enhancing it but also making it cost-effective and reducing wastage. On the other hand, it is probably also the sector facing the greatest challenges to adopting IoT technologies.

The use of IoT for digitization of farms has caught the attention of the Government of India and the same has been included in the government's draft policy released in 2015. Talking of Indian farmers, which are right now in huge trouble and are at disadvantageous position in terms of farm size, technology, trade, government policies, climate conditions etc. No doubt, ICT based techniques have solved some problems but are not well enough for efficient and assured production. Agricultural production requires lots of activities like soil and plant monitoring, environmental monitoring like moisture and temperature, transportation etc. In the last five years, the total volume of investment in the agricultural sector has grown by a massive ~80%. This sector faces several key challenges and our objective of this research paper is to list the challenges & opportunities for Indian farmers like Connectivity in rural areas, Making sense from big data in agriculture, Size of individual management zones, Lack of scalability and configuration problem etc.

II. IOT & SMART FARMING

Internet of Things (IoT) gained a great attention from researchers, since it becomes an important technology that promises a smart human being life, by allowing a communications between objects, machines and every things together with people.

The fundamental components that make internet of things a reality are:

Hardware-

Making physical objects responsive and giving them capability to retrieve data and respond to instructions.

Software-Enabling the data collection, storage, processing, manipulating and instructing

Communication Infrastructure-Most important of all is the communication infrastructure which consists of protocols and technologies which enable two physical objects to exchange data.

Services provided by IOT are:

- Data storage: The information sent by sensors are stored in the cloud and used later
- Connectivity services: Several devices can be connected to an IoT platform using several protocols
- Data analytics: This a set of services (that uses data stored) ranging from simple service to complex services like machine learning and so on
- Data visualization: It provides several ways to represent data using charts.

III. IOT EFFECTS ACROSS DIFFERENT SECTORS:

With the adoption of IoT in various areas like Industry, Homes and even Cities, huge potential is seen to make everything Intelligent and Smart. Even the Agricultural sector is also adopting IoT technology these days and this in turn has led to the development of “AGRICULTURAL Internet of Things (IoT)”.

Application of IOT in different sectors is listed below (Fig 1).

- Smart cities
- Smart Agriculture
- Smart supply chain management
- Smart Retail etc.

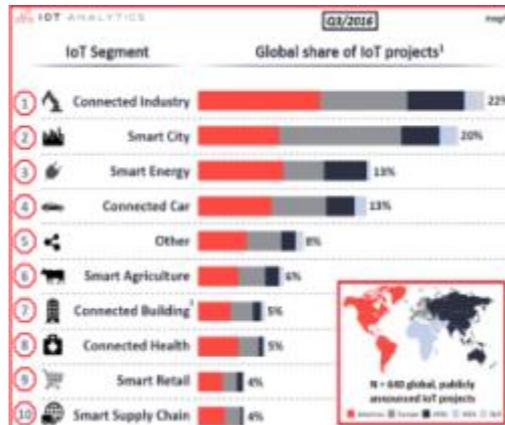


FIG1. Application of IOT in different sectors

IV. BENEFITS OF IOT IN AGRICULTURE

The following are the benefits of IoT in Agriculture:

- a) IoT enables easy collection and management of tons of data collected from sensors and with integration of cloud computing services like Agriculture fields maps, cloud storage etc., data can be accessed live from anywhere and everywhere enabling live monitoring and end to end connectivity among all the parties concerned.
- b) IoT is regarded as a key component for Smart Farming as with accurate sensors and smart equipment's, farmers can increase the food production by 70% till year 2050 as depicted by experts.
- c) With IoT production costs can be reduced to a remarkable level which will in turn increase profitability and sustainability.
- d) With IoT, efficiency level would be increased in terms of usage of Soil, Water, Fertilizers, Pesticides etc.
- e) With IoT, various factors would also lead to the protection of environment.

Smart Farming is a concept of farming management using modern Information and Communication Technologies to increase the quantity and quality of products. Smart farming represents the application of modern information and communication technologies (ICT) into agriculture to increase the amount of production and economic returns, The IoT helps in smart and automated information gathering and

merging. It helps as well as in monitoring sensor data coming from different machines, animals, plants, other farms and greenhouses and othersystems.

The technologies available for present-day farmers are (Fig 2)

- Sensing technologies- including soil scanning, water, light, humidity, temperaturemanagement;
- Software applications- specialized software solutions that target specific farmtypes;
- Communication technologies- such as cellularcommunication;
- Positioning technologies- includingGPS;
- Hardware and software systems that enable IoT-based solutions, robotics andautomation;
- Data analytics, that underlies the decision making and prediction processes.



FIG 2. Smart Farming Technologies

V. CRISIS IN SMART FARMING SECTOR

Agriculture is the primary source of livelihood for about 58 per cent of India's population. Gross Value Added by agriculture, forestry and fishing is estimated at Rs 18.53 trillion (US\$ 271.00 billion) in FY18. The Indian food and grocery market is the world's sixth largest, with retail contributing 70 per cent of the sales. The Indian food processing industry accounts for 32 per cent of the country's total food market, India is the second largest fruit producer in the world. Production of horticulture crops is estimated at record 314.7 million tons (met) in 2018-19 as per third advance estimates. Agriculture may account for just 17 per cent of India's wealth (\$9 trillion or about Rs 64 lakhcoreGrossDomesticProductorGDP)butitaccountsforcloseto50percentofemploymentgeneration. Farmers, it seems, remain poor even during a bumper crop season. Official estimates indicate that as many as 22.5 per cent farmers were living below the poverty line in 2013, while the All India Financial Inclusion Survey, conducted by the National Bank for Agriculture and Rural Development in 2015/16, found that the average monthly income of an agricultural household in India was Rs 8,059. India is witnessing the IoT revolution and is being deployed across various sectors including agriculture. With the advancement in technology at hand, the opportunities for IoT to revolutionize the agricultural sector is beneficent. Several technologies are being integrated with the traditional farming processes to enable smart agriculture practices for moving to a non-farming but better-paying occupation. However, most of our farmers are either illiterate or have elementary education and therefore are wary of using digital devices, considering they are too complex. This gap between their knowledge and the available format is the key hurdle to adopting smart technologies. Farmers Farming families in rural areas are increasingly leaving farming occupation and moving to a non-farming but better-paying occupation. However, most of our farmers are either illiterate or have elementary education and therefore are wary of using digital devices, considering they are too complex. This gap between their knowledge and the available format is the key hurdle to adopting smart technologies IOT based Smart Farming, solutions in country like India has its own challenges.

1. The learning curve

Lack of knowledge and fear of upgrading to a technology of higher level. Lack of awareness in farmers about Technology based farming solutions and their applicability are concerned. Getting farmers thoroughly acquainted with the concept of smart farming, and the tools/devices involved in it, is of the utmost importance before they can actually proceed with the implementation. Lack of knowledge can be dangerous.

2. Connectivity in rural areas

In many remote rural locations across the world, strong, reliable internet connectivity is not available. Unless the network performances and bandwidth speeds are significantly improved, implementation of digital farming will remain problematic.

3. Deficiency of power

Many rural areas of India suffer from shortage of electricity energy, heavy rain causes damage in transformer (TC) and in summer generation of power will be less because scarcity of water. Most people who are below poverty line live in rural, sparsely populated areas. This means that connecting them to the electricity grid, however it is powered, would be expensive.

4. Shortage of labour

As countries develop the share of population working in agriculture is declining. While two third of the population in poor countries work in agriculture, less than 5% of the population does in rich country.

Moreover as IoT in agriculture becomes more and more mainstream and things become automated – a large percentage of this agricultural labor will lose their jobs. The other sectors need to have the capacity to absorb this workforce which is a very big challenge for developing country like India.

5. High Investment.

Established ICT infrastructure & to train farmers, requires lot of investment. A key issue in tech diffusion is the increasing rate of fragmentation of land ownership or operationally land holdings. Nearly 90% of farmers are small and marginal. The average size of a farm is now just 1.15 hectares. According to the Agricultural Census 2016, 85% of land ownership is of less than 2 hectares and account for 45% of the total cropped area.

By contrast, only 5% of farmers operate on land parcels larger than 4 hectares. Farmers need to be able to define the correct production function. Typically, the production function is not the same for all crops, differs in the various zones of a farm.

6. Lack of scalability and configuration problems

A farmer needs to be provided IoT tools (access points, gateways, etc.) that are completely scalable. In other words, the same technology should be applicable, and the same benefits should be available, on a large commercial farm as well as a small piece of personal garden/crop land. The need for manually configuring the setup and the devices is yet another probable point of concern. For agriculture to become truly autonomous, the technology should be self-configurable.

7. Technical failures and resultant damages

If there is a mechanical breakdown in the hardware, or a farming IoT unit/sensor malfunctions – serious crop damages can be the result. For example, in case the smart irrigation sensors are down, plants are likely to be under-watered or over-watered. Food safety can be compromised, if the technological resources in the storage area(s) are not functioning. Even a few minutes of downtime due to a power failure can have serious consequences – particularly when backup power is not available.

8. Mounting of e-waste

A new risk has cropped up though – in the form of electronic wastes (e-wastes). In 2013, the total volume of such wastes was in excess of 52 million metric tons – and the piles of discarded IoT tools and computers and outdated electronic devices are compounding this problem further. For things to be sustainable, proper arrangements for the disposal of e-waste have to be made.

9. The security factor

The presence of malware and data thefts is a risk in practically all types of ‘connected systems’, and smart agriculture is not an exception from that. As the count of middleware technology, endpoints and IoT devices in active use in agriculture is increasing, the number of entry-points for malicious third-party programs is going up as well. Since the third-party attacks on a complex IoT system are often decentralized, detecting and removing them emerges as a big challenge. The situation becomes more complicated due to the propensity of many farm owners to opt for slightly cheaper devices and resources, which do not come with the essential safety assurances. The multiple software and API layers can cause problems as well. There is an urgent need for tighter security and provisioning policies for agricultural IoT – to make it more acceptable for users.

10. Benefits not immediately apparent

To get the motivation to invest on a ‘new technology’ like smart farming, there is almost no way to guesstimate the benefits of precision farming over the long-run – and the benefits do not become apparent from the very outset. For this very reason, many landowners still view the use of advanced technology in agriculture as ‘risky’ and ‘uncertain’, and stay away from adopting it. With greater familiarity with agritech and comprehensive training, such fears should go away.

VI. OPPORTUNITIES IN SMART FARMING SECTOR

The above mentioned challenges can be handled by IOT through research in the following listed areas:

- Application-oriented visualization with decision support system & Interoperability of heterogeneous devices and actuators to establish a better Interface between Farmers & devices.
- Scalable IoT cloud platforms for small to large farms.
- Wireless network access medium and low power Wi-Fi to avoid power factor affect on farming.
- New environment sensor technologies to predict weather forecasting.
- Energy harvesting techniques for battery-less IoT node.

VII. Conclusion

Agriculture is an integral part of smart growth. The ability to feed one's own population is critical to the independence of any state. Agriculture is a diverse industry with very specific locational connections. Certain crops can only be grown in specific locations where the combination of a variety of factors including soil, moisture, temperature, and topography is right. The challenge of the smart growth initiative will be to establish an environment that will allow the continued existence of a healthy agricultural industry. For the agricultural community, uncertainty is a major issue. The average age of farmers is rising and the pessimistic attitude discourages the younger generation from entering the sector. The challenge of the smart growth initiative will be to establish an environment that will allow the continued existence of a healthy agricultural industry. Competing demands for land will have to be balanced against the benefits of maintaining a healthy agricultural base. There are an increasing number of possibilities for low income countries to orientate production along pathways that are both more sustainable and more productive. Research and development partners have a crucial role to play in identifying and promoting smart farming practices that strengthen rural communities, improve smallholder livelihoods and employment, and avoid negative social and cultural impacts. *Flexibility* is needed to provide an environment in which farmers can operate successfully.

REFERENCES

1. Ashton, K. (2009). That 'internet of things' thing. *RFID Journal*, 22(7), 97-114.
2. Atzori, L., Iera, A., & Morabito, G. (2010). The internet of things: A survey. *Computer networks*, 54(15), 2787-2805.
3. Patil, V. C., Al-Gaadi, K. A., Biradar, D. P., & Rangaswamy, M. (2012). Internet of things (IoT) and cloud computing for agriculture: An overview. *Proceedings of Agro-Informatics and Precision Agriculture (AIPA2012)*, India, 292-296.
4. <https://www.biz4intellia.com/blog/5-applications-of-iot-in-agriculture/>
5. <https://internetofthingsagenda.techtarget.com/blog/IoT-Agenda/IoT-challenges-associated-with-the-agriculture-industry>
6. <http://www.scind.org/1330/Science/smart-agriculture-in-india-possibilitiesbenefits-and-challenges.html>

INTERNET OF THINGS (IOT)

Thimmappa . T. N¹ & Rashmi.M.J² & Supriya.R²

¹Associate Prof. in CS Department

²Seshadripuram first grade college

ABSTRACT: *The paper introduces the introduction and explanation of Internet of Things concept with the advanced level with the applications of it in our regular life. It focuses on how the IOT devices work and how they are developed. It describes how it collaborates with human life and also how it is changing human life . Internet of things (IOT) is the fast becoming a disruptive technology business opportunity, with standards emerging primarily for wireless communication between sensors, actuators and gadgets in day -to-day human life, all in general being referred to as "THINGS". The paper overviews the advantages as well as challenges. The paper in detail explain how Internet of things are linked in several areas like Robotics , Automobile industries , Smart Homing systems , Smart Cities , IOT , BigData , Analytics*

Keywords:

HISTORY:

The concept of a network of smart devices was discussed as early as 1982, with modified coke vending machine at carnage mellon university becoming the first internet connected appliance , Mark Weiser's 1991 paper on ubiquitous computing, "the computer of the 21st century",as well as academic venues such as ubicom and percom produced the contemporary vision of the IOT.Between 1993 and 1997, several companies proposed solutions like microsoft's at work or novell's nest. The term "internet of things" was coined by **Kevin Ashton** in 1999, by the presentation to proctor and gamble. He is a co-fonder of MIT's auto-ID lab. He pioneered radio frequency identification (RFID) as essential to the internet of things, which would allow computer to manage all individual things.

Defining the internet or things as "simply the point in times when more' things or objects' were connection to the internet than people", cisco systems estimated that the IOT was "born"between 2008 and 2009,with the things/people ratio growing from 0.08 in 2003 to 1.84 in 2010.

INTRODUCTION OF IOT:

The 'things' in IOT can be any device with any kind of built-in-sensors with the ability to collect and transfer data over a network without manual intervention. The embedded technology in the object helps them to interact with internal states and the external environment, which in turn help in decisions making process. The definition of the internet of things has evolved due to the convergence of multiple technologies, real-time analytics, machine learning, commodity sensors, and embedded systems. And others all contribute to enabling the internet things.

IOT is a device that connects all the devices to the internet and let them communicate with each other over the internet. By doing so, each of the devices will be learning from the experience of other devices, as human do. IOT is trying to expand the interdependence in human.

DEFINITION OF IOT:

The internet of things (IOT) is a system of interrelated computing devices, mechanical and digital machines, objects animals or people that are provided with unique identifiers (UIDs)and ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.

WORKING OF IOT:

An IOT system consist of sensors or devices which talk to the cloud through some kind of connectivity once the data gets into the cloud , software process it and then might decide to perform an action , such as sending as alert or automatically adjusting the sensors or devices with out the need for the users .

But if the user input is needed or if the user simply wants to check in on the system, a user interface allows them to do so . Any adjustment or actions that the user makes or then sends in the opposite direction through the system: from the user interface to the cloud and back to the sensors or devices to make some kind of changes.

APPLICATIONS OF IOT:

- Factory digitalization
- Wearables
- Industrial Automation
- Health care
- Smart Cities
- Home automation
- Agriculture

HOME AUTOMATION:

“Home automation” refers to the automatic and electronic control of household features, activity, and appliances. In simple terms, it means you can easily control the utilities and features of your home via the internet to make life more convenient and secure, and even spend less on household bills.

The concept of home automation aims to bring the control of operating your every day home electrical appliances to the tip of your finger, thus giving user affordable lighting solutions, better energy conservation with optimum use of energy. Apart from just lighting solutions, the concept also further extends to have a overall control over your home security as well as build a centralized home entertainment system and much more. The IOT based home automation system, as the name suggests aims to control all the devices of your smart home through internet protocols or cloud based computing.



shutterstock.com • 1045674226

HOME AUTOMATION WORKS:

Home automation is a network of hardware, communication, and electronic interface that work to integrate everyday devices with one another via the internet. Each device has sensors and is connected through wifi, so you can manage them from your smartphone or table whether you're at home, or miles away. This allows you to turn on the lights, lock the front door, or even turn down the heat, no matter where you are.

Due to IOT , it is possible to communicate with the centralized hub even from remote and distant location through your smartphone. All you need is just a reliable internet connection at the hunt location and the data package to your smartphone that helps you connect to the cloud network. Most of the smart home controller available in the market from several manufacturers cater to all three widely used protocols of wireless communications from home automation :ZIGBEE,Z-WAVE AND WI-FI.



shutterstock.com • 1115885546

There are 3 main elements of a home automation systems are:

- Sensors
- Controllers
- Actuators

SENSORS: The IOT based home automation consist of several smart devices for different applications of lighting, security, home entertainment etc. thus all the sensors within a common network can perform cross-talk via the main controller unit. Some of the smart sensors in home automation acts as sensor hubs. These are basically the signal repeaters of signal bouncers which that are location and the sensors that are at the distant location. For such long distance, these sensor hubs play an important role to allow easy transmission of signals to sensors that are far away from the main controller but in closer proximity to the sensor hub. The commonly used sensor hubs in IOT based home automation are smart plugs.

CONTROLLERS: It is possible to communicate with the centralized hub even from remote and distant locations through your smartphone. All you need is just a reliable internet connection at the hub location and location and the data package to your smartphone that helps you to the connect to the cloud network. Most of the wireless connections are: zigbee, z-wave and Wi-Fi.

ACTUATORS: These may be light switches, motors, or motorized valves that control the actual mechanism, or function, of a home automation system. They are programmed to be activated by a remote command from a controller.

FEATURES OF HOME AUTOMATION SYSTEM:

- Home automation system offers a variety of services and functions. Some of the more common features available through these platforms include:
- Keyless entry
- Remote lighting control
- Thermostat control
- Fire and carbon monoxide monitoring
- Home automation security systems and camera
- Alarm system
- Voice-activated control
- Appliance control
- Digital personal assistant integration
- Real-time text and email alerts



BENEFITS:

The purpose of a home automation system is to streamline how our home functions. consider some of these of these benefits.

- **REMOTE ACCESS:** control your home from mobile devices, including your laptop, tablet, or smartphone.
- **COMFORT:** Use home automation to make your home a more comfortable, livable space. Preprogram your thermostat with your preferred settings so that your home is always at a comfortable temperature, set up smart speakers to play music when you get home from work, or adjust your lights to soften or brighten based on the time of day.
- **CONVENIENCE:** Program device to turn on automatically at certain times, or access their settings remotely from anywhere with an internet connection. when you don't have to remember to lock the door behind you or switch off the lights, you can turn your attention to more important things.

- **INCREASED SAFETY:** Smart fire detections, carbon monoxide monitors, pressure sensor, and other home automation security features can help protect your home from disaster.
- **ENERGY EFFICIENCY:** Home automation allows you to be more mindful of your power usage.

For example: you can save on energy bills by reducing the length of time that lights stay on, or by lowering temperatures when you leave a room.

ADVANTAGES OF IOT:

1. Communication between the connected devices become more transparent and easier.
2. Automation is the need of the hour; IOT reduces human intervention and increases efficient of services.
3. Transferring data packets over a network reduces both time and money.
4. Accessing information is easy, you can control a device that is miles apart in real time.
5. Increased productivity.
6. Automation and control.
7. Communication.
8. Cost saving.

DISADVANTAGES OF IOT:

1. There is a huge risk of leakage of confidential data, when send over a network.
2. Due to its complex network, a single loophole can put the entire system down, affecting everyone.
3. With automation, the need of human labor reduces drastically.
4. Today's lifestyle is technology driven, we depend on technology for the tiniest of tasks.
5. Over dependent on technology.
6. Losing security on privacy.
7. Complexity.
8. Lesser employment prospects.

FUTURE ENHANCEMENT OF IOT:

So IOT is a major technology by which we can produce various useful internet applications . Basically, IOT is a network in which all physical objects are connected to the internet through network devices or routers and exchange data. IOT allows objects to be controlled remotely across existing network infrastructure.

The current number of IOT devices in India is around 60million and the number is going to increase to 1.9 billion units by 2020. The IOT market in India is poised to reach \$15billion by 2020, accounting for 5% of the global market, as per a NASSCOM report

IOT devices will be a huge part of how we interact with basic everyday object. IOT devices are becoming a part of main stream electronics culture and people are adopting smart devices into their homes faster than ever. By 2020 it is established that there will be up to 21 billion connected devices to the internet.

To prove that IOT is taking of rapidly, target opened up a store in San Francisco that exclusive sales IOT device. In just one year alone we went for having 5millions IOT devices connected to the internet to billions. The future is happening now and these devices are getting smarter everyday through Machine Learning and Artificial Intelligence The more data that IOT devices collect the smarter they will become. City will transform into Smart cities to the users

Of IOT connected devices. Think of smart traffic lights that connected data on traffic, and use that to sync lights to peak traffic times.



Conclusion:

- IOT security design should enable and open and interoperable IOT security design should enabled and open and interoperable yet secure in infrastructure.
- For the sake of privacy and flexibility, IOT or smart objects must be capable of implementing individual connection use by NOMADIC smart IOT objects.
- IOT needs special tools and technology for its realization.

References:

1. <https://www.xfinity.com/hub/smart-home/home-automation>
2. <https://smartify.in/knowledgebase/iot-based-homeautomation-system/>
3. <https://www.redappletech.com/iot-home-automation/>
4. https://www.edureka.co/blog/iottutorial/#introduction_to_iot

Analysis of SMC Using Artificial Neural Networks

Sharmila.G

Lecture, Department of Computer Science, Seshadripuram College, Bengaluru, Karnataka, India

ABSTRACT: such as farming, erosion prevention, flood control, and drought prediction. Soils typically contain a finite amount of water, which can be expressed as the soil moisture content. The aim of the work is to design a system that is applicable in a wide range of geographic areas for solving the widest possible range of problems. Synthetic Aperture Radar (SAR) image data provide information such as surface roughness, geometric structure, and orientation. The pre-processing the remote sensing data are, backscattering coefficient, Normalized Difference Vegetation Index (NDVI), thermal infrared temperature and incidence angle parameters are defined. By using the pre-processed parameters, an Artificial Neural Networks methodology is proposed using algorithm SMOSAR. This system yields efficient SMC values in terms of RMSE value and that supports a hydrological system.

Keywords: Artificial Neural Network, HEC-HMS, SAR, NDVI, SMOSAR, RMSE.

I.BACKGROUND STUDY

The approach for SMC estimation is gravimetric method which is time consuming and labour intensive. Although plenty of applications have been reported on the monitoring and detecting environmental change, there are enormous challenges on applying multi-temporal imagery to derive timely information on the earth's environment and human activities. However, remote sensing provides a fast alternative to mapping SMC and its temporal distribution. The advent of satellite based remote sensing has led to a considerable amount of scientific literature on identifying the potential of such sensors to provide explicit SMC Values. The Synthetic Aperture Radar image data provide information different from that of optical sensors operating in the visible and infrared regions of the electromagnetic spectrum. Synthetic Aperture Radar data consist of high-resolution reflected returns of radar-frequency energy from terrain that has been illuminated by a directed beam of pulses generated by the sensor.

Synthetic Aperture Radar systems operating at shorter wavelengths (C-band: 5.6 cm; X-band: 3.1 cm) typically reflect from the surface and top layer of the forest (leaves and twigs) and thus provide information about canopy structure. While the contrast between forest and low vegetation generally is less distinct compared with longer wavelength SAR, the use of two polarisations improves discrimination. X-band SAR data can be acquired at a spatial resolution better than 5 metres, which allows more detailed characterisation of forest canopy structure. Synthetic Aperture Radar sensors have demonstrated their potential for effective monitoring of soil properties. The Fig 1 explain the SAR working method in detail. The Synthetic Aperture Radar returns from the terrain are mainly determined by the physical characteristics of the surface features such as surface roughness, geometric structure, orientation, and the electrical characteristics dielectric constant, moisture content, and conductivity, with the radar frequency of the sensor.

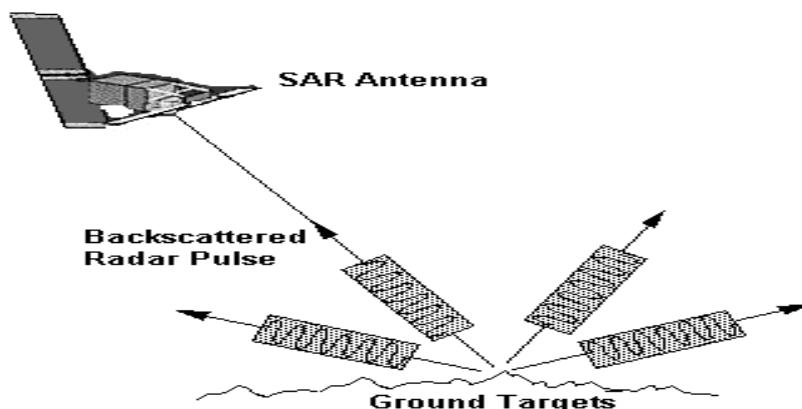


Fig 1 The radar pulse is scattered by the ground targets back to the antenna.

Several theoretical approaches exist for calculating backscattering from landsurfaces with different roughness scales. Especially in the case of bare soils and high radar frequency observation, backscattering is considered to be extremely sensitive to soil surface roughness. In the case of high frequencies, backscattered signal is mostly affected by surface roughness and vegetation, rather than SMC. Various backscattering models have been developed over the past 30 years, categorized into three main groups: physical, empirical and semi-empirical. The accuracy of SMC estimation by inverse backscattering models is also affected by various parameters such as surface roughness.

Different approaches have been followed in the past to calculate SMC, such as multi-temporal change detection and forward model inversion models (ANN) with extremely promising results. With the ANN, their effectiveness in solving inverse remote sensing problems such as those required by SMC monitoring has been proved to have implemented the SMOSAR algorithm for retrieving SMC from data.

II INTRODUCTION

Neural network (NN)³ methods have a strong learning ability and are able to represent the nonlinear relationship between the inputs and outputs of a system. Some specific applications of neural networks to irrigation and water resource management include the prediction of soil moisture to aid irrigation scheduling, crop yield prediction, prediction of irrigation water demand, rainfall-runoff modelling and groundwater modelling. An NN method is applied in this study for predicting the soil moisture dynamics because of their ability to produce robust functions approximating complex processes. However, traditional feedforward neural networks (FFNNs) have limited ability to model dynamic data because they are unable to preserve previous information, resulting in suboptimal predictions when they are applied in modelling highly causal systems.

The learning capability of FFNNs can be improved through additional pre-processing of dynamic data and combining the FFNN with other methods including genetic algorithms and fuzzy logic. Furthermore, the methods that employ additional pre-processing of dynamic data are time-consuming because of the extensive time and frequency domain computations they rely on. The data pre-processing steps also rely on subjective user intervention, which limits the scalability of the models to new environments. This present study focuses on a SMOSAR "Soil Moisture retrieval from multi-temporal SAR data" algorithm. SMOSAR retrieves soil moisture (mv) products at high spatial resolution from dense time series of either single (i.e. HH or VV) or dual polarized (i.e. HH+HV or VV+VH) S-1 data.

II SYSTEM OVERVIEW

This study investigates the combined use of active and passive remote sensing data with complementary information in terms of soil water content. Vertical (VV) multi-temporal C-band backscatter measurements are used. A non-linear Artificial Neural Network (ANN) approach is assessed for its potential to translate satellite remote sensing input to SMC. The estimated SMC values are used as input to the HEC-HMS hydrological model. The final model is modified to be used along, which does not require any prior knowledge about soil other than to derive SMC.

Thus, the Digital Number (DN) values of satellite images are converted to reflectance values. Eventually, images are corrected for atmospheric distortions using the Darkest Pixel (DP) atmospheric correction approach and dams and lakes as non-variant Darkest Pixel targets. The method can practically eliminate atmospheric distortions of otherwise unknown distributions and intensities by accounting for dark and non-variant targets located in the image.

The Normalized Difference Vegetation (NDVI) is used to estimate the degree of vegetation coverage in terms of vegetation height and density. Tall or dense vegetation absorbs most incident visible light and reflects a large portion of the near-infrared (NIR) light, resulting in high NDVI values. NDVI is widely accepted as a sensitive indicator that can be used to monitor phenological variations and biomass changes of vegetation in time-series analyses.

The canopy temperature can indirectly describe the soil moisture regime. The Thermal Infrared Sensor (TIRS) measures land surface temperature in two thermal bands by applying quantum physics principles. Atmospheric conditions and their effects on Thermal Infrared (TIR) spectral band data are different from day to day, so images that are acquired on different dates often have different ranges in TIR values. Thus, a relevant index is developed to remove or reduce the absolute differences by normalizing the values to a range of 0 to 1

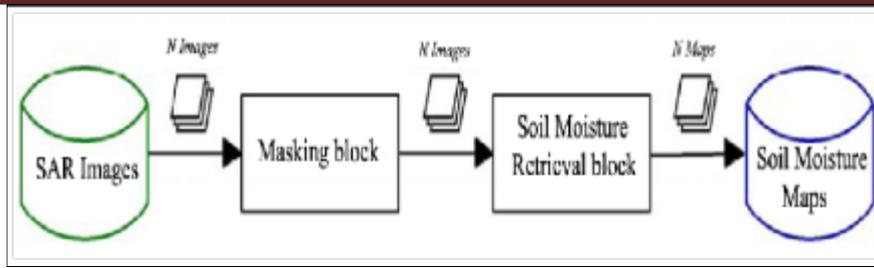


Fig 2 The Pre-processing steps of radar Image

Thus inputs of ANN namely, corrected radar inputs are: 1.Backscattering 2.NDVI 3.Incidence angle 4. Thermal infrared temperature TIR. The fig 2 explains the processing of this inputs from a radar image. Following, the estimated SMC is used as input in the HEC-HMS model to conduct hydrologic⁸ simulations.

III METHODOLOGY

An ANN consists of a number of hidden neurons limited by rigid normality and linearity. An ANN consists of a number of hidden neurons or nodes that work in parallel to convert data from an input to output layer. Here, the VV backscattering, NDVI, TIR and Incidence Angle parameters were used as input and ground SMC measurements (experimental data) as output in MATLAB[®] environment. Besides backscattering data, NDVI was incorporated in the model for accounting vegetation and roughness, incidence angle for topography and thermal infrared temperature for water content. A feed-forward Multilayer Perceptron (MLP) model used. In MLPs, successive layers of neurons are interconnected, with connection weights that control the strength of the connection. The optimal architecture of an ANN is defined by varying the number of neurons in the hidden layer and successively training and testing against variable sets previous unknown to the network. The Fig 3 explains the methodology in detail. The main aim of the training process is to minimize the error between the ANN output and the input data by adjusting the correlation weights between them.

Trial and error (hidden layers and neurons added or removed from the model) determined the optimal MLP architecture to a three-layer network consisting of an input layer four neurons: Backscattering, NDVI, TIR, Incidence Angle and one hidden layer (10 neurons) and one output layer. ANN training was repeated 50 times and the RMSE of the mean value of the final results was estimated.

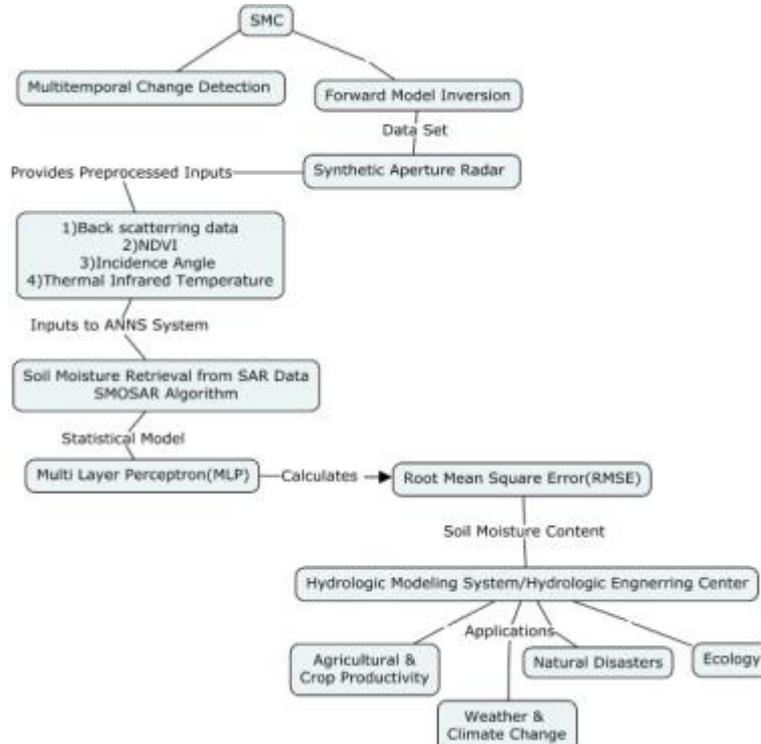


Fig 3 Flowchart of the overall methodology.

IV RESULT

Concerning environmental parameters, the results in our study denoted the fact that incidence angle is the least sensitive parameter, while NDVI is the most sensitive for the accurate estimation of SMC. In addition, the thermal infrared temperature parameter seems to be important for the overall performance of the model. Results demonstrate that the retrieval of SMC is possible at C-band (VV polarization) by using an inversion algorithm. The complementary information from optical/thermal infrared sensors was proved substantial for the optimum performance of the model. Therefore, NDVI may be the most important parameter but all parameters are important for the optimum results. The presented methodology forms a sufficient method for the determination of initial soil moisture conditions during the hydrologic analysis.

V CONCLUSION

This study computes RMSE (Root mean Square Error) Value from the radar processed inputs through the Soil Moisture retrieval from SAR data algorithm. The Computed value is submitted to the Hydrologic Modeling System & Hydrologic Engineering Center. In this paper the RMSE value is calculated using the Artificial Neural Networks with the concept of Multilayer perceptron. This all is implemented in the software and resulted is obtained from MATLAB. This method is sufficient for determination of the soil moisture conditions for the hydrologic analysis. It highlights the potential of the ANN inversion model for the estimation¹⁰ of Soil Moisture Content from SAR observations.

Soil Moisture content is vital factor when evaluating for rainfall, flood, agricultural etc. of the particular region. The estimated SMC values calculated were used to analysis the above factors of the region. Therefore SMC values can be used in analysis of the application as agricultural & crop Productivity, ether & climate change, natural disaster and the entire ecology of the region.

References:

1. Jianya, Gong and Haigang, Sui and Guorui, Ma and Qiming, Zhou, 2008, A review of multi-temporal remote sensing data change detection algorithms, 37, PP.757-762.
2. Kumar, P and Prasad, R and Choudhary, A and Gupta, DK and Mishra, VN and Vishwakarma, AK and Singh, AK and Srivastava, PK, 2019, Comprehensive evaluation of soil moisture retrieval models under different crop cover types using C-band synthetic aperture radar data, 34, PP.1022—1041.
3. Adeyemi, Olutobi and Grove, Ivan and Peets, Sven and Domun, Yuvraj and Norton, Tomas, 2018, Dynamic neural network modelling of soil moisture content for predictive irrigation scheduling, 18, PP. 3408.
4. Zhang, Yufang and Gong, Jianya and Sun, Kun and Yin, Jianmin and Chen, Xiaoling, 2018, Estimation of soil moisture index using multi-temporal Sentinel-1 images over Poyang Lake ungauged zone, 10, PP.12
5. Babaeian, Ebrahim and Sadeghi, Morteza and Jones, Scott B and Montzka, Carsten and Vereecken, Harry and Tuller, Markus, 2019, Ground, Proximal, and Satellite Remote Sensing of Soil Moisture, 57, PP.530-616.
6. Xuan, Weidong and Fu, Qiang and Qin, Guanghua and Zhu, Cong and Pan, Suli and Xu, Yue-Ping, 2018, Hydrological simulation and runoff component analysis over a cold mountainous River Basin in Southwest China, 10, PP. 1705.
7. Balenzano, Anna and Satalino, Giuseppe and Lovergine, Francesco and Rinaldi, Michele and Iacobellis, Vito and Mastronardi, Nicola and Mattia, Francesco, 2013, On the use of temporal series of L-and X-band SAR data for soil moisture retrieval. Capitanata plain case study, 46, PP.721-737.
8. Alexakis, Dimitrios and Mexis, Filippou-Dimitrios and Vozinaki, Anthi-Eirini and Daliakopoulos, Ioannis and Tsanis, Ioannis, 2017, Soil moisture content estimation based on Sentinel-1 and auxiliary earth observation products. A hydrological approach, 17, PP. 1455
9. Balenzano, Anna and Mattia, Francesco and Satalino, Giuseppe and Pauwels, Valentijn and Snoeij, Paul, 2012, SMOSAR algorithm for soil moisture retrieval using Sentinel-1 data, PP.1200—1203.
10. Baghdadi, Nicolas and Holah, Noha and Zribi, Mehrez, 2006, Soil moisture estimation using multi-incidence and multi-polarization ASAR data, 27, PP. 1907—1920.

Science and technology

Dr.Sharmila Biswas

H. O. D.

Hindi Department

Seshadripuram First Grade College Yelahanka New Town Bangalore 64.

Science is a systematic way which involves observation and experimentation in order to get knowledge and improve skill; whereas, technology is the practical application of science which helps in improving the quality of life. Science is a systematic study and technology is what comes out of it. Science and technology go hand in hand, that is, scientific progress is always followed by technological advancements and the latter is only the implication of former.

Today, Science and Technology plays a very significant role in the overall development of a country. The two define the progress made in almost every field i.e. infrastructure development, communications, defense, industrialization etc. the world is developing fast, at an unprecedented rate because of scientific and technological developments. Anyone who lags behind in science and technology will be left behind by ever progressive world.

Science and technology plays vital role in the modern life and profoundly influenced the course of human civilization. Technological advancement in the modern life has provided us lots of remarkable insights all over the world. Scientific revolutions has taken its full speed from the 20th century and has become more advance in the 21st century. We have entered to the new century in new ways and with all the arrangements for well beingof the people. Modern culture and civilization has become dependent over the science and technologies astheyhave become integral part of life according to the need and requirement of the people.

India has become an important source of the creative and foundational scientific developments and approaches all across the world. All the great scientific discoveries and technological achievements in our country have improved the Indian economic status and have created many new ways to the new generations to grow in the technologically advanced environment.

There are many new scientific researches and development have been possible in the field of Mathematics, Architecture, Chemistry, Astronomy, Medicine, Metallurgy, Natural Philosophy, physics, agriculture, health care, pharmaceuticals, astrophysics, nuclear energy, space technology, applications, defense research, biotechnology, information technology, electronics, oceanography and other areas.

Introduction of scientific researches, ideas and techniques to the field of education has brought a huge level of positive change in the new generation and provided them variety of new and innovative opportunities to work in the field of their own interest.

Modem science in India has been awakened by the continuous and hard efforts of the outstanding scientists. Scientists in India are great who have made possible the scientific advances of highest international caliber.

Technological development in any filed enhances the economy of any nation. In order to improve the power of science and technology in India, Indian government has made Council of Scientific and Industrial Research in the year 1942 and Board of Scientific and Industrial

Research in the year 1940. In order to emphasize the growth of science and technology in the country, Indian government has established a chain of national laboratories and research institutes in various regions.

After the independence, our country has been involved in the promotion of spread of science for the national development. Variety of policies made by the government has emphasized the self-sufficiency and sustainable growth and development all through the country. Both science and technology have impacted the economic growth and social development in the country in extraordinary manner.

SIZE AND SHAPE CONTROLLED BAND GAP VARIATION IN CdSe QUANTUM DOTS AND RODS

¹Malasa M.R, ²Akhila B.D

¹ Associate Professor, ²Assistant Professor

¹Department of Electronics, ²Department of Chemistry

Indian Academy Degree Cllege Autonomous, Kalyan Nagar, Bangalore-560 043, India

ABSTRACT: *The semiconducting nano crystals such as quantum dots, quantum rods exhibit optical and electronic properties which are size dependent. The typical dimensions of these particles range from 1 - 100 nm. They Exhibit a phenomenon called as Quantum confinement effect. The band gap of a nano crystalline semiconductor can be tuned to a precise energy. This size dependent band gap tuning is the consequence of quantum confinement effect. The tuning can be achieved depending on the dimensionality and degree of confinement¹. The highly tunable band gap of these nano crystals is the basis of fascinating optical properties exhibited by them. These size and shape tunable optical properties make them promising materials in LED technology, Solar cells and bio imaging. Here we review the size dependent and dimensionality dependent band gap tuning of CdSe Nano Crystals. The CdSe Quantum dots exhibit green-orange luminescence varying in size from 2-8nm. It is observed that the emission wavelength of CdSe rods can be tune over the same range as in CdSe dots, by varying only the length². It is observed that in case of CdSe rods, emission peak depends more precisely on width than on length when both the length and the width of the rods are varied².*

Keywords: *Quantum Dots,*

Introduction:

The semiconducting nanocrystals such as quantum dots, quantum rods exhibit optical and electronic properties which are size dependent. The typical dimensions of these particles range from 1 - 100 nm. In a bulk semiconductor the lowest energy state of electron - hole pair is electro statically bonded and is called excitons. The excitons are created by absorbing a photon of energy equal or greater than the band gap of a semiconductor. These excitons annihilate in radiative recombination by emitting a photon.

The size of the excitons is finite and is determined by the Bohr excitons diameter (α_B) and varies from 1nm to 100nm. If the size of the excitons is more than the size of the semiconductor nanocrystals, the energy of the charge carrier increases and they become spatially confined. Therefore, the nanocrystals with size smaller than α_B exhibits size dependent absorption and fluorescence.

The band gap of a nanocrystalline semiconductors can be tuned to a precise energy. This size dependent band gap tuning is the consequence of quantum confinement effect. The tuning can be achieved depending on the dimensionality and degree of confinement¹. The phenomenon which makes nano size particles so different from atom, molecule and bulk is the quantum confinement effect which comes into play when the dimensions of a material approach the nanoscale (1-20nm). This leads to the proportional increase in surface by volume ratio and splitting of energy levels. These two effects are considered to be the main cause of all outstanding features inherited by nanoin CdSe nano crystals confined in three dimensions (quantum dots) two dimensions (quantum wires or rods) or one dimension (quantum wells or disc's). A stronger degree of electronic confinement is possible with the number of confined dimensions and achieves good range of tunability of band gap⁶. Band gaps of CdSe quantum wells, wires, and dots are plotted against the length of the confined dimension. The bulk band gap and exciton diameter are noted on the axes. wires (purple), the disks (green) and the dots (blue).

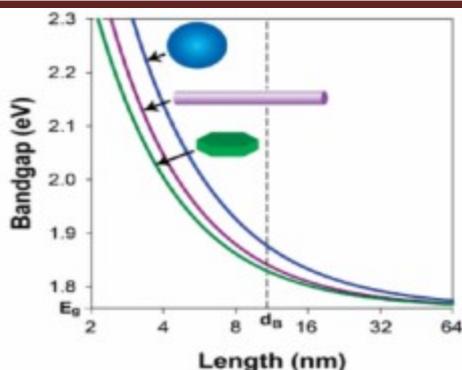


Figure 1 :Impact of shape on the electronic properties of semiconductor nano crystals. (A) Band gaps of CdSe quantum wells, wires, and dots are plotted against the length of the confined dimension. The bulk band gap and exciton diameter are noted on the axes¹.

Quantum Dot:

A nano crystal confined in three dimension is a quantum dot. A quantum dot is a semiconductor nano crystal that exhibits exceptional optical, electronic and magnetic properties. A quantum dot is a semiconductor nano structure which confines the motion of excitons in all the three spatial directions. This was initially discovered by Alexei Ekimov in 1980 on a glass matrix and by Brus in colloidal solutions. The Quantum dots have attracted the scientific community because of its unique size dependent optical and electronic properties. And they also exhibit size tunable luminescence, narrow photo luminescence and broad absorption spectra.

The Quantum dots can be synthesized from elements of group[II-VI] and group[III-V] by colloidal synthesis. Among the various quantum dots CdSe are most popular because of high luminescence and good Quantum yield. The CdSe is direct band gap semiconductor with energy gap of 1.74eV at room temperature. The large Bohr radius of CdSe quantum dots [5.6nm] also offers a broad range of sizes to study quantum confinement effects.⁷

These properties make CdSe quantum dots potential candidates for optoelectronic applications, Biological imaging, Solar energy conversion, thin film transistors and Photo catalysis.⁵

It is observed in CdSe quantum dot material with ($E_g = 1.76\text{eV}$, $\alpha_B = 9.6\text{nm}$), the band gap can be tuned through quantum confinement effect. Hence CdSe can be used to emit fluorescent light throughout visible spectrum. In case of a bulk semiconductor the excitons is not confined in space and can be rapidly dissociate, which results in non-radiative relaxation. In case of nanocrystals there is a strong overlap between electron and hole wave function in confined structure which increases the efficiency of light emission^{8,9}.

The CdSe QDs exhibit green-orange luminescence varying in size from 2-8nm as shown in Figure 2. The PL output wavelengths cor-responding to the peaks are 560, 590, 586, 594 and 596 nm, respectively for the samples S-1, S-2, S-3, S-4 and S-5. The reason for the fluorescence of CdSe QDs is the recombination of electron and hole due to surface trapped electrons and holes by quantum confinement¹².

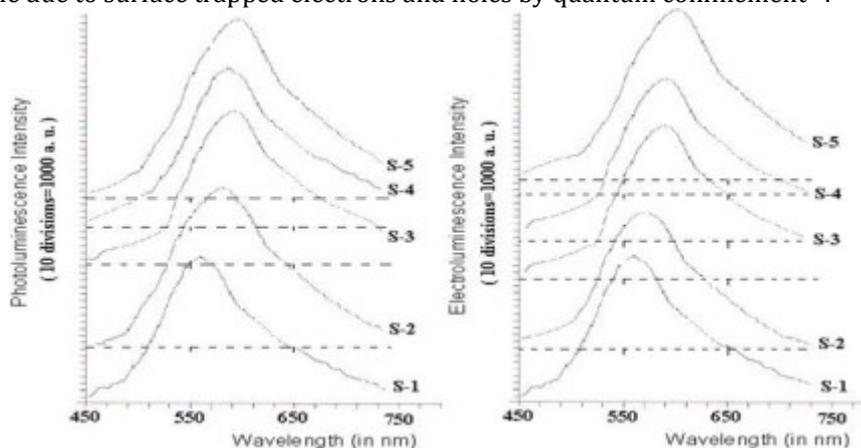


Fig. 2. (Left) PL Spectra and (Right) EL Spectra for the size distributions of colloidal solution of CdSe QDs in methanol. EL spectra for all the samples are shown in Fig. 2 (Right). The EL spectra^{14,15} show peaks at

558, 572, 588, 582 and 594 nm, respectively which also lie in green-orange region of the visible spectrum. This is also due to the surface trapped electrons and holes created by quantum confinement and their recombination under de-excitation.¹³

Quantum Rod:

Nanostructures shaped like long sticks or dowels with a diameter in the nanoscale but having a length that is very much longer. Nanorods are one morphology of nanoscale objects in nanotechnology. Each of their dimensions range from 1–100nm. They may be synthesized from metals or semiconducting materials. Standard aspect ratios (length divided by width) are 3 to 5.¹⁰

Band gap of CdSe quantum rods:

Figure 3 shows the emission spectra of 3.7nm wide rod samples with four different wavelengths: Wavelength of photoluminescence spectra can be well tuned by changing the CdSe quantum rod length (9.2, 11.5, 28.0 and 37.2nm) with rod width being kept constant at 3.7(+0.2)nm. It is observed that the emission wavelength of CdSe rods can be tuned over the same range as in CdSe dots, by varying only the length². The only difference is that the emission from each individual rod is highly linearly polarized where as emission from spherical dots are plane polarized².

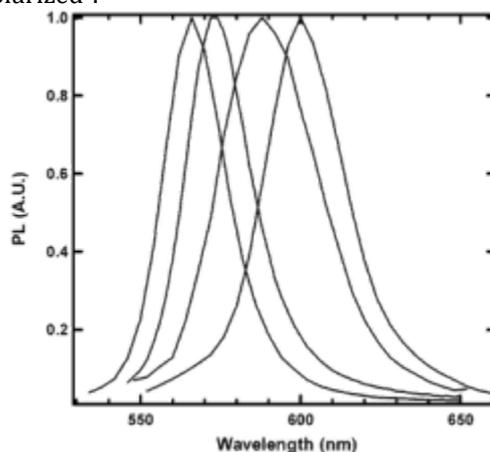


Figure 3. Photoluminescence spectra of 3.7 ((0.2) nm wide CdSe quantum rods with lengths of 9.2, 11.5, 28.0, and 37.2 nm, respectively (from left to right), excited at 450 nm².

Band gap of CdSe Quantum rods versus length and width:

From Figure 4, it is evident that when both the length and the width of the rods are varied, it has been observed that emission peak depends more precisely on width than on length. This fact indicates the lateral confinement determines the band gap².

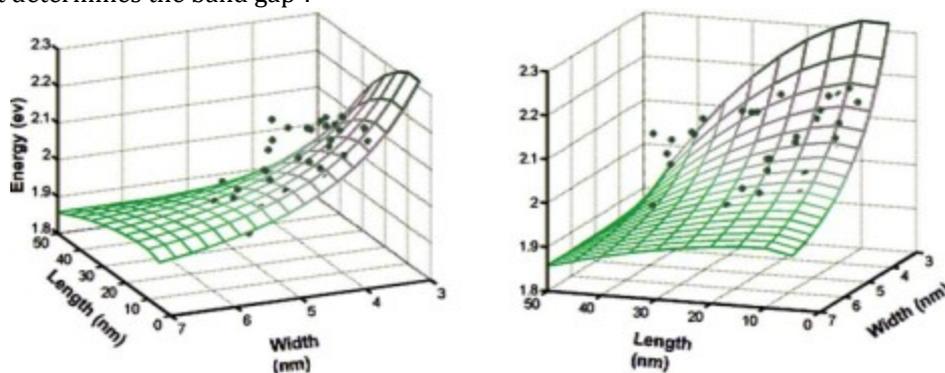


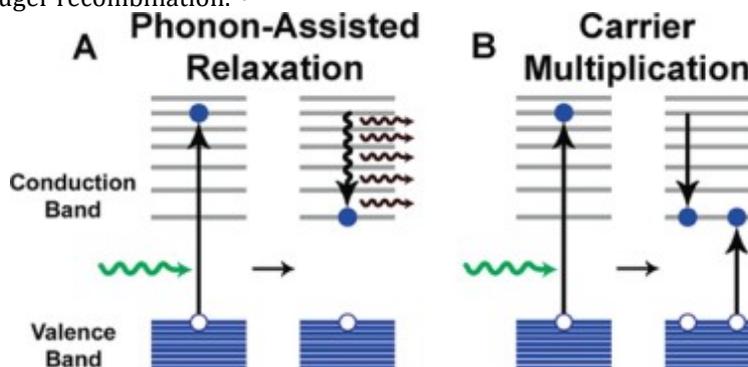
Figure 4. Band gap of CdSe quantum rods vs length and width viewed from two different angles. The mesh is the best fit described in the text².

Carrier Multiplication:

Absorption of a single photon creates the multiple electron - hole (e-h) pair in semiconductors, this phenomenon is regarded as carrier multiplication. Carrier multiplication intensifies the performance of photo detector and solar cells.¹⁶

Here high energy photons will create e-h pairs which are more energetic and these e-h pairs are cool down by losing their energy in the form of electric current. A significant part of absorbed light energy is converted into electric current or heat. This is observed in earlier devices, which are operated based on conversion of single photon to single electron. Charge extraction during cooling down the excited electron can be done directly or by emission of lower energy photons. Carrier multiplication in turn explains the quantum efficiency of the material. Quantum efficiency is the number of e-h pair generated per absorbed photon. If all the photons are converted into e-h pair, then quantum efficiency is 100%.¹⁶

Carrier Multiplication was first observed in classical crystalline bulk semiconductors.¹⁷ Spatially confined materials such as nano sheets (two dimension), nano tubes, nano rods (one dimension) and quantum dots (zero dimension) are also considerable capable to show the carrier multiplication phenomenon. Dispersed colloidal or embedded quantum dots also show carrier multiplication.¹⁸⁻²⁰ Coulombic interaction is more in case of spatially confined materials. This enhances the charge scattering process, mainly carrier multiplication and Auger recombination.¹⁶



Schematic illustration of electronic energy relaxation and carrier multiplication in quantum dots. (A) Electrons excited to energies greater than the band edge efficiently relax to the band edge through the release of phonons, or quanta of lattice vibration. (B) Alternatively, excited state electrons with kinetic energy greater than the band gap can transfer their energy to a second electron via impact ionization, yielding two excitons.¹

Fig 5 explains that in quantum dots after the formation of e-h by absorption of photon with at least twice the energy of band gap, release their excess kinetic energy through exciting second electron in collision manner like Auger process, results in biexciton. This leads the graded quantum efficiency to quantum dots, may be more than 100%. This improve the capacity of photovoltaic devices. A study shows at room temperature (CdSe)ZnS quantum dots shows high quantum efficiency (11% & 5%) and long lifetimes (790 ps for biexciton).¹

Studies show that carrier multiplication in CdSe quantum dots are depends on size and band-gap. In CdSe density of trion (triexciton) increases with increase in size of nano-crystal this is because E_g is smaller and absolute energy probed also less.²¹

References:

1. Andrew M. Smith and Shuming Nie. Semiconductor Nanocrystals: Structure, Properties, and Band Gap Engineering. *Acc Chem Res.* 2010 February 16; 43(2): 190-200.
2. Liang-Shi Li, Jiangtao Hu, Weidong Yang, and A. Paul Alivisatos : Band gap variation of Size and Shape controlled colloidal CdSe Quantum Rods. *Nano letters*, 2001 Vol.1, No.7(349-351).
3. K. Vishwakarma and O. P. Vishwakarma, Nano particle size effect on photo-luminescence, *Int. J. Nanotechnol. Appl.* 4, 13 (2010)
4. S. Kiravittaya, A. Rastelli and O. G. Schmidt, *Advance Quantum dot configuration*, *Rep. Prog. Phys.* 72, 046502 (2009)
5. J. M. Auxier, A. Schulzgen, M. M. Morrell et al., Quantum dots for fiber laser sources, *Proc. SPIE*, Bellingham 5709, 249 (2005).
6. Buhro WE, Colvin VL. Semiconductor nanocrystals - Shape matters. *Nat. Mater* 2003; 2:138-139. [PubMed: 12612665]
7. Ganesh R. Bhand, Manorama G. Lakhe et al., Synthesis and Characterization of Controlled Size CdSe Quantum Dots by Colloidal Method. *J. Nanosci. Nanotechnol.* 2018, Vol. 18, No. 4.
8. Nirmal M, Brus L. Luminescence photo physics in semiconductor nanocrystals. *Acc. Chem. Res* 1999; 32:407-414.

9. McBride J, Treadway J, Feldman LC, Pennycook SJ, Rosenthal SJ. Structural basis for near unity quantum yield core/shell nanostructures. *Nano Lett* 2006; 6:1496–1501. [PubMed: 16834437]
10. Dmitri V. Talapin, Elena V. Shevchenko, Christopher B. Murray, Andreas Kornowski, Alivisatos, A. P. *Science* 1996, 271, 933.
11. Stephan Förster, and Horst Weller. *J. AM. CHEM. SOC.* 9 VOL. 126, NO. 40, 2004 12985.
12. Subhash C. Dey and Siddhartha S. Nath Size-dependent fluorescence in CdSe quantum dots. *Emerging Materials Research Volume 1 Issue EMR3*
13. S. C. DEY and S. S. NATH Size-dependent fluorescence and electroluminescence of colloidal CdSe quantum dots.
14. K. Mohonta, S. K. Majee, S. K. Batabyal et al., Electrical bistability in electrostatic assemblies of CdSe nanoparticles, *J. Phys. Chem. B* 110, 18231 (2006).
15. M. E. Boatman, G. C. L. Karen, J. Nordell et al., Faster synthesis for CdSe quantum dot nanocrystals, *J. Chem. Edu.* 82, 1697 (2005).
16. Saba Saeed, Chris de Weerd, Peter Stallinga et al., Carrier multiplication in germanium nanocrystals, *Light: Science & Applications* (2015) 4.
17. Kolodinski S, Werner JH, Wittchen T, Queisser HJ, Quantum efficiencies exceeding unity due to impact ionization in silicon solar cells. *Appl Phys Lett* 1993; 63; 2405-2407
18. Smith C, Binks D. Multiple exciton generation in colloidal nanocrystals. *Nanomaterials* 2014; 4: 19-45.
19. Ip AH, Thon SM, Hoogland S, Voznyy O, Zhitomirsky D et al. Hybrid passivated colloidal quantum dot solids. *Nat Nanotechnol* 2012; 7: 577-582.
20. Ellingson RJ, Beard MC, Johnson JC, Yu P, Micic OI et al. Highly effective multiple exciton generation in colloidal PbSe and PbS quantum dots. *Nano Lett* 2005; 5: 865-871.
21. Eran Rabani and Roi Baer, Distribution of carrier multiplication rates in CdSe and InAs nanocrystals. *The Hebrew University of Jerusalem PACS numbers: 78.67.Bf, 71.35.-y.*

A Study on Nanoparticles and their applications

Rajashri Padaki¹ & Aishwarya Padaki²

¹Dept. Of Electronics, Seshadripuram First Grade College, Bangalore University, Bangalore Karnataka, India

²Dept of Information Science Nitte Meenakshi Institute of Technology Visweshvariah Technological University Belgaum, Karnataka, India

ABSTRACT: Nanotechnology is said to be the upcoming technology. The promising technology exhibits lots of favorable characteristics which would take the current technology by swing and generate revolution in the current trending technologies. The breaking down of bulk materials into nano particles is the reason behind the miraculous effect and the genesis of Nanotechnology. The nano particles are characterized by the quantum effects that dominate the behavior of the matter at nanoscale. The surface area to volume ratio almost doubles when compared to the surface area to volume ratio of bulk matter as a result of which the materials become more chemically reactive and affect their strength or electrical properties. The changes in the properties of the material at nanoscale have unleashed a lot of applications in which nanomaterials have a deep impact and bring in lot of advantages to contemplate upon.

Keywords: nanotechnology, nano particles(nps), quantum effect, bulk material, nanoscale, nanomaterials.

Introduction:

A material is said to be nanomaterial if its size lies between 1-100nm. The miniaturizing of the electronic components and devices is in vogue since its origin; the invention of transistor was the first revolution, followed by the invention of integrated circuits by the virtue of embedded technology. But miniaturizing of matter to micro size was proportional to its bulk matter, in the sense the characteristics of the bulk material hardly changed at micro levels, but with the advent of nano particles it is observed, experimented and proved that the characteristics of the material when bulk changes drastically when broken to nano size. This has indeed set in a revolution in the fields of applications of electronics and opened up a plethora of research opportunities having an identity of its own known as **Nanotechnology**.

Nano Materials Characteristics:

The surface area of a material increases in nanoparticles as compared to bulk material itself.

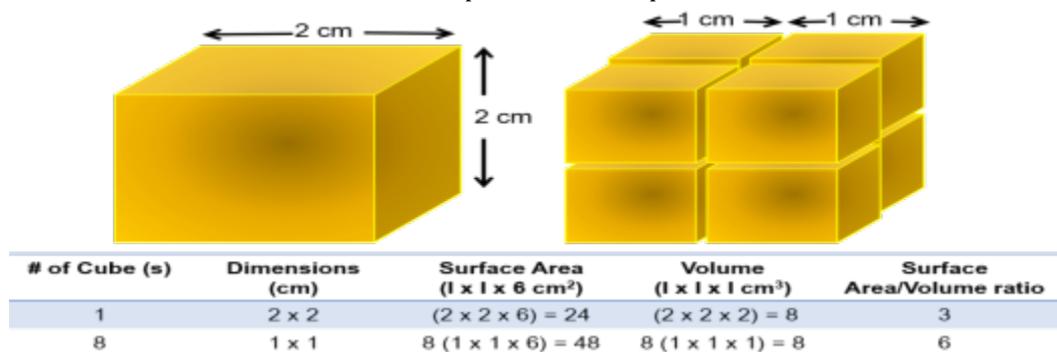


Fig1.

Salient characteristics of Nanomaterials:

As the surface area to volume ratio increases, A greater amount of substance comes in contact with surrounding material as hidden surfaces are exposed which enhances catalytic activity for potential reaction.

As the size goes down to Nano, the materials become chemically more reactive and their strength and physical properties also vary profoundly. The reason for variation is the quantum effect that dominates at the nanoscale.

Eg: Quantum Confinement in semiconductor particles or superparamagnetism in magnetic particles.

The colors of the material change as the bulk material is reduced to nano scale in stages due to the phenomena called plasma resonance. As the size is reduced and the shape is changed, the wavelength of

these materials change and fall in the visible spectrum range, hence different colors are exhibited at different stages of the making of Nano particles as shown in fig 2.

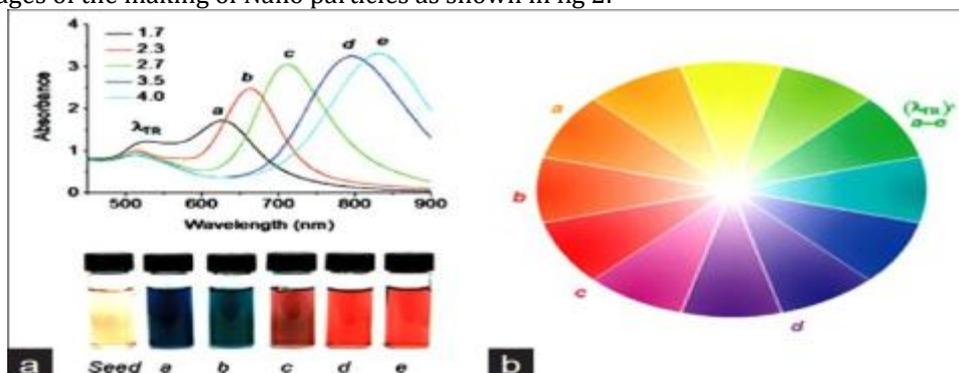


Fig 2

The insulators are found to conduct at nanoscale, as well as the strength of the material increases remarkably.

History of NanoMaterials:

The word Nano was coined by Japanese Prof. Taniguchi in the year 1974. But the usage of these dates back thousand years ago wherein the Chinese used nanoparticles as an inorganic dye to introduce red color into porcelains. Different metal nanoparticles were used to get different colors. In 1857, Faraday prepared gold colloids that was stable for almost a century before being destroyed during world war II. Bhasma, the holy ash made by burning various shrubs in India is also nanoparticle which is widely used since ancient times for skin diseases and various therapeutic purposes.



Fig 3. Chinese porcelain painted using NPs, Faraday's Gold Colloids and Bhasma

Types of Nanoparticles:

Nanoparticles are classified based on the mode of its preparation as follows:

1. naturally occurring Nanoparticles like forest fires, Sea spray, Volcanic ash etc.
2. Incidental Manmade Nanoparticles like cooking smoke, Industrial effluents, Welding fumes etc.. which have carbon nanoparticles
3. Engineered Nanoparticles which are designed and manufactured for a specific purpose viz., Metal nanoparticles, Quantum dots, Bucky balls, Nanotubes, Nanocapsules etc.

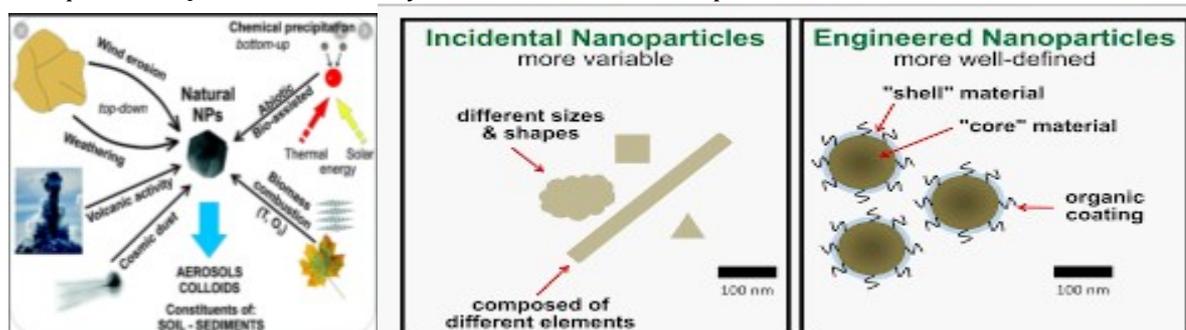


Fig 4. Natural NPs, Incidental NPs and Engineered NPs

Nanostructures are made using two methods: Top down approach and Bottom up approach. In Top down approach the bulk material is patterned and etched out as in the case of fabrication of Integrated Circuits. In bottom up approach, the atoms and molecules are assembled as in case of chemical and biological systems to form a certain specific Nano Particle.i.e. it starts from atomic scale to nanoscale.

Applications of Nanoparticles in medical field:

Huge applications are found in medical field. This helps in enhancing the diagnostics and treatments.

- Because of their small size, nanoscale devices can readily interact with biomolecules on both the surface of the cells and inside of cells. By gaining access to so many areas of the body they have the potential to detect disease and deliver therapeutical molecule.
- Used in diagnostic purposes; In the traditional cancer therapy the area of cancer is incident with harmful radations to kill the cancer cells, but in the process the healthy cells are also killed and will have tremendous side effects, but using nanotechnology the therapeutic nanoparticles carry the drug to destroy the cancer cells, they are directed to the exact spot of cancer where they specifically kill the cancer cells. This is called Targeted Drug Delivery System.
- In tissue engineering, the damaged skin or organ is grown in the lab using bottom up approach and the replaced without affecting the rest of the organs.
- Any Organ like artificial ear, Limbs can be 3D printed and transplanted. This method is Under clinical trials and some cases have been successfully tried.
- Artificial cells are grown in the lab using Nanoparticles and only the damaged and dysfunctional cells are replaced instead of the whole organ.
- DNA cells are nanosized. The detailed study of these cells leads to the understanding of their behavior, their structures and helps in building similar structures for treatment purposes.

Future Scope

Nanorobots/ Nanobots: Like the bacteria moves from one location to another with the help of its flagella, the nanorobots are formed with tail like structures which has a micro camera to monitor its movement which also has a payload , i.e therapeutic molecule. It will move through arteries and veins and reaches the location delivering the drug or destroy the cancer cell.

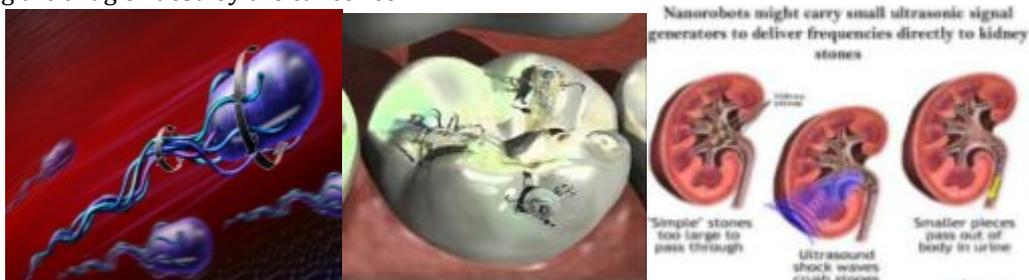


Fig 5: Nanobots for Drug Delivery, mouthwash and Kidney stones removal

Large kidney stones are difficult to pass through urine and the operation to remove these stones is extremely painful. Nano robots can be used to breakdown these kidney stones to small pieces by generating the ultrasound shock waves and these small particles can easily pass through urine.

Nanobots are finding their way in day to day life also. In the field of dentistry, A mouth wash full of nanobots is prepared, which would clean the plaques and keep the teeth healthy.

Conclusion:

Nanotechnology is the field of possibilities and hence exhaustive research is going on and large numbers of researchers are working on this. The next era is going to be nanoera.

References:

1. The NPTEL lectures on nanotechnology at IIT Roorkee and IISc, Bangalore
2. eBook on Introduction to NanoScience and NanoTechnology by Chattopadhyay
3. eBook on nanomaterials by A.K. Bandyopadhyay.

A brief study of Graphene and its applications

Rajashri Padaki¹ & Rohan Anvekar² & Rohit Hosmani² & Netra Mirji³

^{1,2}Dept. Of Electronics, Seshadripuram First Grade College, Bangalore University, Bangalore
Karnataka, India

³ Dept of Computer Science, Seshadripuram First Grade College, Bangalore University, Bangalore
Karnataka, India

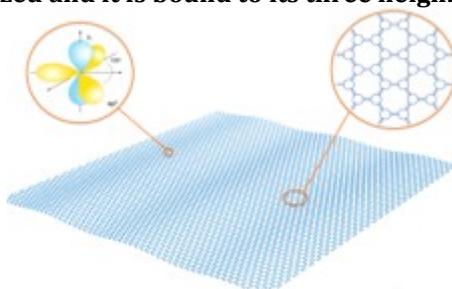
ABSTRACT: Graphene is a rapidly rising star on the horizon of materials science. This strictly two-dimensional material exhibits exceptionally high crystal and electronic quality, and despite its short history, has already revealed abundance of new physics and potential applications, which are briefly discussed here. Whereas one can be certain of the realness of applications only when commercial products appear, graphene no longer requires any further proof of its importance in terms of fundamental physics. More generally, graphene represents a conceptually new class of materials that are only one atom thick, and, on this basis, offers new inroads into low-dimensional physics that has never ceased to surprise and continues to provide a fertile ground for applications.

Keywords: Graphene, fundamental physics, Low-dimensional physics

Introduction

Graphene can be described as one atomthick layer of Graphite. It is the basic structural element of other allotropes, including charcoal, graphite, carbon nanotubes and fullerenes. It is the strongest and thinnest material. Graphene is an atomic scale honeycomb lattice made of carbon atoms known to exist.

**Graphene is a 2D crystal of carbon atoms, arranged in a honeycomb lattice
Each carbon atom is sp^2 hybridized and it is bound to its three neighbors.**



History

One of the very first patents pertaining to the production of graphene was filed in October, 2002 entitled, "Nano-scaled Graphene Plates".

Two years later, in 2004 **Andre Geim** and Sir **Konstantin Novoselov** at University of Manchester extracted single-atom-thick crystallites from bulk graphite

Geim and Novoselov received several awards for their pioneering research on graphene, notably the 2010 Nobel Prize in Physics. In 2012, Konstantin Novoselov was knighted to Sir Konstantin Novoselov

Structure

Graphene is a 2-dimensional network of carbon atoms.

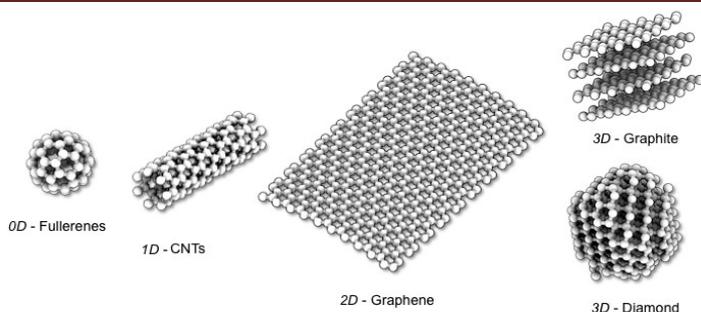
These carbon atoms are bound within the plane by strong bonds into a honeycomb array comprised of six-membered rings.

By stacking of these layers on top of each other, the well known 3-dimensional graphite crystal is formed.

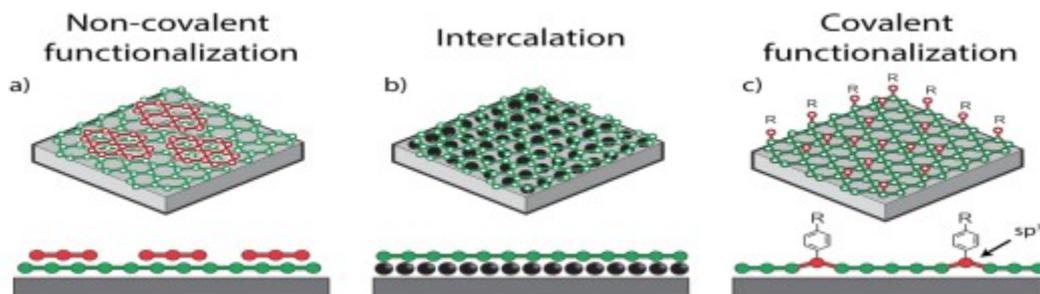
It is a basic building block for graphitic materials of all other dimensionalities.

It can be wrapped up into 0D fullerenes, rolled into 1D nanotubes or stacked into 3D graphite.

Thus, graphene is nothing else than a single graphite layer.



Chemical properties



Graphene is chemically the most reactive form of carbon.

Only form of carbon (and generally all solid materials) in which each single atom is in exposure for chemical reaction from two sides (due to the 2D structure).

Carbon atoms at the edge of graphene sheets have special chemical reactivity.

Graphene burns at very low temperature (e.g., 350 °C).

Graphene has the highest ratio of edgy carbons (in comparison with similar materials such as carbon nanotubes). Graphene is commonly modified with oxygen- and nitrogen-containing functional groups

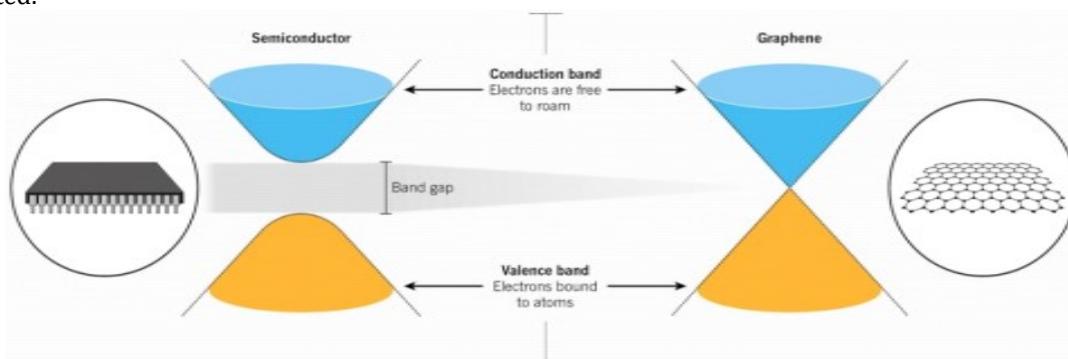
Electronic properties

Electrons are able to flow through graphene more easily than through even copper.

The electrons travel through the graphene sheet as if they carry no mass, as fast as just one hundredth that of the speed of light.

It is a zero-overlap semimetal (with both holes and electrons as charge carriers) with very high electrical conductivity.

High charge carrier mobility, for which values of 10,000 cm²/Vs, in some cases even 200,000 cm²/Vs were reported.



In an insulator or semiconductor, an electron bound to an atom can break free only if it gets enough energy from heat or passing photon to jump the 'band gap'.

But in graphene the gap is infinitesimal. This is the main reason why graphene's electron can move easily and very fast.

Mechanical properties

To calculate the strength of graphene, scientists used a technique called Atomic Force Microscopy.

It was found that graphene is harder than diamond and about 300 times harder than steel.

The tensile strength of graphene exceeds 1 Tpa. It is stretchable up to 20% of its initial length.

It is expected that graphene's mechanical properties will find applications into making a new generation of super strong composite materials and along combined with its optical properties, making flexible displays.



Thermal properties

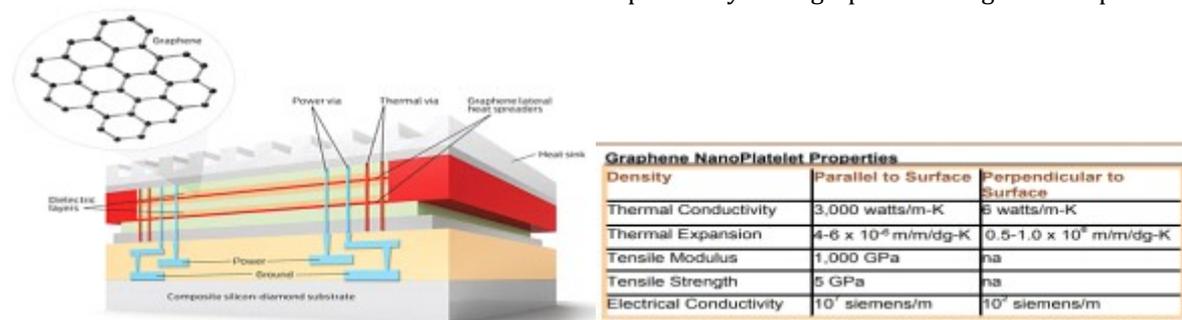
Graphene is a perfect thermal conductor

Its thermal conductivity is much higher than all the other carbon structures as carbon nanotubes, graphite and diamond ($> 5000 \text{ W/m/K}$) at room temperature

The ballistic thermal conductance of graphene is isotropic, i.e. same in all directions

The material's high electron mobility and high thermal conductivity could lead to chips that are not only faster but also better at dissipating heat.

This schematic shows a three-dimensional stacked chip with layers of graphene acting as heat spreaders.

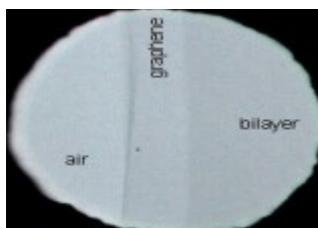


Optical properties

Graphene, despite it is only 1 atom thick, is still visible to the naked eye. Due to its unique electronic properties, it absorbs a high 2.3% of light that passes through it.

The ability for graphene to absorb radiation from many different regions in the electromagnetic spectrum is down to its band structure, lack of a band gap and the interaction between the electromagnetic radiation and the Dirac fermions in the graphene sheet.

Because graphene possesses some unique optical properties and can absorb a wide range of electromagnetic radiation, there are a lot of potential optical and photonics applications that graphene can be used in, from saturable absorbers to transparent conductors in photonic devices and high-bandwidth photodetectors.



Photograph of graphene in transmitted light. This one-atom-thick crystal can be seen with the naked eye.

Applications

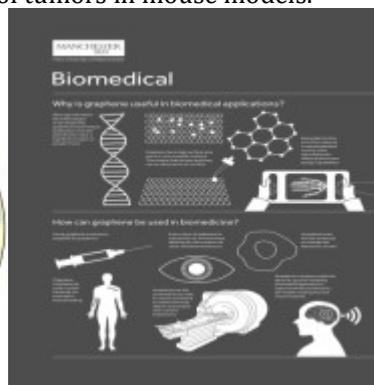
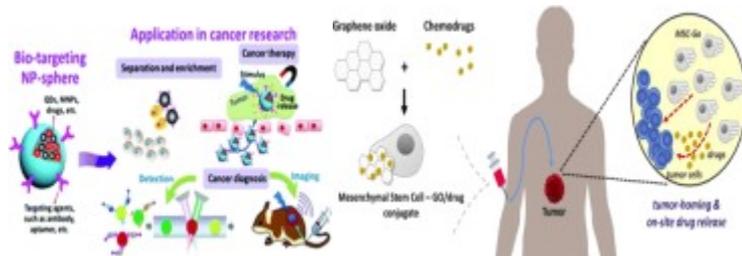
Graphene is a one-atom-thick sheet of carbon atoms arranged in a honeycomb-like pattern. Graphene is considered to be the world's thinnest, strongest and most conductive material to both electricity and heat. All these properties are exciting researchers and businesses around the world as graphene has the potential

the revolutionize entire industries in the fields of electricity, conductivity, energy generation, batteries, sensors and more.

Biomedical applications

Cancer Treatments

There are vast possibilities for graphene in medicine. One of the most critical applications is in cancer treatments. It has been suggested that functionalized nano-sized graphene can be used as a drug carrier for invitro intracellular delivery of anticancer chemotherapy drugs. So far, nano-graphene with a biocompatible polyethylene glycol (PEG) coating has been used in effective ablation of tumors in mouse models.



Antimicrobial Applications

Researchers at Case Western Reserve University, USA are planning to capitalize on graphene's antimicrobial properties for reducing infections in hospitals. It can be used to coat stents and medical devices making them much safer for surgeries. They believe that graphene can decelerate the spread of antibiotic-resistant superbugs.

Neurological Disorders

Neural stem cell (NSC) therapy is being researched to provide a treatment for numerous neurological disorders. However, NSCs require scaffolds to provide micro-environments for their growth and differentiation. Korean researchers have discovered that graphene sheets could support the required growth for them and most recently Chinese researchers have created graphene foam that can act as efficient NSC scaffolds.

Genetic Diseases

Nanotechnologies can be used to deliver genetic information to specific regions of the brain for patients suffering from neurological disorders and diseases. Researchers are planning to work towards uniting graphene and medicine in the coming years. Kostas Kosarelos, a nanomedicine researcher at the University of Manchester is at the forefront of this endeavour.

Mechanical applications

Graphene is the world's strongest material, and so can be used to enhance the strength of other materials. Dozens of researches have demonstrated that adding even a trace amount of graphene to plastics, metals or other materials can make these materials much stronger - or lighter (as you can use less amount of material to achieve the same strength).

Such graphene-enhanced composite materials can find uses in aerospace, building materials, mobile devices, and many other applications.

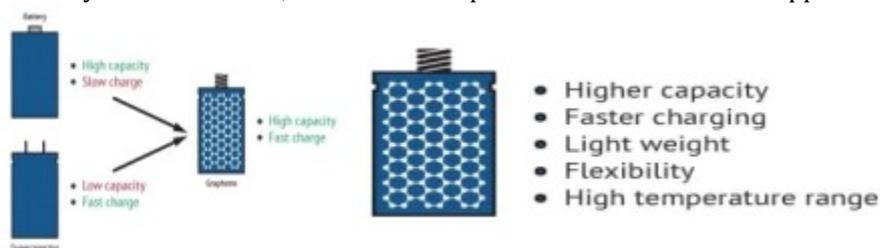


Energy storage

Because graphene is the world's thinnest material, it is also the material with the highest surface-area to volume ratio. This makes graphene a very promising material to be used in batteries and supercapacitors.

Graphene may enable devices that can store more energy - and charge faster, too. Graphene can also be used to enhance fuel-cells.

Graphene, a sheet of carbon atoms bound together in a honeycomb lattice pattern, is hugely recognized as a "wonder material" due to the myriad of astonishing attributes it holds. It is a potent conductor of electrical and thermal energy, extremely lightweight chemically inert, and flexible with a large surface area. It is also considered eco-friendly and sustainable, with unlimited possibilities for numerous applications.



Electronic sensors and coatings

Graphene has a lot of other promising applications: anti-corrosion coatings and paints, efficient and precise sensors, faster and efficient electronics, flexible displays, efficient solar panels, faster DNA sequencing, drug delivery, and more.

Graphene is such a great and basic building block that it seems that any industry can benefit from this new material. Time will tell where graphene will indeed make an impact - or whether other new materials will be more suitable.

The latest Graphene Application news:

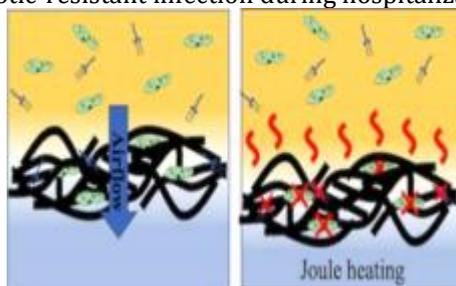
1. GraphCase creates prototype for graphene-based smart suitcase made from recycled plastic

UK-based start-up company, GraphCase, has developed a patent-pending technology to create a composite polymer using graphene, which is made from 100% recycled plastics. A prototype for a graphene-based smart suitcase made from this material has been developed in collaboration with The University of Manchester. The world first graphene suitcase is said to be 60% stronger, 20% lighter and has a lifetime warranty. The material used can also be recycled multiple times whilst maintaining its performance. The use of one 20" GraphCase cabin luggage could potentially reduce 6 kg CO₂ emissions into the environment.



2. Rice team designs graphene-based air filter that traps and kills pathogens

Rice University team under chemist James Tour has modified their [laser-induced graphene \(LIG\)](#) into self-sterilizing filters that grab pathogens out of the air and kill them with small pulses of electricity. This may be of importance to hospitals, where according to the Centers for Disease Control and Prevention, patients have a 1/31 chance of acquiring antibiotic-resistant infection during hospitalization.



The device reportedly captures bacteria, fungi, spores, prions, endotoxins and other biological contaminants carried by droplets, aerosols and particulate matter.

3.Smart insole with graphene sensors may become a lifesaving technology for diabetic patients

Stevens Institute of Technology located in New Jersey, United States, has signed an exclusive licensing agreement with Bonbouton for the right to use and further develop a [graphene sensing system](#) that detects early signs of foot ulcers before they form so people living with diabetes can access preventative treatment and confidently manage their health.



The smart insole can be placed into a shoes or dress shoes for passive monitoringof the foot health of a person living with diabetes. The data are then sent to a companion app which can be accessed by the patient and shared with their physician, who can determine if any treatment is needed.

References:

1. <https://www.graphene-info.com/graphene-applications>
2. <https://www.aznano.com/amp/article.aspx%3farticleID=3723>
3. <https://www.graphene.manchester.ac.uk/learn/applications/biomedical>

Rectangular Slot Loaded Square Monopole Microstrip Antenna for Triple band operation

Basawaraj Patne¹, Nagraj Kulkarni² and S.N. Mulgi³

¹ Research Scholar Department of PG Studies and Research in Applied Electronics Gulbarga University, Kalaburgi

² Assistant Professor and Head Department of Electronics Government College(Autonomous), Kalaburgi

³ Professor and Chairman Department of PG Studies and Research in Applied Electronics Gulbarga University, Kalaburgi

ABSTRACT: In this paper a square monopole microstrip antenna is presented for triple band operation. A rectangular slot is loaded on the radiating patch. The antenna operates between the frequency range of 3.6 GHz to 8.13 GHz. The antenna has a structure of 80x80x1.6 cubic meters on glass epoxy substrate. The radiation characteristics of the antenna is linear and broadside with peak gain of 5.2dB. The design parameters are presented and the results of the antenna are discussed. This antenna may find its applications in WLAN and Wi-max systems.

Keywords: Slot, Square monopole, Gain, Radiation,

I INTRODUCTION

In today's era microstrip antennas are becoming popular because of their numerous inherent advantages like low profile, light weight, low fabrication cost, robustness, integrability with MMICs and ease of installation [1]. The modern communication systems such as, WLAN and Wi-Max use antennas operating at definite frequency bands. But an antenna operating at dual and triple band is more attractive to use the device for the desired applications such as transmit/receive purpose. In this study a simple square monopole microstrip antenna having a rectangular slots on the radiation patch is presented for triple band operation bearing good radiation characteristics. This kind of study is found to be rare in the literature.

II ANTENNA DESIGN

In this study the square microstrip antenna is considered as conventional antenna(CSMSA) shown in Fig. 1. The antenna is fabricated by using low cost glass epoxy substrate material of $\epsilon_r=4.2$ using the photolithography process. The microstripline of length L_f and width W_f is used to supply the microwave energy to the antenna. A quarterwave transformer of length $L_t= 1.26$ cm and width $W_t= 0.08$ cm is used to match the impedance between the microstripline and the patch. A 50Ω SMA connector is used to connect the microwave source. The proposed antenna is sketched using the computer software AUTO CAD to achieve better accuracy. Table-1 gives the design parameters of the antennas.

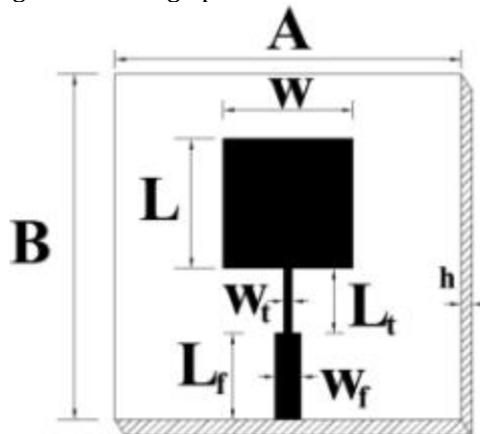


Figure-1 Conventional Square Microstrip antenna(CSMSA)

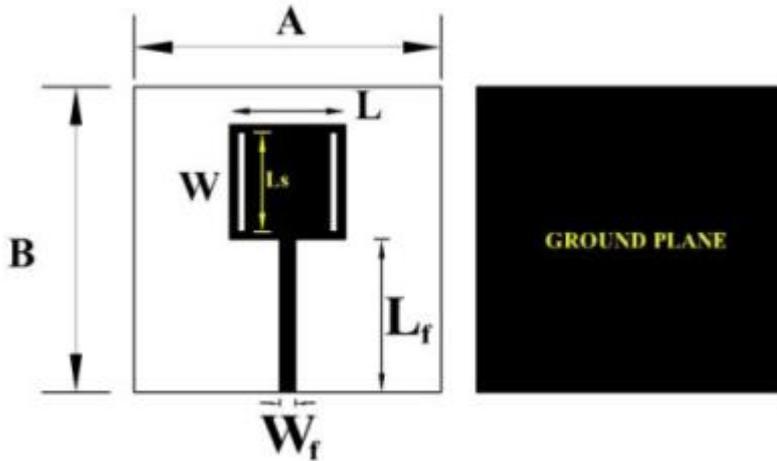


Figure-2 Structure of Rectangular slot loaded Square Monopole Microstrip antenna

Table-1 Design Parameters

Parameter	A	B	L=W	L _f	W _f	h
Dimension(cm)	8	8	2.39	1.27	0.32	0.16

Figure 2 shows the rectangular slot loaded square monopole microstrip antenna (RSMMSA). The full ground plane of CSMSA is maintained as it is. The rectangular slot of length L_s whose dimension is taken equal to $\lambda_0/6$, where λ_0 is a free space wave length in cm corresponding to the designed frequency of 3.0 GHz. All other dimensions of the CSMSA are kept same for RSMMSA also.

III RESULTS AND DISCUSSION

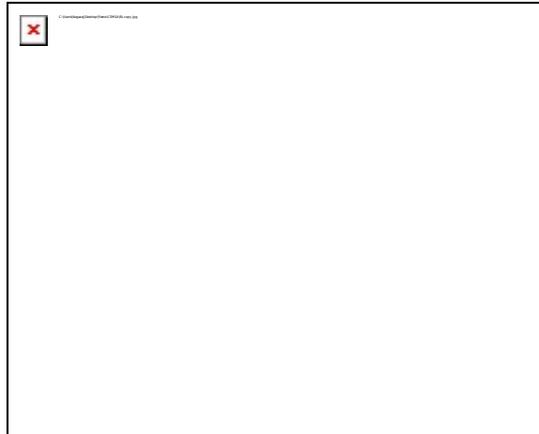


Figure-3 Return Loss versus frequency of the CSMSA

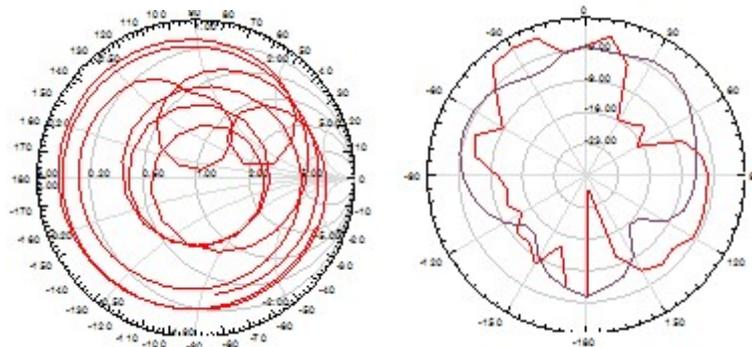


Figure-4 Typical Radiation Pattern of CSMSA Figure-5 Smith Chart of CSMSA

Figure 3 shows the return loss versus frequency of CSMSA, it is designed for 3 GHz frequency and it is resonated at 2.98 GHz which is very close to the designed value. The impedance bandwidth of the conventional microstrip antenna is calculated by the relation

$$\text{Impedance bandwidth (\%)} = \frac{f_H - f_L}{f_c} \times 100 \%$$

where f_H and f_L are the upper and lower cut off frequencies of the resonated band when its return loss reaches -10 dB and f_c is the centre frequency between f_1 and f_2 . The impedance bandwidth of CSMSA is found to be 3.38%

Figure 4 and 5 show the radiation pattern and Smith Chart of the CSMSA. It can be noticed that the radiation is linear in nature and Smith chart shows good matching.

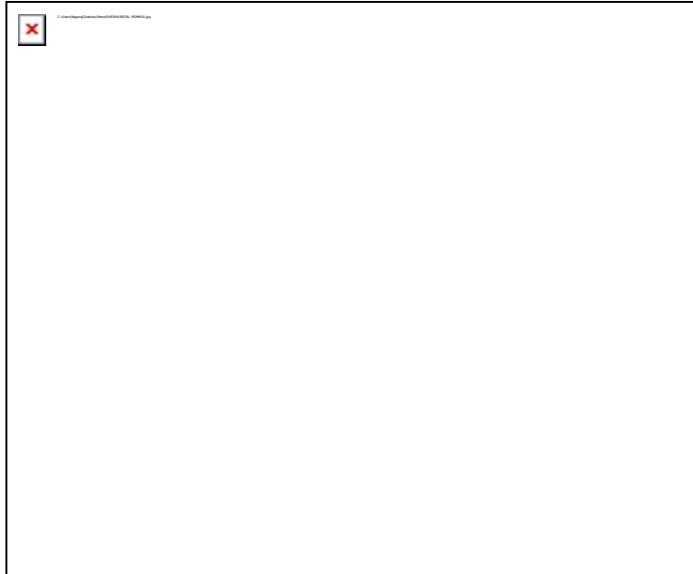


Figure 6 Return loss versus frequency of RSMMSA

Figure 6 shows the return loss versus frequency of the RSMMSA , the antenna resonates for three modes f_1 , f_2 and f_3 with their respective bandwidths $BW_1= 4.9\%$ (3.6GHz-3.78GHz) $BW_2= 3.83\%$ (5.88 GHz-6.11GHz) and $BW_3= 5.42 \%$ (7.71GHz-8.13GHz). The first band is due to the fundamental resonance of the patch. The second and third bands are due to the presence of the rectangular slots on the radiating patch. The frequency ratio f_2/f_1 of about 1.59 is achieved which shows the possible tunable property of the antenna.

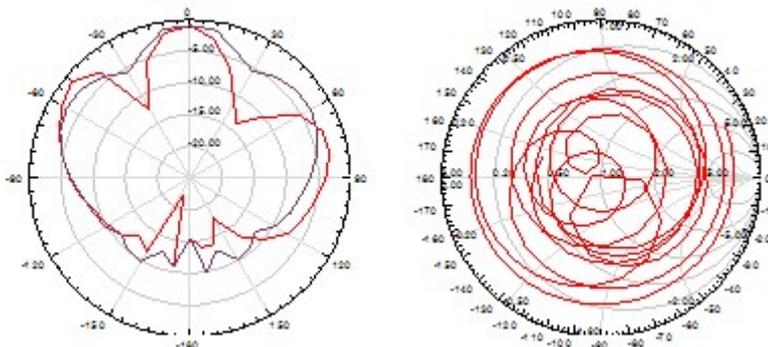


Figure-7 Radiation pattern of RSMMSA Figure-8 Smith Chart of RSMMSA

Figures 7 and 8 respectively show radiation pattern and Smith chart of the RSMMSA, it can be noticed that the radiation pattern is linear and broadside . The Smith chart shows loops at the center of the plot depicting the good matching concept.

IV CONCLUSION

The proposed antenna shows all the needs of the modern communication systems. The triple bands with impedance bandwidth of 5.42% is obtained. The linear and broadside radiation characteristics is achieved with maximum gain up to 5.2 dB. The antenna exhibits frequency ratio of 1.59 which gives the possible tenability. This antenna may find its applications in WLAN and Wi-Max applications.

REFERENCES

- [1] Constantine A. Balanis, *Antenna Theory - Analysis and Design*, John Wiley & Sons, Inc., New York, 1982.
- [2] David M. Pozar and Daniel H.Schaubert, *Microstrip Antennas: The Analysis and Design of Microstrip Antennas and Arrays*, IEEE Antennas and Propagation Society, Sponsor, IEEE Press, Inc., New York, 1995.
- [3] I. J. Bhal and P. Bhartia, *Microstrip Antennas*, Dedham, MA: Artech House, 1981.
- [4] G. A. Deschamps, "Microstrip microwave antennas," presented at the 3rd USAF, Symposium on Antennas, 1953.
- [5] Robert E. Munson, "Conformal microstrip antennas and microstrip phased arrays," *IEEE, Trans. Antennas Propagat.*, vol. AP-22, no. 1, pp. 74-78, Jan. 1974.
- [6] John Q. Howell, "Microstrip Antennas," *IEEE, Trans. Antennas Propagat.*, pp. 90-93, Jan. 1975.
- [7] Girish Kumar and K. P. Ray, *Broadband Microstrip Antennas*, Norwood, MA: Artech House, 2003.
- [8] David M. Pozar, *Microwave Engineering*, Addison Wesley Publishing Company, Inc. 1990.

A STUDY OF SOME APPLICATIONS OF DIGRAPHS

RoopaRajashekhar Anagod¹ and Putul Dutta²

^{1,2}Department of Mathematics, Sindhi college, Bangalore-560024,India.

ABSTRACT: Many physical situations require directed graphs. For example: the street map of a city with one-way streets, flow networks with valves in the pipes and electrical networks are represented by digraphs. Digraphs are employed in abstract representations of computer programs, where the vertices stand for the program instructions and the edges specify the execution sequence. Applications of digraphs are virtually unlimited. Some important ones are briefly discussed in this paper.

Keywords:

3.3 The One-way street problem:

Over the years, the amount of traffic on the streets of a small city has increased enormously and the city planners are trying to decide what should be done. The map of any network of roads or streets is an example of a graph. But an up to date city plan should show not only the relative locations of the streets and their intersections but it should also give information about which streets have a two-way traffic flow and which streets have one-way traffic, together with the direction in the latter case. Clearly, we are again faced with a directed graph or rather with a mixed graph if not all streets have one-way directions. We can replace an undirected edge by two directed edges, one in each direction, between the same two vertices.

Suppose that certain members of the city council decide to introduce a new traffic plan, such that all streets be made one-way in order to simplify traffic flow. This brings up the problem: When it is possible to direct the streets in such a manner that one can drive from any point to any other along one-way streets. The corresponding problem in the graph formulation is: When can the edges of a graph G be given directions in such a way that there is a directed path from any vertex to any other? or "Does a given connected graph have a strongly connected orientation?" Also there are conditions that must be satisfied.

Ex:

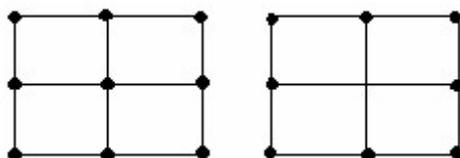


Fig 3.3.1

A graph for which one-way street problem can be solved (fig 3.3.1)

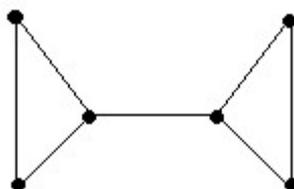


Fig 3.3.2

A graph for which the one-way street problem cannot be solved

This graph does not have a strongly connected orientation. The trouble is the middle edge; once this is given a direction, flow will only be permitted from one side of that edge to the other, but not in reverse. Such an edge is called a bridge.

Theorem: If e is not a bridge in a connected graph G , then e is part of a circuit

Proof: Let $e = uv$. Since e is not a bridge, $G - \{e\}$ is connected. Then there is a path in $G - \{e\}$ from v to u . This path followed by $e = uv$ is a circuit in G containing e .

Ex: Let us find a strongly connected orientation for the graph fig(3.3.3)

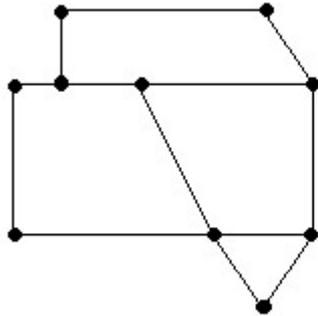


Fig 3.3.3

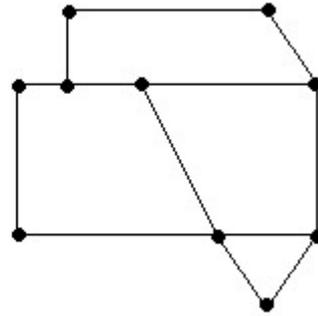


Fig 3.3.4

We begin by finding a circuit, for ex: $u_1 u_2 u_3 u_1$ and orienting the edges $u_1 \rightarrow u_2 \rightarrow u_3 \rightarrow u_1$ by single arrows in fig(3.3.4).

Next, we look for a vertex which is not in but which is adjacent to some vertex of this circuit: v_1 is adjacent to u_1 , for instance. Now, we look for a circuit containing $v_1 u_1$, say $v_1 v_2 (= u_1) v_3 (= u_3) v_4 (= u_2) v_5 v_6 v_7 v_8 v_1$. We would like to orient the edges of this circuit $v_1 \rightarrow v_2 \rightarrow \dots \rightarrow v_8 \rightarrow v_1$ as before, but we cannot because edges $v_2 v_3$ and $v_3 v_4$ have already been oriented in the opposite direction. So we orient those edges of this circuit not already assigned directions: we orient $v_1 \rightarrow v_2, v_4 \rightarrow v_5, v_5 \rightarrow v_6, v_6 \rightarrow v_7, v_7 \rightarrow v_8, v_8 \rightarrow v_1$ with double arrows. So far, our procedure has identified eight vertices and oriented all but one of the edges between pairs of these. We orient the omitted edge $v_8 u_2$ arbitrarily, say $u_2 \rightarrow v_8$. At this stage, the subgraph whose vertices are u_i and v_j and whose edges are all edges of the given graph among these vertices is strongly connected, because we can get from any u_i or v_j to any other of these vertices following edges in the direction of arrows.

Again, we next look for a vertex which is not in but which is adjacent to some vertex in this subgraph: w_1 is adjacent to v_1 , for instance. We find a circuit which includes the edge $w_1 v_1$, for ex: $w_1 w_2 (= v_1) w_3 (= v_3) w_4 (= v_7) w_5 w_1$ and orient the edges of this circuit which have not so far been oriented in the direction of this sequence of vertices indicated. We orient: $w_1 \rightarrow w_2, w_4 \rightarrow w_5$ & $w_5 \rightarrow w_1$ with triple arrows in fig (3.3.4). Finally, the given graph has strongly connected orientation.

Theorem: A graph G has a strongly connected orientation iff it is connected and has no bridges.

Proof: Suppose, if a graph G has a strongly connected orientation, then G is surely connected. Let e be an edge, say with end vertices u and v . If e is oriented in the direction $u \rightarrow v$ when G is assigned its strongly connected orientation, then in this strongly connected digraph, there is a directed path from v to u . In particular, there is a path P in G from v to u . This path cannot use the edge e , so any walk in G which involves e can be replaced by a walk which avoids e , simply by replacing e with P . It follows that $G - \{e\}$ is connected, so e is not a bridge.

Conversely, suppose G is connected and has no bridges. We first note that every edge of G must be part of a circuit (by previous theorem). Now, we S.T. G can be assigned a strongly connected orientation by using the same procedure as we done in the above example. Let $C: u_1 u_2 \dots u_n u_1$ be a circuit in G (since every edge is a part of a circuit, so some such circuit certainly exists). For $1 \leq i \leq n - 1$, assign edge $u_i u_{i+1}$ the orientation $u_i \rightarrow u_{i+1}$. Assign edge $u_n u_1$ the orientation $u_n \rightarrow u_1$. Then orient any other edges between vertices of C arbitrarily.

If C consists all vertices of G , then clearly we have an orientation of G which is strongly connected, since C is strongly connected. Suppose on the other hand, that C does not contain all the vertices of G . Since G is connected, there exists a vertex v_1 not in C such that $v_1 u_j$ is an edge for some u_j . Since every edge in G is part of a circuit, $v_1 u_j$ is part of a circuit $v_1 u_j (= v_2) v_3 \dots v_m v_1$. Assign $v_1 v_2$ the direction $v_1 \rightarrow v_2$ and $v_m v_1$ the direction $v_m \rightarrow v_1$. Leave unchanged the orientation of edges on the circuit which have already been oriented, but orient any $v_i v_{i+1}$ not yet oriented in the direction $v_i \rightarrow v_{i+1}$. Finally, assign an arbitrary orientation to any remaining edges among vertices considered to this point.

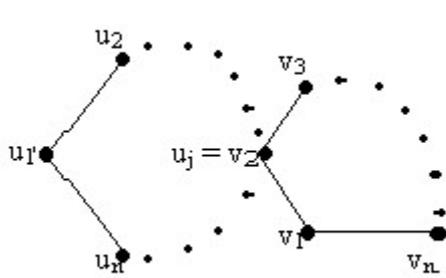


Fig 3.3.5

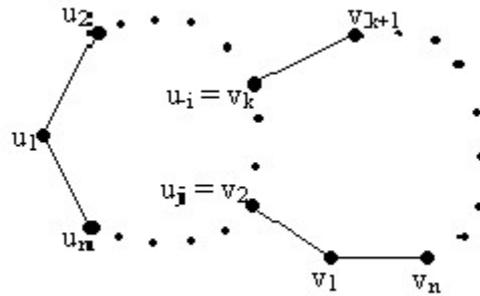


Fig 3.3.6

We have two possibilities for the oriented subgraph whose vertices are $u_1, u_2, \dots, u_n, v_1, \dots, v_m$ in the above figure. The subgraph in fig(3.3.6) shows that in addition to v_2 , some other of the vertices v_3, \dots, v_m may coincide with vertex u_j . In this subgraph if we want to get from v_{k+1} to v_k , we have to go first to v_1 , then to u_j , then around C to v_k .

We note that the subgraph of vertices and edges identified so far is strongly connected. Thus, if this subgraph is the entire graph, then we are through. Otherwise we find a vertex w_1 which is not a part of, but which is adjacent to some vertex in this subgraph and then find a circuit containing this vertex and orient edges as before. Finally this procedure terminates with a strongly connected orientation.

Algorithm for a strongly connected orientation:

Suppose G is a connected graph without bridges. To produce a strongly connected orientation, proceed as follows:

Step1: Carry out a depth -first search in G and let T be the spanning tree which this produces

Step2: For each edge e of G , consider the u and v of its ends. Suppose $u < v$,

- If e is in T , orient it $u \rightarrow v$;
- If e is not in T , orient it $v \rightarrow u$.

For ex: Consider the graph,

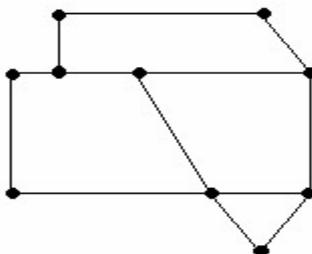


Fig 3.3.7

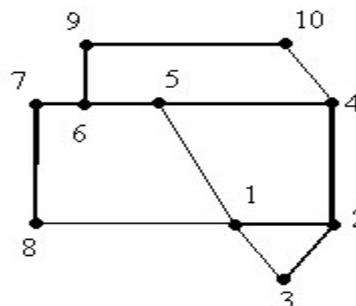


Fig 3.3.8

We apply the above algorithm to the graph in fig(3.3.7). The labels which a depth-first search might yield and with heavy lines, shows the corresponding spanning tree fig(3.3.8). For edge uv with $u < v$, the algorithm orients $u \rightarrow v$ if the edge is the part of the tree, otherwise $v \rightarrow u$. For instance, consider the edge $(6, 9)$, since it is in the tree, it is oriented $6 \rightarrow 9$, on the otherhand the edge $(4, 10)$ is not in the tree, so it is oriented $10 \rightarrow 4$.

The farmer's puzzle:

Consider a farmer standing on the bank of a river with a dog, a sack of wheat and a goose. He wishes to transport these three and himself to the far bank by using a boat that will hold, at any one time, himself and at most one of his possessions. For obvious reasons the goose cannot be left alone with either the dog or the wheat. The puzzle is concerned with devising a sequence of crossings in which the farmer progressively transports possessions across the river which terminates in all four being safely landed on the other bank.

We now devise a digraph model of this puzzle which can be analyzed to find a solution. Let the dog, wheat and the goose be denoted by d, w and g respectively. The state of the system after any number of

crossings can be completely defined by which possessions are on the original bank after a round trip of two crossings, from and than back to the original bank. These states are,

$\{d, w, g\}$, $\{d, w\}$, $\{d, g\}$, $\{w, g\}$, $\{d\}$, $\{w\}$, $\{g\}$ and ϕ .

The states, $\{d\}$ and $\{w\}$ are infeasible because they constitute inadmissible combinations on the far bank. The objective is to find a sequence of crossings which transform the system from its initial state $\{d, w, g\}$ into the desired final state ϕ , via a sequence of feasible states.

We can devise a digraph $G = (V, A)$ in which each feasible state is represented by a vertex in V and uv is an arc in V iff it is possible to transform the system from state u to state v by one round trip of crossings beginning at the original bank without creating an inadmissible combination of possessions on either bank. (Actually the very last system transformation comprises only a single crossing from the original bank to the far bank and not the return crossing). The appropriate digraph is shown in the figure, where the infeasible states and their system transformations are not included.

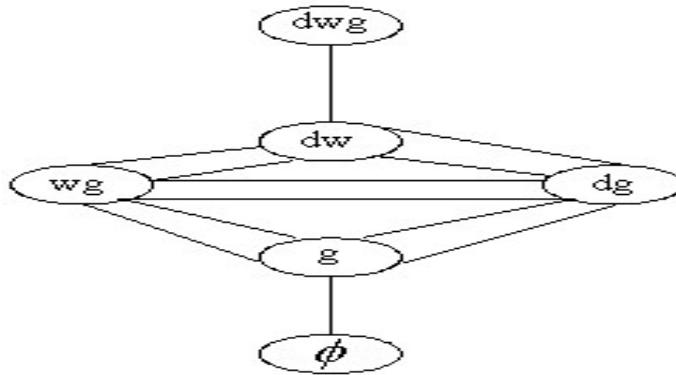


Fig 3.5.3

Any solutions to the puzzle can be represented by a path in the digraph from vertex dwg to vertex ϕ . There are 4 such paths:

$P_1 = (dwg, dw, dg, g, \phi)$, $P_2 = (dwg, dw, wg, g, \phi)$, $P_3 = (dwg, dw, dg, wg, g, \phi)$ and $P_4 = (dwg, dw, wg, dg, g, \phi)$.

Among these paths P_1 and P_2 are more satisfactory in the sense that they involve less trips (3 round trips and one one-way trip) than P_3 and P_4 .

The solution corresponding to P_1 can be described as follows:

1. Transport goose
2. Return empty
3. Transport wheat
4. Return with goos
5. Transport dog
6. Return empty
7. Transport goose.

A Job Sequence Problem:

A number of jobs J_1, J_2, \dots, J_n , have to be processed on one machine; for example, each J_i might be an order of bottles or jars in a glass factory. After each job, the machine must be adjusted to fit the requirements of the next job. If the time of adaptation from job J_i to job J_j is t_{ij} , find a sequencing of the jobs that minimizes the total machine adjustment time.

This problem is clearly related to the traveling salesman problem and no efficient method for its solution is known. It is therefore desirable to have a method for obtaining a reasonable good solution.

Step1: Construct a digraph G with vertices v_1, v_2, \dots, v_n such that there is an edge directed from v_i to v_j iff $t_{ij} \leq t_{ji}$. By definition, G contains a spanning tournament.

Step2: Find a directed Hamiltonian path (v_{i1}, \dots, v_{in}) of G and sequence the jobs accordingly.

Since step1 discards the larger half of the adjustment matrix $[t_{ij}]$, it is a reasonable supposition that this method, in general produces a fairly good job sequence. Note that however, when the adjustment matrix is symmetric, the method is of no help whatsoever.

As an example, suppose that there are six jobs J_1, J_2, \dots, J_6 and that the adjustment matrix is

	J_1	J_2	J_3	J_4	J_5	J_6
J_1	0	5	3	4	2	1
J_2	1	0	1	2	3	2
J_3	2	5	0	1	2	3
J_4	1	4	4	0	1	2
J_5	1	3	4	5	0	5
J_6	4	4	2	3	1	0

The sequence $J_1 \rightarrow J_2 \rightarrow J_3 \rightarrow J_4 \rightarrow J_5 \rightarrow J_6$ requires 13 units in adjustment time. To find a better sequence, construct the digraph G as in step1.

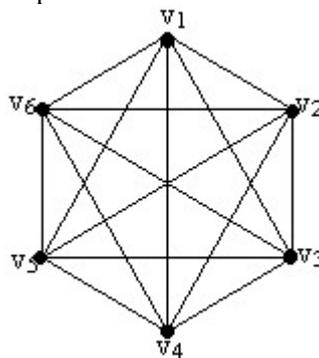


Fig 3.7.1

From the figure consider 3 directed Hamiltonian paths

$$P_1 = (v_1, v_6, v_5, v_2, v_3, v_4)$$

$$P_2 = (v_1, v_6, v_3, v_5, v_2, v_4)$$

$$P_3 = (v_1, v_6, v_3, v_4, v_5, v_2)$$

The path P_1 yields the sequence, $J_1 \rightarrow J_6 \rightarrow J_5 \rightarrow J_2 \rightarrow J_3 \rightarrow J_4$, which requires only 7 units of adjustment time. The sequences from the paths P_2 and P_3 require 9 and 8 units respectively.

Finding the shortest path:

Consider the road network as shown in fig(a); the numbers next to the edges are the times taken to travel along the corresponding stretch of road.

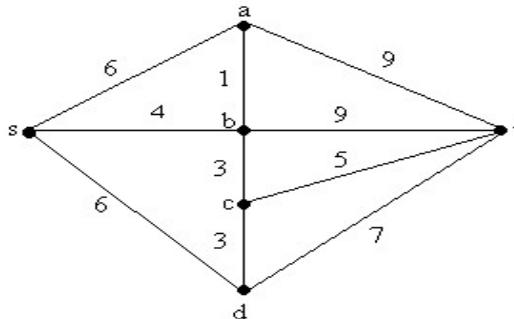


Fig 3.8.1

We have to plan a route from city s to city t which covers the journey in the least possible time. We have a simple method for finding the shortest route between any two given cities in a road network. This method is very efficient and can be used for any network, however complicated. The basic idea is to move across the network from left to right, determining the shortest time from city s to each of the intermediate cities as we

go. At each intermediate stage we look at all those vertices reachable by an edge from the current vertex and assign to each one a temporary label (which we write in a circle), representing the shortest time taken to reach it paths already considered. Eventually, each vertex receives a permanent label (which we write in a square), representing the shortest time from city s to that city. Our aim is to find the permanent label assigned to city t.

We start by assigning city s the permanent label 0 (since it takes no time to go from s to s), and look at all cities reachable directly from s. These cities are a, b and d and we assign to them temporary labels of 6, 4 and 6, corresponding to the times taken to reach them directly from s.

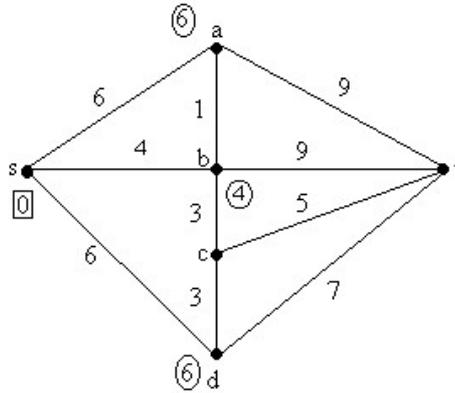


Fig 3.8.2

The next step is to take the smallest temporary label and make it permanent. This occurs at city b and shows that the shortest time to travel from city s to city b is 4. We now look at all cities reachable directly from b (i.e., cities a and c) and assign to each one a temporary label equal to the label at b plus the time taken to go from b to that vertex-unless that vertex already has a smaller label. In this case, we assign to city a, the new label $4 + 1 = 5$ and to city c the label $4 + 3 = 7$.

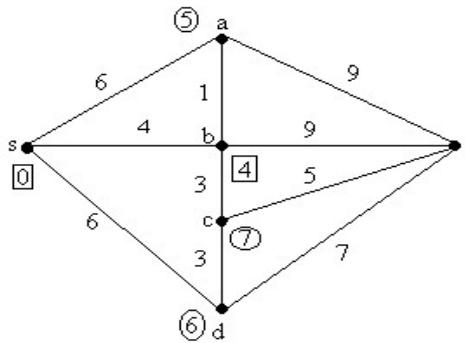


Fig 3.8.3

The smallest temporary label is now 5 at a, so we assign to city a the permanent label 5. We now look at all cities reachable directly from a (i.e., city t) and assign to it the temporary label $5 + 9 = 14$.

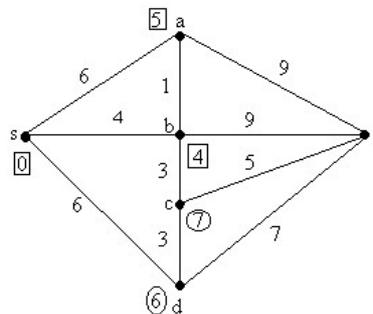


Fig 3.8.4

The smallest temporary label is now 6 at d, so we assign to city d the permanent label 6. We now look at all cities reachable directly from d (i.e., cities c and t) and assign to city t the new label $6 + 7 = 13$, we have the label at c unchanged, since $6 + 3$ is larger than its present label 7.

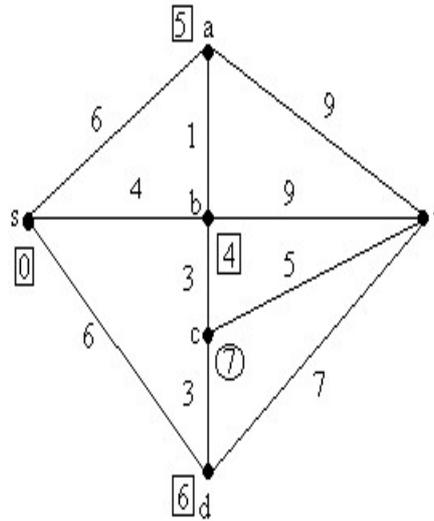


Fig 3.8.5

The smallest temporary label is now 7 at c, so we assign to city c the permanent label 7. We now look at all cities reachable directly from c (i.e., city t) and assign to it the new label $7 + 5 = 12$. The only remaining temporary label is 12 at t, so we assign to city t the permanent label 12. Thus, the shortest time to reach city t is 12.

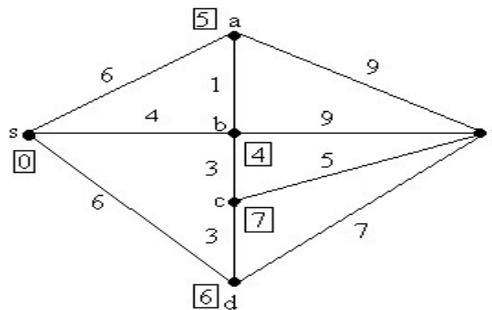


Fig 3.8.6

Now, we can find the shortest route from city s to city t by working backwards from t as follows:

Since, (the label at t) - (the label at c) = the time ct, we include the edge ct.

Similarly, (the label at c) - (the label at b) = the time bc

and (the label at b) - (the label at s) = the time sb.

So we include the edges bc and sb. Thus, the shortest route from city s to city t is sbct.

References:

1. J.A.Bondy and U.S.R.Murthy, Graph Theory with Applications, American Elsevier, New York, (1979)
2. L.R.Foulds, Graph Theory Applications, Narosa Publishing House, (1992)
3. E.G.Goodaire and M.M.Parmenter, Discrete Mathematics with Graph Theory, Prentice-Hall, Inc., (1998)
4. F. Harary, Graph Theory, Narosa Publishing House, (2001)
5. Narasingh Deo, Graph Theory with applications to Engineering and Computer science, Prentice-Hall, Englewood Cliffs, N.J. (1974)
6. O. Ore, Graphs and their uses, The Mathematical Association of America, (1990)

Concepts of Mathematical Modeling-A Decision Making Tool in Economics

¹Shobha T & ²Ramesh T C

^{1,2}Professor

Dept. of Mathematics, Seshadripuram First Grade College, Yelahanka Newtown, Bengaluru, India

ABSTRACT: *The mathematical models are more extensively used in all areas and discipline to arrive a specific result through calculations. Demand and supply theories of economics are very important elements in economics, strategic decision on demand and supply needs a strong ground calculations and results, which can be achieved by using mathematical concepts, tools and models. In this study an attempt is made to relate mathematical models. Analysis and arriving at specific results for decision making; it poses how decision related to demand and supply can be arrived at using this mathematical model.*

Keywords: *Mathematics, Tools, Techniques, Optimization.*

I. Introduction

Use of mathematics in economics has started in the early 19th century and it was originally called as classical economics. In the early stage the economic subjects were discussed using algebra however, calculus was not used. In 1936 the Russian -born economist Wassily Leontief built his model of Input-Output analysis from the 'material balance' tables constructed by soviet economists. In mathematics, the mathematical optimization relates to selecting the appropriate elements from set of available elements. In economics optimization includes finding the best available element of some function given a defined domain and may use a variety of different computational optimization techniques. Economics is closely linked to optimization by agents in an economy that, an influential definition relatedly describes economics science as the "Study of human behavior as a relationship between ends, scarce means" with alternative uses. Key ingredient of economic theorems that in principle could be tested against empirical data.

Mathematics used in economics for defining the relation between testable proposition and complex subjects which could be expressed in mathematical modeling. Much of economic theory is currently presented in terms of mathematical economic models

II. Objectives of the study

1. Understanding economic theory and concepts using mathematics.
2. To solve economic problems using mathematical tools.

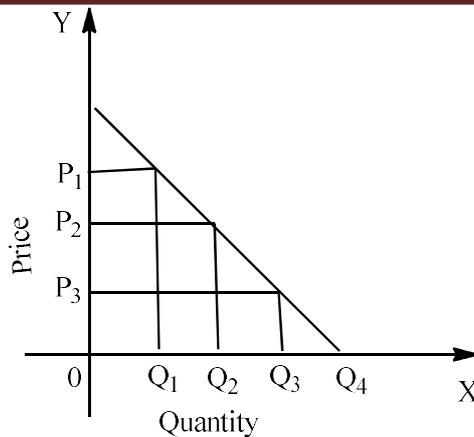
III. Methodology

The study is based on secondary data. The author refers to articles books, journals and research articles etc.

Mathematical concepts used to explain economic theory

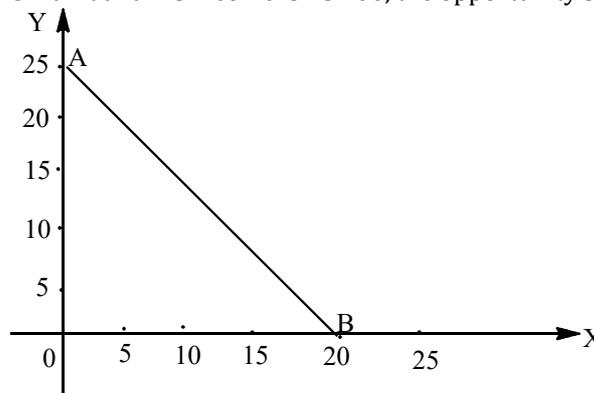
1. **Functions:** Function is a relation between two variables, we denote it by $y = f(x)$, where 'x' is called independent variable and 'y' is called dependent variable. For every value of 'x' there corresponds one or more value of 'y'.

Example: $Q = Q(p)$, where Q is Quantity and P is Price. These are the basic building blocks of economic models. The function $D = D(p)$ is a demand function and its graph with price on one axis and quantity on the other axis will give a demand curve. It indicates the cause-effect relationship between variables. A function can be represented by means of a table or graph.



Deviation of demand curve from law of diminishing marginal utility.

2. Algebra: A set is a collection of well defined objects. In economics, the need is to define an opportunity set of decision maker. i.e., the set of alternative actions which are feasible. For example, the opportunity set of a consumer is the set of all combinations of goods which the consumer can buy with his given income. Given the consumer's budget and prices of all goods, the opportunity set is well defined and we can find out whether the consumer can buy that combination of goods. If a person consumes only two goods (x, y), whose prices are Rs. 5 and Rs 4 unit and his income is Rs 100, the opportunity set is as shown below.



If the consumer spends all his income on 'x', he can buy 20 units of 'x' with no y(B) or if he spends all on the goods 'y' then he buys 25 units of 'y' and no x(A). All other alternatives of spending Rs 100 will lie on the line AB. Hence, the area OAB constitutes the consumer's opportunity set.

Algebra also includes addition, subtractions multiplication and division etc., we require these in solving economic equations such as in Bain's concept of entry,

$$E = \frac{P_L - P_C}{P_C}$$

E = Condition of entry
 P_L = Limit of price
 P_C = Price under pure competition in the long-run

In calculating present value, suppose that RS Q are invested for one year at the rate of interest 'i' percent compound annually, then at the end of the year we would get Rs iQ as interest which, with the return of principle 'Q', would give us $Q + iQ = Q(1 + i)$ rupees. If the initial sum is designated as Q₀ and the sum at the end of one year as Q, then we get the expression,

$$Q_1 = Q_0(1+i)$$

3. Variables: Variables are things which change and can take a set of possible values within a given problem. A constant or parameter is a quantity which does not change in a given problem.

For example $y = a + bx$. Here 'a' and 'b' are constants and 'x' and 'y' are variables. 'x' is the independent or exogenous variable while 'y' is dependent or endogenous variable. The values of 'x' will be given from

outside the system, while the values of 'y' will be determined from within the system. 'x' can assume different values and this will cause y to assume different values also.

- 4. Differentiation:** It is the measure of rate of change of one variable with respect to other variables. In economics decisions are based on mathematical concepts 'Derivatives'. This process is called "marginal analysis".

Example: The marginal product of a factor of production is defined as a change in output due to a very small change in the quantity of this factor while quantities of all other factors of production remain constant. Then,

$$MP_L = \Delta_x / \Delta_L \text{ and } MP_X = \Delta_x / \Delta_K$$

Where, MP_L = Marginal product of labour and MP_K = Marginal product of capital.

Mathematically, the marginal product of a factor of production is the partial derivative of the production function with respect to this factor.

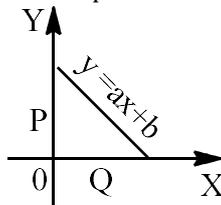
$$MP_L = \delta_x / \delta_L \text{ and } MP_X = \delta_x / \delta_K$$

- 5. Slope:** The concept of slope is important in economics because it is used to measure the rate at which changes are taking place. The unit of change in X (independent variable) will result in a change in 'y' (dependent variable).

$$\text{Slope} = (\text{change in } y) / (\text{change in } x)$$

In economics slope is used to measure how the things will change. Example, how the demand change when change in price or how the consumption change when income is changed.

If the slope of a line $y = ax + b$ is positive then the line moves upward when going from left to right. Similarly when the slope is negative the line moves down when going from left to right. The following graph shows downward sloping demand curve which declines as price increases.



- 6. Partial derivatives:** In business economics we encounter a function of several independent variables.

Example: demand of a product on the part of consumer depends on the price of the product. The prices of other related goods, consumer's income, and consumer's wealth, consumer's tastes and so on. When the price of the goods changes, the effect on the quantity demanded of the goods can only be analyzed if all other variables are held constant. The functional relationship that we get between the quantities demanded of a product and its own price is called a partial function. The process of differentiation can be applied to the partial function is known as the partial derivatives of the original function and is denoted by $\delta f / \delta x$.

Example: The quantity of goods sold in a firm depends on the price of the product (p), income of the consumer (y) and the amount of money spent on advertising (a). This can be written as $q = f(p, y, a)$. If the firm needs to know the effect of advertising on the quantity of goods sold, then we have to treat price and income of consumer as constant and advertising as variable. This can be achieved by taking partial derivatives of the function with respect to advertising i.e., $\delta q / \delta a$.

- 7. Maxima:** The maxima of a function are the highest value that is reached over a closed interval.

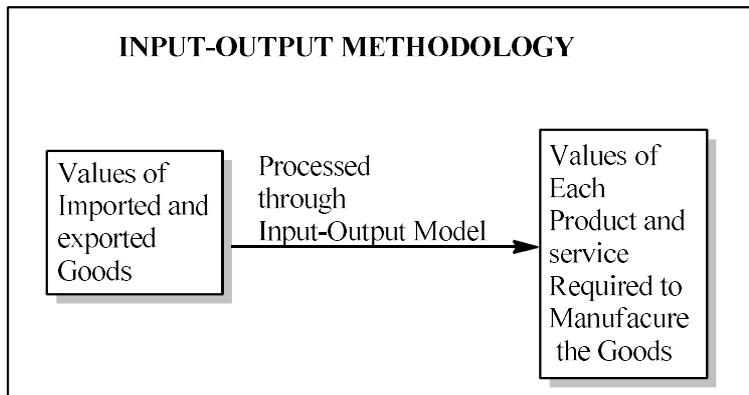
Example: The equilibrium of the project maximizing firm occurs simultaneously on the input and output sides. i.e., a firm which is maximizing its profit by choosing an output at which marginal cost equals marginal revenue. i.e., simultaneously minimizing the cost of producing the output or maximizing the output subject to cost constraint.

For maximum, first derivative is equal to zero and second derivative is < 0 .

For minimization, the first derivative is equal to zero and the second derivative is > 0 .

- 8. Input-output analysis:** Input-output is very popular economic analysis though it is not an optimized one. Matrix is basic for understanding the rationale and use of input-output models such as model essentially states the nature of technological relationship, which exists between sectors. By using this model, we can stipulate a change in the exogenous variables and use the model to

determine the system of equations using technological relationships to determine the changes to be made to sustain the new level of autonomous variables.



9. Linear programming: Linear programming is defined as a method of determining an optimum programme of inter-dependent activities in view of available resources to maximize or minimize an objective function. A mathematical might be more technical and may define linear objective function subject to certain linear constraint.

Any linear programming problem has three constituents,

9.1 Objective function: An objective function of the linear programming problem must be clearly defined mathematically.

9.2 Constraints: The decision variables of the linear programming problem are interrelated and the resources are taken to be limited in supply. These constraints are expressed in the form of inequalities which describe the problem in linear form.

9.3 Non-negativity constraints:

This emphasizes that the units of commodities produced or consumed is either zero or more than zero.

There are many methods to solve the linear programming problems, to mention few as below

- (i) Simple method
- (ii) Simplex method
- (iii) Northwest corner method
- (iv) Least cost method

10. Statistical tools and Techniques: A decision maker gathers information in the form of statistical figures for the demand of the product, production levels, inputs used, market shares, advertisement, expenditures and their input on sales, price behavior over a period and so on. The information collected has to be tabulated in the form of statistical tables called frequency distribution and then it has to be analyzed by working out various 'Constraints' to make inferences out of it using varies Probability Distribution, Correlation, Regression, Analysis of variance and Test of significance etc.,

IV. Conclusion

Language of mathematics allows economic problems and concept to make specific, positive claims about controversial or contentious subjects that would be impossible without mathematics. From the above study it can be conclude that students who are looking to pursue a career in economics are advised to strengthen their knowledge in mathematics and statistics. To analyze problems in economics they need mathematical concepts like calculus, matrix algebra, linear programming etc., are vital.

References:

1. Bose "An introduction to Mathematical Economics" Himalaya Publishing House, 2007
2. Richard J, (1998) Mathematical visions the pursuit of Geometry in Victorian England, San, Diego Academic Press
3. Rituparna Chaudhary, International Journal of Commerce and Management Research, Vol.3, pp. 51-55 (2017)
4. "Mathematical optimization and economic theory"-Book by Michael Intriligator
5. "Mathematics for Economics"-Book by Carl P. Simon and Lawrence E. Blume

Solution of Non-Linear Differential Equations with Exponential Function using Power Series Method

¹Prof. Ramesh T C* & ²Prof. Shobha T

¹Professor and HOD, ²Professor

^{1,2}Dept. of Mathematics, Seshadripuram First Grade College, Yelahanka Newtown, Bengaluru, India

ABSTRACT: In mathematics non-linear differential equations can be used to describe the manner of change in a qualitative modeling. By the virtue of this it is entering in to various fields such as biology, economics, physics, chemistry and engineering to describe the exponential growth and decay, the population growth of species. Non-linear differential equations have a much richer structure, but the solutions in closed form are generally not available. For these reason non-linear differential equations even ordinary ones are challenging and fascinating. Hence in this work the attempt has been made to solve the second order non-linear differential equations with exponential function of dependent variable using power series method. In power series method Taylor's series supports to construct a power series based on the derivatives of a function at a particular point and for a lot of functions which is vital to achieve the solution straightforwardly.

Keywords: Non-linear Differential Equations, Power Series Method, Taylor's series.

I. Introduction

A system of differential equation is said to be non-linear if it is not a linear system. Non-linear differential equations are equations in which dependent variable and its derivatives appear as a product and their degree greater than one. It may contain trigonometric, exponential and logarithmic functions of dependent variable such equation is called as transcendental non-linear differential equation. Some of the commonly used methods for the qualitative analysis of non-linear ordinary differential equations are, examination of conserved quantity especially in the Hamiltonian systems, examination dissipative quantities analogous to conserved quantities, linearization through Taylor series, bifurcation theory and perturbation numerical methods. In this work Taylor's series method is preferred, because it supports to construct a power series based on the derivatives of a function at a particular point and for a lot of functions which is vital to achieve the solution straightforwardly. Some of the non linear differential equations are AC power flow model, ball and beam system, bellman equation optimal policy, Boltzmann transport equation, general theory of relativity, Ginsburg-Landau equation, Navier-Stokes equation of fluid dynamics, Korteweg-Derries equation, Non linear optics, Non linear schrodinger equation, Richards equation for unsaturated water flow, Robert unicycle balancing equation, Sine-Gordon equation, Landau -Lifshitz equation, Ishimori equation, Vander-Pol equation, Lienard equation which are used in various disciplines of science and technology. In this work the solution of non linear differential equation can be obtained by power series method. Paper outlines: section II represents the related work, section III includes the detailed solution of non-linear differential equation with exponential function using power series method and section IV concludes the paper.

II. Related Work

Science and Technology models straightforwardly search for quick and effective approach to find solution for the given problem. During the last few decades, several methods have been introduced to solve nonlinear differential equations with exponential function. Guo [1, 2] proposed a method that maps the original problem in an unbounded domain onto a problem in a bounded domain, and used suitable Jacobi polynomials to approximate the resulting functions. Boyd [3] used a domain truncation method thereby replacing the semi-infinite interval by a finite interval. P L Sachdev [4] has solved a non linear differential equation exponential function of dependent variable by using power series. Thus in this work the attempt has been made to adopt the Power Series Method to find the solution for non-linear differential equations with exponential function.

III. Proposed work for solution of Non-Linear Differential Equations with Exponential function using Power Series Method

The concept of power series is used in solving different mathematical problem. Particularly non-linear differential equations can be solved by applying power series method. And also if the series is slowly

convergent if may be of little use from a practical point of view. It may have to use exponential series to take this aspect into account. In the other hand it may sometimes obtain series which involve boundary value problems over infinite domain. The computational effort is essential to solve the one or several transcendental equations.

Solve: $y^{11} + ae^y = 0$ with initial condition $y'(0) = \sqrt{-a}$ and $y(0) = 0, a = -4, y'(0) = 2$

Solution:.

Consider the series solution is

$$y = \sum_{n=0}^{\infty} a_n x^n$$

$$e^{y(x)} = \sum_{n=0}^{\infty} e_n x^n$$

$$y' = \sum_{n=0}^{\infty} a_n x^{n-1}$$

$$x=0 \quad e^{y(0)} = e_0$$

$$y'' = \sum_{n=0}^{\infty} a_n (n-1) x^{n-2}$$

$$e_0 = 1$$

Substitute these in the equation

$y'' + ae^y = 0$ we get

$$\sum_{n=0}^{\infty} a_n (n-1) x^{n-2} + a \sum_{n=0}^{\infty} e_n x^n = 0$$

$$a_{n+2} = \frac{-ae_n}{(n+1)(n+2)} \text{-----(1)}$$

$$y(x) = a_0 + a_1 x + a_2 x^2 + \text{-----}$$

$$y(0) = a_0 = 0$$

$$y'(x) = a_1 + 2a_2 x + 3a_3 x^2 + \text{-----}$$

$$a_0 = 0 \quad y'(0) = a_1$$

$$a_1 = 2$$

put $n=0$ in (1)

$$a_2 = \frac{-ae_0}{2}$$

$$a = -4$$

$$a_2 = 2$$

Consider the series

$$e^{y(x)} = \sum_{n=0}^{\infty} e_n x^n$$

$$e^y y'(x) = \sum_{n=0}^{\infty} e_n n x^{n-1}$$

$$\sum_{n=0}^{\infty} e_n x^n \sum_{n=0}^{\infty} a_n n x^{n-1} = \sum_{n=0}^{\infty} e_n n x^{n-1}$$

We get the relation

$$e_{n+1} = \frac{1}{(n+1)} \left(\sum_{n=0}^{\infty} e_n n x^{n-1} (n+1-i) \right) \text{-----(2)}$$

put $n=1$ in (1)

$$a_3 = \frac{-ae_1}{6} \text{-----(3)}$$

$$a_3 = \frac{4}{3}$$

put $n=0$ in (2)

$$e_1 = 2$$

[because $a = -4$]

put $n=2$ in (1)

$$a_4 = \frac{-ae_2}{12}$$

put $n=1$ in (2)

$$e_2 = 4$$

$$a_4 = \frac{4}{3}$$

put n=3 in (1) we get

$$a_5 = \frac{-ae_3}{20} \text{-----(5)}$$

put e₃ in (5) we get

$$a_5 = \frac{4}{3}$$

put n=4 in (1) we get

$$a_6 = \frac{-ae_4}{30} \text{-----(6)}$$

$$a_6 = \frac{64}{45}$$

put n=5 in (1) we get

$$a_7 = \frac{-ae_5}{42} \text{-----(7)}$$

$$a_7 = \frac{488}{315}$$

put n=6 in (1) we get

$$a_8 = \frac{-ae_6}{56} \text{-----(8)}$$

$$a_8 = \frac{544}{315}$$

put n=2 in (2)

$$e_3 = \frac{20}{3}$$

put n=3 in (2)

$$e_4 = \frac{32}{3}$$

put n=4 in (2) we get

$$e_5 = \frac{244}{15}$$

put n=5 in (2) we get

$$e_6 = \frac{1088}{45}$$

The series solution is

$$y = \sum_{n=1}^{\infty} a_n x^n$$

$$y = a_0 + a_1 x + a_2 x^2 + a_3 x^3 + a_4 x^4 + \text{-----}$$

$$y = 2x + 2x^2 + \frac{4}{3}x^3 + \frac{4}{3}x^3 + \frac{4}{3}x^4 + \frac{4}{3}x^5 + \frac{64}{45}x^6 + \frac{488}{315}x^7 + \frac{544}{315}x^8 + \text{-----}$$

The analytical solution of $y'' + ae^y = 0$ by Murphy problem No.(15) in page No. 381 is $y = \log(1-x)^{-2}$ or $y = -2\log(1-x)$ for $a = -4$

Conclusion

Nowadays non-linear differential equations can be used in science and technology to describe the manner of change in a qualitative modeling. Non-linear differential equations have a much richer structure, but the solutions in closed form are generally not available. Hence in this work the second order non-linear differential equations with exponential function of dependent variable can be solved using power series method. In power series method Taylor's series is used since, it supports to construct a power series based on the derivatives of a function at a particular point and for a lot of functions which is vital to obtain the solution easily.

References

1. Guo B Y, Jacobi approximations in certain Hilbert spaces and their applications to singular differential equations, *J. Math. Anal. Appl.* **243** (2000) 373-408
2. Guo B Y, Jacobi spectral approximation and its applications to differential equations on the half line, *J. Comput. Math.* **18** (2000) 95-112
3. Boyd J P, Chebyshev and Fourier Spectral Methods, Second Edition (2000) (New York: Dover)
4. Abbasbandy S and Hayat T, Solution of the MHD Falkner-Skan flow by homotopy analysis method, *Commun. Nonlinear Sci. Numer. Simul.* **14** (2009) 3591-3598
5. P.L. Sachdev. : " Non-linear Ordinary Differential Equations and their Applications" MARCEL DEKKER.INC.1991
6. Neha Aggarwal, Nitin Verma and P. Arun. : The Article "Simple Pendulum revisited" European Journal of Physics -26(2005)517-523.
7. Murphy .G.M.: "Ordinary Differential Equations and their Solutions" Van Nostrand Reinhold, Princenton - 1960.
8. Hongwei Chen .: the Article "Two Classes of Power Series and Applications" (608-615) 2001
9. Richard Bronson. : "Theory and Problems of Differential Equations" Schaum's Outline Series.

EXACT SOLUTIONS FOR HEAT TRANSFER OF A MAGNETOHYDRODYNAMIC FLUID-SATURATED POROUS MEDIUM OVER A PERMEABLE NON-ISOTHERMAL STRETCHING SHEET

S.S. Bellad, Archana M*¹ and Vijayalakshmi A.R*

¹Department of Physics, Maharani's Science College for women, Maharani cluster University, Palace Road, Bangalore - 560 001.

*¹Department of Mathematics, Nagarjuna College of Management studies, Chickmarali, Nandi Hobli, Chikkaballapur - 562101

*Department of Mathematics, Maharani's Science College for women, Maharani cluster University, Palace Road, Bangalore - 560 001.

ABSTRACT: The study of flow and heat transfer of a magnetohydrodynamic viscous fluid-saturated porous medium, past a permeable and non-isothermal stretching sheet with internal heat generation or absorption and radiation is analyzed. Closed-form solutions to the full Darcy-Brinkman equations, without applying to boundary layer approximations, are found using a similarity transformation. We propose to find closed-form solutions for temperature corresponding to the thermal conditions, which are quadratic function of the distance from the origin. The temperature functions for heating conditions are given in terms of Kummer's functions. Asymptotic expressions of the temperature functions are also presented valid for both large and small modified Prandtl numbers. The effect of viscosity ratio, suction parameter, porous parameter is studied.

Keywords: Magnetohydrodynamic viscous fluid, saturated porous medium, Kummer's functions, Asymptotic expressions

1. INTRODUCTION

An interesting fluid mechanics application is found in polymer extrusion processes where the object on passing between two closely placed solid blocks is stretched into a liquid region. The stretching imparts a unidirectional orientation to the extrudate, thereby improving mechanical properties. The liquid is basically meant to cool the stretching sheet whose property as a final product depends greatly on the rate at which it is cooled. It is important to consider two important aspects in this physically interesting problem: proper choice of cooling liquid and regulation of the flow of the cooling liquid, due to the stretching sheet, to achieve a desired rate of cooling appropriate for successfully arriving at a sought final product. Flow and heat transfer from a linearly stretching sheet gained more importance due to practical applications in industrial processes. In most of the investigations involving heat transfer, we observe that either the constant prescribed surface temperature (PST) or constant prescribed wall heat flux (PHF) boundary condition is assumed. It is a well-known fact that constant PST and PHF assumed by many are difficult to realize. Also if the final product that is obtained after cooling needs to be non uniform in terms of properties, variable PHF is the appropriate temperature boundary condition

Heat generation or absorption may become important in weak-electrically conducting polymeric liquids due to the non-isothermal situation they are in and also due to the presence of cation/anion salts dissolved in them. An example of such a liquid is polythene oxide. The transfer of heat, mass and momentum in the laminar boundary layer flow on a heated stretching sheet are considered important from both theoretical and practical point of view. Such situations may arise often in polymer processing industry, liquid thin film development and other related surface flows. (Sakiadis,1961) studied first the boundary layer flow over a continuous solid surface moving in its own plane with a constant speed. It is generally assumed that the sheet is inextensible. But many cases arises in polymer industry in which it is necessary to deal with a stretching sheet as noted by (Crane,1970). (Gupta and Gupta ,1977) presented the heat and mass transfer over a stretching sheet with blowing or suction.

(Kumari, M etal, 1990) studied about the flow and heat transfer over a stretching sheet with a magnetic field in an electrically conducting fluid using numerical methods. (Subhas and Veena,1998) studied heat transfer characteristics in the laminar boundary layer flow of a visco-elastic fluid over a linearly stretching continuous surface with variable wall temperature subjected to suction or blowing and obtained solution in terms of kummer's function. (Siddheshwar and Mahabaleshwar, 2005) studied the

MHD flow and also heat transfer in a viscoelastic liquid over a stretching sheet in the presence of radiation. The stretching of the sheet is assumed to be proportional to the distance from the slit. (Vajravelu and Nayfeh, 1993) presented the flow and heat transfer by introducing temperature dependent heat source or sink. They considered heat transfer in a saturated porous medium over a continuous impermeable stretching surface with power law surface temperature (PST) and power law surface heat flux (PHF) including the effects of fractional heat and internal heat generation or absorption. Many authors including (Ranjagopal et al., 1984),(Anjalidevi S.P. and Thiyarajan M, 2002), (Sujit Kumar Khan et. al.,2005), have analyzed the problem on boundary layer flow due to the stretching sheet/continuous moving sheet for different flow models and boundary conditions.

In all the stretching sheet problems (both hydro-dynamic and hydromagnetic) mentioned earlier, radiation effect has not been considered. We know that the radiation effect is important under many non-isothermal situations. If the entire system involving the polymer extrusion process is placed in a thermally controlled environment, then radiation could become important. In this paper, we consider the effect of radiation, magnetic field and temperature dependent heat source over a stretching sheet, with variable PST/PHF.

2. MATHEMATICAL FORMULATION

2.1 Flow analysis

A two-dimensional flow of incompressible viscous fluid saturated in a porous medium past a permissible stretching sheet $y=0$ in the presence of a magnetic field \vec{B} is considered. The fluid is occupied above the sheet $y>0$. The axis is chosen perpendicular to the stretching sheet. The flow is generated by the application of two equal and opposite forces along the stretching sheet, keeping the origin fixed. The continuity and momentum equations for a steady, two dimensional fluid saturated porous medium in the presence of a weak magnetic field of strength B_0 are

$$\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} = 0$$

$$(1) \rho_f \left(u \frac{\partial u}{\partial x} + v \frac{\partial u}{\partial y} \right) = -\frac{\partial p}{\partial x} + \hat{\mu} \left(\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} \right) - \frac{\mu}{k_1} \phi u - \mu_m B_0^2 u \tag{2}$$

$$\rho_f \left(u \frac{\partial v}{\partial x} + v \frac{\partial v}{\partial y} \right) = -\frac{\partial p}{\partial y} + \hat{\mu} \left(\frac{\partial^2 v}{\partial x^2} + \frac{\partial^2 v}{\partial y^2} \right) - \frac{\mu}{k_1} \phi v \tag{3}$$

where u, v and p are the velocity component in the x -direction, velocity component in the y -direction, and pressure. The physical quantities $\rho_f, \phi, \hat{\mu}, \mu$ and k_1 are the density of the fluid, porosity, effective viscosity, permeability and magnetic field respectively and they are all assumed to be constants.

We assume that the flow is subjected to suction on the sheet with constant transverse velocity v_0 and the sheet is stretching with a constant rate $c>0$.

The relevant boundary conditions are

$$u = u_w = cx, v = -v_0, p = p_w \text{ at } y=0, \tag{4}$$

$$u \rightarrow 0 \text{ as } y \rightarrow \infty \tag{5}$$

where u_w and p_w are the longitudinal velocity component and the pressure specified at the sheet respectively.

We introduce a similarity transform for velocity component and pressure as,

$$u = cx f'(\eta), v = -\left(\frac{c\mu}{\rho_f}\right)^{1/2} f(\eta), p = p_w - \frac{1}{2} \frac{c\mu}{\phi} g(\eta), \tag{6}$$

with $\eta = \left(\frac{c\rho_f}{\mu}\right)^{1/2} y$,

Using equation (6) into equation (2) and equation (3), we get

$$f^{l^2} - ff^{ll} = \Lambda f^{lll} - (K + H) f^l, \tag{7}$$

$$ff^l = \frac{1}{2} g^l - \Lambda f^{ll} + Kf \tag{8}$$

and

$$f(0) = R, f^l(0) = 1, g(0) = 0, f^l(\infty) \rightarrow 0 \tag{9}$$

where $\Lambda = \frac{\hat{\mu}}{\mu}$ is the viscosity ratio, $K = \frac{\phi\mu}{k_1\rho_f c}$ is the porous parameter, $R = \frac{v_0}{\left(\frac{c\mu}{\rho_f}\right)^{1/2}}$ is the suction

parameter and $H = \frac{p\mu B_0^2}{c\rho_f}$ is the magnetic parameter

The solution of equation (7) subject to equation (9) can be obtained as, $f(\eta) = A + Be^{-m\eta}$, (10a)

where $m = \frac{A + \sqrt{A^2 + 4\Lambda k}}{2\Lambda}$, $A = \frac{(1 + 2k)R + \sqrt{R^2 + 4\Lambda(\Lambda + K)}}{2(1 + K)}$,

$$B = \frac{-2\Lambda}{R + \sqrt{R^2 + 4\Lambda(\Lambda + K)}} \tag{10b-d}$$

$g(\eta)$ can be obtained by integrating equation (8) and using equation (9) as

$$g(\eta) = f^2 + 2\Lambda f^l - 2(K + H) \int_0^\eta f d\eta - 2\Lambda - R^2 \tag{11}$$

The solution for velocity component and pressure are given by,

$$u = -Bme^{-m\eta} cx \tag{12}$$

$$v = -\left(\frac{c\mu}{\rho_f \mu_w^2}\right)^{1/2} (A + Be^{-m\eta}) \tag{13}$$

$$\varphi = P_w - \frac{1}{2} c\mu \left\{ (A - Be^{-m\eta})^2 - 2\Lambda (Bme^{-m\eta}) + 2(K + H) \left(A\eta - \frac{Be^{-m\eta}}{m} \right) - 2\Lambda - R^2 + 2(K + H) \frac{R}{m} \right\} \tag{14}$$

The dimensionless skin friction at the sheet can be calculated form,

$$C_f = \frac{\tau_w}{\rho_f u_w^2} = \Lambda \text{Re}_x^{-1/2} f^{ll}(0), \tag{15}$$

where $f^{ll}(0) = Bm^2$ is the dimensionless velocity gradient,

$\text{Re}_x = \frac{\rho_f u_w x}{\mu}$ is the local Reynolds number.

Case (i) :Very Large Suction $R \gg 1$

We expand equation (10.b) to equation (10.d) into a two-term approximations where $R \gg 1$, respectively as follows,

$$A \sim R + \frac{\Lambda}{R}, \tag{16}$$

$$B \sim -\frac{\Lambda}{R} + \frac{\Lambda^2(1+K+H)}{R^3}, \tag{17}$$

$$m \sim \frac{R}{\Lambda} + \frac{(1+K+H)}{R} \tag{18}$$

and find

$$f''(0) = Bm^2 = -\frac{R}{\Lambda} - \frac{(1+K+H)}{R} + O(R^{-3}) \tag{19}$$

Case(ii): Very large injection , $R = -R^*$ and $R^* \gg 1$

In this case,

$$A \sim -\frac{(K+H)}{1+K+H}R^* + \frac{\Lambda}{R^*}, \tag{20}$$

$$B \sim \frac{H\Lambda}{R^*} + \frac{4\Lambda^2(1+K+H)}{R^{*3}}, \tag{21}$$

$$m \sim \frac{1+K+H}{R^*} - \Lambda \frac{(1+K+H)^2}{R^{*3}} + 2\Lambda^2 \frac{(1+K+H)^3}{R^{*5}} \tag{22}$$

And the dimensionless velocity gradient is given by,

$$f''(0) = -\frac{(1+K+H)}{R^*} - \frac{2\Lambda(1+K+H)^2}{R^{*3}} + O(R^{-5}) \tag{23}$$

2.2 Heat transfer analysis

The steady 2-D energy equation for a porous medium with internal heat generation or absorption in the presence of radiation is governed as

$$(\rho C_p)_f \phi \left(u \frac{\partial T}{\partial x} + v \frac{\partial T}{\partial y} \right) = k_m \left(u \frac{\partial^2 T}{\partial x^2} + v \frac{\partial^2 T}{\partial y^2} \right) + Q_m (T - T_\infty) + \frac{16\sigma_m^* T_\infty^3}{3k_m^*} \left(\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} \right) \tag{24}$$

where T is the temperature of the mixture and T_∞ is the temperature far from the sheet. The physical quantities $C_p, k_m, Q_m, \sigma_m^*$ and k_m^* are the specific heat at constant pressure, thermal conductivity, volumetric rate of internal heat generation or absorption, the Stephan-Boltzmann constant and the mean absorption coefficient, respectively and they are all assumed to be constants for simplicity. The subscripts m and f denote the properties belonging to the mixture.

Two thermal boundary conditions are considered, for example, the prescribed surface temperature condition (PST) and prescribed surface heat flux condition (PHF).The boundary conditions are

$$T = T_w = T_\infty + Dx \text{ (PST)} \tag{25}$$

$$q_w = -k_m \frac{\partial T}{\partial y} = Ex \quad (PHF) \quad (26)$$

$$\text{and } T \rightarrow T_\infty \text{ as } y \rightarrow \infty \quad (27)$$

where T_w is the wall temperature, q_w is the wall heat flux and D and E are proportional constants.

Case(i) The Prescribed Surface Temperature (PST) case

In PST case we introduce a transformation for the temperature

$$\begin{aligned} \theta &= \frac{T - T_\infty}{T_w - T_\infty} \\ \Rightarrow T &= \theta(\eta)Dx + T_\infty \\ &= \varphi(x, \eta) + T_\infty = x\theta_1(\eta) + T_\infty \end{aligned} \quad (28)$$

where η is defined in Equation (6). Substituting Equations (6), (10) and (24) into Equations (20), (21) and (23) yields

$$(1 + Nr)\theta_1'' + P \left(A - \frac{e^{-m\eta}}{m} \right) \theta_1' + P\alpha\theta_1 = 0 \quad (29)$$

$$\theta_1(0) = 1, \theta_1(\infty) \rightarrow 0 \quad (30)$$

where

$Nr = \frac{16\sigma_m^* T_\infty^3}{3k_m^* k_m}$ is the radiation parameter, $P = \frac{c_p \mu \phi}{k_m}$ is the Prandtl number and $\alpha = \frac{Q_m}{\phi(\rho c_p)_f}$ is the internal heat parameter.

Using $\xi = \frac{PBe^{-m\eta}}{m(1 + Nr)}$ Equations (25) and (26) are transformed to,

$$\xi\theta_1'' + \left(\frac{P^*A}{m} - \xi \right) \theta_1' + \frac{\alpha P^*}{\xi} \theta_1 = 0 \quad (31)$$

$$\theta \left(\frac{P^*B}{m} \right) = 1, \quad \theta(0) = 0 \quad (32)$$

where the primes stand for differentiation with respect to ξ and

$P^* = \frac{P}{1 + Nr}$ is the modified Prandtl number.

After further transformation the solution of Equation (31) subject to Equation (32) can be solved, in terms of Kummer's function as,

$$\theta_1(\xi) = \left(\frac{m\xi}{P^*B} \right)^{p+q} \frac{M(p+q-1, 2q+1, \xi)}{M\left(p+q-1, 2q+1, \frac{P^*B}{m}\right)} \quad (33)$$

where

$$p = \frac{P^* A}{2m}, \quad q = \sqrt{\frac{P^* A^2 - 4P^* \alpha}{2m}}, \tag{34}$$

and

$$M(a, b, z) = 1 + \sum_{n=1}^{\infty} \frac{(a)_n z^n}{(b)_n n!} \tag{35}$$

is the Kummer's function,

$$(a)_n = a(a+1)(a+2)\dots\dots(a+n-1) = \frac{\Gamma(a+n)}{\Gamma(a)}$$

$\Gamma(a)$ is the Gamma function.

solution of equation (33) in terms of η is

$$\therefore \varphi(x, \eta) = x \left\{ \frac{M\left(p+q-1, 2q+1, \frac{P^* B e^{-m\eta}}{m}\right)}{(e^{-m\eta})^{p+q} M\left(p+q-1, 2q+1, \frac{P^* B}{m}\right)} \right\} \tag{36}$$

The local heat flux at the sheet can be expressed as

$$q_w = -k_m \frac{\partial T}{\partial y} = -k_m D_x \sqrt{\frac{c\rho_f}{\mu}} \theta_1'(0) \tag{37}$$

$$\therefore \theta_1'(0) = - \left\{ \frac{m(p+q) + P^* B \frac{p+q-1}{2q+1} \frac{M\left(p+q-1, 2q+1, \frac{P^* B e^{-m\eta}}{m}\right)}{M\left(p+q-1, 2q+1, \frac{P^* B}{m}\right)}}{m(p+q) + P^* B \frac{p+q-1}{2q+1}} \right\} \tag{38}$$

Case(ii) The Prescribed Surface Heat Flux (PHF) Case

In the PHF case, the dimensionless temperature is assumed to be of the form,

$$T - T_\infty = \frac{Ex}{k_m} \sqrt{\frac{\mu}{c\rho_f}} h_1(\eta) \tag{39}$$

and the corresponding energy equation and boundary conditions become

$$(1 + Nr)h_1'' + P\left(A - \frac{e^{-m\eta}}{m}\right)h_1' + P\alpha h = 0 \tag{40}$$

and

$$h_1'(0) = -1, \quad h_1(\infty) \rightarrow 0 \tag{41}$$

The solution of equation is obtained as

$$h_1(\eta) = c_1 e^{-m(p+q)\eta} M\left(p+q-1, 2q+1, \frac{P^* B e^{-m\eta}}{m}\right) \tag{42}$$

where

$$c_1 = \left[m(p+q)M\left(p+q-1, 2q+1, \frac{P^*B}{m}\right) + P^*B\left(\frac{p+q-1}{2q+1}\right)M\left(p+q, 2q+2, \frac{P^*B}{m}\right) \right]^{-1} \quad (43)$$

By equating the coefficients we get

$$(1+Nr)h_1^{11} + p\left(A - \frac{e^{-m\eta}}{m}\right)h_2^1 + p\alpha h_2 = -\frac{c_p \mu}{k_m} \frac{M_{L,P}\left(\frac{Q_1^2}{m^2 p_1} e^{-m\eta}\right)}{M_{L,P}\left(\frac{Q_1^2}{m^2 p_1}\right)} \quad (44)$$

$$h_1'(0) = 0, \quad h_1(\infty) \rightarrow 0$$

whose solution is given by

$$\left(\frac{\Gamma(2(p+q)-1)\Gamma(2q+1)}{\Gamma(p+q+1)\Gamma(3q+p+1)} \xi \right) \xi^{p+q} \quad (45)$$

3. Asymptotic Analysis

In this section we derive the asymptotic expressions of the temperature functions $\varphi(x, \eta)$ and $h(x, \eta)$ valid for both large and small the modified Prandtl numbers.

3.1 The Prescribed Surface Temperature Case:

The Kummer's function can be approximated to the first order as

$$M(a, b, -z) \approx (1 + c_0 z)^{-a} \quad (46)$$

with

$$M(a, b, -z) \approx 1 \text{ as } z \rightarrow 0 \quad (47)$$

and

$$M(a, b, -z) \approx (c_0 z)^{-a} \text{ as } z \rightarrow \infty \quad (48)$$

where c_0 is a constant to be determined by matching equation

$$c_0 = \left(\frac{\Gamma(b)}{\Gamma(b-a)} \right)^{-\frac{1}{a}} \quad (49)$$

Now,

$$M\left(p+q-1, 2q+1, \frac{P^*B e^{-m\eta}}{m}\right) \sim \left(1 - \frac{C_1 P^* B e^{-m\eta}}{m}\right)^{1-(p+q)} \quad (50)$$

and

$$M\left(p+q-1, 2q+1, \frac{P^*B}{m}\right) \sim \left(1 - \frac{C_1 P^* B}{m}\right)^{1-(p+q)} \quad (51)$$

where

$$C_1 = \left(\frac{\Gamma(2q+1)}{\Gamma(p+q-1)} \right)^{-\frac{1}{p+q-1}} \quad (52)$$

The temperature function $\phi(x, \eta)$ can be approximated as,

$$\phi(x, \eta) = x \left\{ e^{-m(p+q)\eta} \left(\frac{1 - C_1 \frac{P^* B e^{-m\eta}}{m}}{1 - C_1 \frac{P^* B}{m}} \right)^{1-p-q} \right\} \quad (53)$$

3.2 The Prescribed Surface Heat Flux (PHF) Case:

In PHF case, the temperature function $H(x, \eta)$ valid for both large and small modified Prandtl number is given by,

$$h(\eta) = C_3 e^{-m(p+q)\eta} \left(1 - \frac{C_1 P^* B e^{-m\eta}}{m} \right)^{1-(p+q)} \quad (54)$$

where

$$C_3 = \left(m(p+q) \left(1 - \frac{C_1 P^* B}{m} \right)^{1-(p+q)} + P^* B \left(\frac{p+q-1}{2q+1} \right) \left(1 - \frac{C_2 P^* B}{m} \right)^{-(p+q)} \right)^{-1} \quad (55)$$

$$C_2 = \left(\frac{\Gamma(2q+2)}{\Gamma(q-p+2)} \right)^{\frac{-1}{p+q}} \quad (56)$$

$$H(x, \eta) = x \left[C_3 e^{-m(p+q)\eta} \left(1 - C_1 \frac{P^* B e^{-m\eta}}{m} \right)^{1-(p+q)} \right] \quad (57)$$

3. RESULTS AND DISCUSSION

In this paper, we consider the effect of radiation, magnetic field and temperature dependent heat source over a stretching sheet, with variable PST/PHF using Kummer’s functions.

From the table the dimensionless temperature gradient at the wall $\theta_1'(0)$ increases with K, α and Nr but decreases with Λ , R and Pr which implies that the thermal boundary layer thickness will increase with Λ , R but will decrease with K, α and Nr. As Pr increases $\theta_1'(0)$ decreases. Wall temperature $h(0)$ behaves similar to $\theta_1'(0)$. Asymptotic expressions of temperature functions valid for large and small modified Prandtl numbers are presented.

Λ	K	R	α	Pr	Nr	$\theta_1'(0)$	$h(0)$
1	0	0.1	-0.2	1	0	-1.1652	0.8582
	1					-1.0882	0.9189
	2					-1.0363	0.9650
	5					-0.9417	1.0620
0.5	1	0.1	-0.2	1	0	-0.9905	1.0096
	1					-1.0882	0.9189
	2					-1.1703	0.8545
	5					-1.2490	0.8006
1	1	0	-0.2	1	0	-1.0351	0.9661
		0.1				-1.0882	0.9189
		0.5				-1.3252	0.7541
		1.0				-1.6690	0.5991
1	1	0.1	-0.2	1		-1.0882	0.9189

			0 0.2		0	-0.9489 -0.8523	1.0538 1.1733
1	1	0.1	-0.2	0.5 1 2 5	0	-0.6900 -1.0882 -1.6885 -2.9569	1.4492 0.9189 0.5922 0.3382
1	1	0.1	-0.2	1	0 1 2 5	-1.0882 -0.6900 -0.5256 -0.3291	0.9189 1.4492 1.9022 3.0380

5. REFERENCES

1. Anjalidevi ,S.P. and Thiyarajan, M. 2002.Non-linear hydro-magnetic flow and heat transfer over a surface stretching with power law velocity. J. Heat and Mass transfer,38:407-413.
2. Crane, L.J.1970. Flow past a stretching plate. Z Angew Math Phys,21(4):645–647.
3. Gupta, P.S. Gupta, A.S. 1977.Heat and mass transfer on a stretching sheet with suction or blowing. Can J Chem Eng,55: 744–746.
4. Kumari, M and Takhar, H.S. and Nath, G. 1990.MHD flow and heat transfer over a stretching surface with prescribed wall temperature or heat flux. Heat and Mass Transfer, 25 (6):331-336
5. Rajagopal, K.R., Na TY and Gupta, A.S. Flow of a visco-elastic fluid over a stretching sheet.1984. Rheol Acta ,23:213–215.
6. Sakiadis,B.C.1961.Boundary layer behaviour on continuous solid surface.AIChE.J. 7:26-28.
7. Siddheshwar, P.G and Mahabaleswar, U.S.2005. Effects of radiation and heat source on MHD flow of a viscoelastic liquid and heat transfer over a stretching sheet. International Journal of Non-Linear Mechanics, 40:807-820
8. Subhas,A. and Veeena,P.1998. Visco-elastic fluid flow and heat transfer in a porous medium over a stretching sheet, International Journal of Non-Linear Mechanics,33(3):531-540
9. Sujitkumar Khan and Sanjayanad, E.2005. Visco-elastic boundary layer flow and heat transfer over an exponential stretching sheet. Int. J. of Heat and Mass transfer,48:1534-1542.
10. Vajravelu, K. and Nayfeh,J.1993.Convective heat transfer at stretching sheet. ACTA Mech.,96(1-4) 47-54.

STUDY OF VELOCITY AND TEMPERATURE OF GRAVITY-DRIVEN CONVECTIVE NANOFLUIDS FLOW PAST AN OSCILLATING AN OSCILLATING VERTICAL PLATE IN THE PRESENCE OF MAGNETIC FIELD

Ramya T.G. and Vijayalakshmi A.R*,

Department of Mathematics, Maharani's Science College for women,
Maharani cluster University, Palace Road, Bangalore – 560 001.

ABSTRACT: *The unsteady gravity-driven convective flow and heat transfer of nanofluid past an oscillating, vertical plate is considered. The flow is confined to $y>0$ where y is the coordinate measure in the normal direction to the plate. The fluid is assumed to be electrically conducting with a uniform magnetic field applied in a direction perpendicular to the plate. The resulting problem is solved using Laplace transform technique. Numerical results for velocity profile and temperature profile for different values of all parameters which are involved in dimensionless equation are presented here..*

Keywords: *nano fluid, magnetic field, Laplace transform*

1. INTRODUCTION

Nanofluids are a class of fluids engineered by dispersing nanometer-sized materials (nanoparticles, nanofibers, nanotubes, nanowires, nanorods, nanosheet, or droplets) in base fluids. In other words, nanofluids are nanoscale colloidal suspensions containing condensed nanomaterials. They are two-phase systems with one phase (solid phase) in another (liquid phase). Nanofluids have been found to possess enhanced thermophysical properties such as thermal conductivity, thermal diffusivity, viscosity, and convective heat transfer coefficients compared to those of base fluids like oil or water. It has demonstrated great potential applications in many fields. Thermo physical properties of the nanofluids are quite essential to predict their heat transfer behavior. It is extremely important in the control for the industrial and energy saving perspectives. Nanoparticles have great potential to improve the thermal transport properties compared to conventional particles fluids suspension. In the last decade, nanofluids have gained significant attention due to its enhanced thermal properties.

(Choi and Eastman,1995) were the first to use nanoparticles to enhance thermal conductivity of fluids and heat transfer rate.(Chamkha etal,2015)presented review of MHD convection of nanofluids in various geometries and applications. The MHD boundary layer flow over a vertical stretching/shrinking sheet in a nano-fluid was investigated by (Makinde etal,2013) and (Das,2014). (Nadeem etal,2014),(Nadeem etal,2015)investigated MHD flow of different types of nano fluids over a convective surface. (Das etal ,2015) studied the MHD Nanofluid flow past an impulsively started porous flat plate in a rotating frame.

The gravity- driven convective heat transfer is an important phenomenon in the cooling mechanism of many engineering systems like the electronic industry, solar collectors and cooling systems for nuclear reactors because of its minimum cost, low noise, smaller size and reliability.The study of magneto hydrodynamic gravity-driven convection through a nano fluid past an infinite vertical plate is considered very essential in understanding the behavior of the performance of fluid motion in several applications. The problem of gravity-driven convection in a regular fluid past a vertical plate is a classical problem solved by (Ostrach,1953). (Seigel,1958) was the first to study the transient free-convective flow past a semi-infinite vertical plate by integral method.

In this paper we study the hydromagnetic gravity-driven convective boundary layer flow of nanofluids past an oscillating vertical plate in the presence of an uniform transverse magnetic field. In the fluid considered water is base fluid with suspensions on nanosized copper (Cu) and silver (Ag) particles. The governing equations are solved analytically and presented in closed form.

2. MATHEMATICAL FORMULATION

The unsteady gravity-driven convective flow and heat transfer of nano fluid past an oscillating vertical plate is considered. At time $t = 0$ the plate is at rest with the constant basic temperature T_0 and at

time $t > 0$, the plate begins to oscillate in its own plane according to $u_0 = \sin \omega t$ where u_0 is amplitude of the plate oscillations and the temperature of the plate is raised or lowered to constant temperature T_w . In the fluid considered the base fluid is water and suspended nanoparticles are copper and silver and it is further assumed that the base fluid and the suspended nanoparticles are in thermal equilibrium and density is linearly dependent on temperature buoyancy forces.

Thermo-physical properties of the base fluid and different nano particles are given [4]

Physical properties	Water	Cu	Ag
Cp(J/kg K)	4179	385	235
ρ (kg/m ³)	997.1	8893	10500
K(W/mK)	0.613	401	429
$\beta \times 10^5$ (K ⁻¹)	21	1.67	1.89

The basic equations in the presence of magnetic field past an oscillating vertical plate are

$$\rho_{nf} \frac{\partial u}{\partial t} = \mu_{nf} \frac{\partial^2 u}{\partial y^2} + g(\rho\beta)_{nf}(T - T_0) - \sigma_{nf} B^2 u \quad (1)$$

$$(\rho c_p)_{nf} \frac{\partial T}{\partial t} = k_{nf} \frac{\partial^2 T}{\partial y^2} \quad (2)$$

where

$$\rho_{nf} = (1-\phi)\rho_f + \phi\rho_s, \mu_{nf} = \frac{\mu_f}{(1-\phi)^{2.5}}, \sigma_{nf} = \sigma_f \left[1 + \frac{3(\sigma-1)}{(\sigma+2) - (\sigma-1)\phi} \right],$$

$$(\rho\beta)_{nf} = (1-\phi)(\rho\beta)_f + \phi(\rho\beta)_s, k_{nf} = k_f \left[1 - \frac{3\phi(k_f - k_s)}{2k_f + k_s + \phi(k_f - k_s)} \right]$$

$$(\rho c_p)_{nf} = (1-\phi)(\rho c_p)_f + \phi(\rho c_p)_s \quad (3)$$

The initial and boundary conditions are

$$t = 0 \quad u = 0 \quad T = T_0 \quad \text{for } y \geq 0$$

$$t > 0 \quad u = u_0 \sin \omega t \quad T = T_w \quad \text{for } y = 0 \quad (4)$$

$$t > 0 \quad u \rightarrow 0 \quad T \rightarrow T_0 \quad \text{for } y \rightarrow \infty$$

Introducing non-dimensional variables

$$y^* = \frac{u_0 y}{\nu_f}, t^* = \frac{u}{u_0}, \theta = \frac{T - T_0}{T_w - T_0}, \omega^* = \frac{\nu_f \omega}{u_0^2} \quad (5)$$

equation (1) and equation (5) becomes

$$\frac{\partial u}{\partial t} = a_1 \frac{\partial^2 u}{\partial y^2} + Gr a_2 \theta - M^2 a_3 u \quad (6)$$

$$\frac{\partial \theta}{\partial t} = a_4 \frac{\partial^2 \theta}{\partial y^2} \quad (7)$$

where

$$b_0 = 1 - \phi, b_1 = \left(b_0 + \phi \frac{\rho_s}{\rho_f} \right), b_2 = \left(b_0 + \phi \frac{(\rho\beta)_s}{(\rho\beta)_f} \right), b_3 = \left(b_0 + \phi \frac{(\rho c_p)_s}{(\rho c_p)_f} \right)$$

$$b_4 = \frac{k_{nf}}{k_f}, b_5 = \frac{\sigma_{nf}}{\sigma_f}, b_6 = \frac{b_4}{b_3}, a_1 = \frac{1}{b_0^{2.5} b_1}, a_2 = \frac{b_2}{b_1}, a_3 = \frac{b_5}{b_1}, a_4 = \frac{b_4}{b_3 Pr} \quad (10)$$

M is the Magnetic parameter where $M^2 = \frac{\sigma_f B^2 U_f}{\rho_f u_0^2}$, Prandtl number $Pr = \frac{\mu_f c_p}{k_f}$, Grashof

number $Gr = \frac{g \beta_f (T_w - T_0) \nu_f}{u_0^3}$, k is thermal conductivity, ω is amplitude of plate oscillation. f is the

fluid phase, nf is nano-fluid

The corresponding initial and boundary conditions are

$$t = 0 \quad u = 0 \quad \theta = 0 \quad \text{for } y \geq 0$$

$$t > 0 \quad u = \sin \omega t \quad \theta = 1 \quad \text{for } y = 0 \quad (11)$$

$$t > 0 \quad u \rightarrow 0 \quad \theta \rightarrow 0 \quad \text{for } y \rightarrow \infty$$

Taking Laplace transform of equation (9) and equation (11) we get

$$\bar{\theta} = \frac{1}{s} e^{-y s \sqrt{a_4}} \quad (12)$$

Taking Laplace transform of equation (8) we get

$$\bar{u} = \frac{i}{2} F_1(y, s) - \frac{i}{2} F_2(y, s) - c_6 F_3(y, s) + c_6 F_4(y, s) + c_6 F_5(y, s) - c_6 F_6(y, s) \quad (13)$$

$$F_1(y, s) = \frac{e^{-y \sqrt{\frac{s+c_1}{a_1}}}}{s+i\omega}, F_2(y, s) = \frac{e^{-y \sqrt{\frac{s+c_1}{a_1}}}}{s-i\omega}, F_3(y, s) = \frac{e^{-y \sqrt{\frac{s+c_1}{a_1}}}}{s}$$

$$F_4(y, s) = \frac{e^{-y \sqrt{\frac{s+c_1}{a_1}}}}{s-c_4}, F_5(y, s) = \frac{e^{-y \sqrt{\frac{s}{a_4}}}}{s}, F_6(y, s) = \frac{e^{-y \sqrt{\frac{s}{a_4}}}}{s-c_4}$$

$$c_1 = M^2 a_3, c_2 = Gr a_2, c_3 = \frac{a_1}{a_4} - 1, c_4 = \frac{c_1}{c_3}, c_5 = \frac{c_2}{c_3}, c_6 = \frac{c_5}{c_4} \quad (14)$$

Taking Inverse Laplace transform of equation (12) and equation (13) we get

$$\theta(y, t) = \text{erfc} \left(\frac{y \sqrt{\frac{1}{a_4}}}{2\sqrt{t}} \right) \quad (15)$$

$$u(y, t) = \frac{i}{2} f_1(y, t) - \frac{i}{2} f_2(y, t) - c_6 f_3(y, t) + c_6 f_4(y, t) + c_6 f_5(y, t) - c_6 f_6(y, t) \quad (16)$$

where

$$\begin{aligned}
 f_1(y,t) &= \frac{e^{-i\omega t}}{2} \left[e^{-y\sqrt{\frac{1}{a_1}(c_1-i\omega)}} \operatorname{erfc}\left(\frac{y}{2\sqrt{a_1 t}} - \sqrt{(c_1-i\omega)t}\right) + \right. \\
 &\quad \left. e^{y\sqrt{\frac{1}{a_1}(c_1-i\omega)}} \operatorname{erfc}\left(\frac{y}{2\sqrt{a_1 t}} + \sqrt{(c_1-i\omega)t}\right) \right] \\
 f_2(y,t) &= \frac{e^{i\omega t}}{2} \left[e^{-y\sqrt{\frac{1}{a_1}(c_1+i\omega)}} \operatorname{erfc}\left(\frac{y}{2\sqrt{a_1 t}} - \sqrt{(c_1+i\omega)t}\right) + \right. \\
 &\quad \left. e^{y\sqrt{\frac{1}{a_1}(c_1+i\omega)}} \operatorname{erfc}\left(\frac{y}{2\sqrt{a_1 t}} + \sqrt{(c_1+i\omega)t}\right) \right] \\
 f_3(y,t) &= \frac{1}{2} \left[e^{-y\sqrt{\frac{c_1}{a_1}}} \operatorname{erfc}\left(\frac{y}{2\sqrt{a_1 t}} - \sqrt{c_1 t}\right) + e^{-y\sqrt{\frac{c_1}{a_1}}} \operatorname{erfc}\left(\frac{y}{2\sqrt{a_1 t}} + \sqrt{c_1 t}\right) \right] \\
 f_4(y,t) &= \frac{e^{c_4 t}}{2} \left[e^{-y\sqrt{\frac{1}{a_4}(c_1+c_4)}} \operatorname{erfc}\left(\frac{y}{2\sqrt{a_4 t}} - \sqrt{(c_1+c_4)t}\right) + \right. \\
 &\quad \left. e^{y\sqrt{\frac{1}{a_4}(c_1+c_4)}} \operatorname{erfc}\left(\frac{y}{2\sqrt{a_4 t}} + \sqrt{(c_1+c_4)t}\right) \right] \\
 f_5(y,t) &= \operatorname{erfc}\left(\frac{y}{2\sqrt{a_4 t}}\right) \\
 f_6(y,t) &= \frac{e^{c_4 t}}{2} \left[e^{-y\sqrt{\frac{c_4}{a_4}}} \operatorname{erfc}\left(\frac{y}{2\sqrt{a_4 t}} - \sqrt{c_4 t}\right) + e^{y\sqrt{\frac{c_4}{a_4}}} \operatorname{erfc}\left(\frac{y}{2\sqrt{a_4 t}} + \sqrt{c_4 t}\right) \right]
 \end{aligned}
 \tag{17}$$

From equation (12) Nusselt number Nu can be written as

$$Nu = -\left(\frac{\partial\theta}{\partial y}\right)_{y=0} = -\sqrt{\frac{1}{a_4\pi t}} \tag{18}$$

From equation (13) skin friction τ can be written as

$$\tau^*(y,t) = -\tau \tag{19}$$

$$\tau = \frac{\partial\theta}{\partial y}\Big|_{y=0} = \frac{i}{2}h_1(t) - \frac{i}{2}h_2(t) - c_6h_3(t) + c_6h_4(t) + c_6h_5(t) - c_6h_6(t) \tag{20}$$

where

$$h_1(t) = e^{-i\omega t} \sqrt{\frac{c_1 - i\omega}{a_1}} \operatorname{erfc}\left(\sqrt{(c_1 - i\omega)t}\right) + \frac{e^{-c_1 t}}{\sqrt{\pi a_1 t}},$$

$$h_2(t) = e^{i\omega t} \sqrt{\frac{c_1 + i\omega}{a_1}} \operatorname{erfc}\left(\sqrt{(c_1 + i\omega)t}\right) + \frac{e^{-c_1 t}}{\sqrt{\pi a_1 t}},$$

$$h_3(t) = -\sqrt{\frac{c_1}{a_1}} \operatorname{erfc}\left(\sqrt{c_1 t}\right) + \frac{e^{-c_1 t}}{\sqrt{\pi a_1 t}} \quad h_4(t) = e^{c_4 t} \sqrt{\frac{c_4 + c_1}{a_1}} \operatorname{erfc}\left(\sqrt{(c_4 + c_1)t}\right) + \frac{e^{-c_1 t}}{\sqrt{\pi a_1 t}}, \quad h_5(t) = \frac{1}{\sqrt{\pi a_4 t}},$$

$$h_6(t) = -e^{c_4 t} \sqrt{\frac{c_4}{a_4}} \operatorname{erfc}\left(\sqrt{c_4 t}\right) + \frac{1}{\sqrt{\pi a_4 t}} \tag{21}$$

3. RESULTS AND DISCUSSION

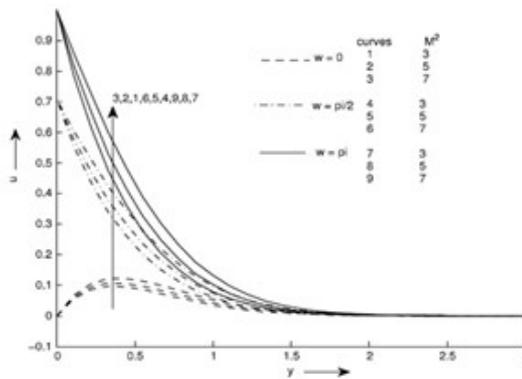


Fig.1 Velocity profile for different values of y and M^2 at $t=0.5, Gr=5, Pr=6.2, \theta=0.15$

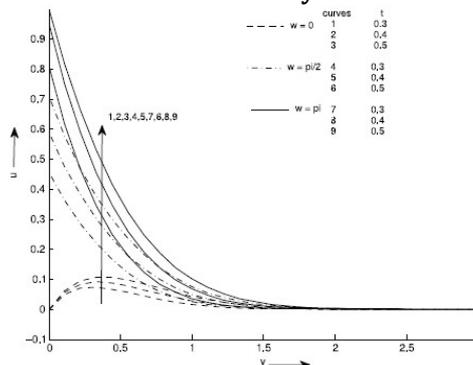


Fig.2 Velocity profile for different values of y and t at $M^2=3, Gr=5, Pr=6.2, \theta=0.15$

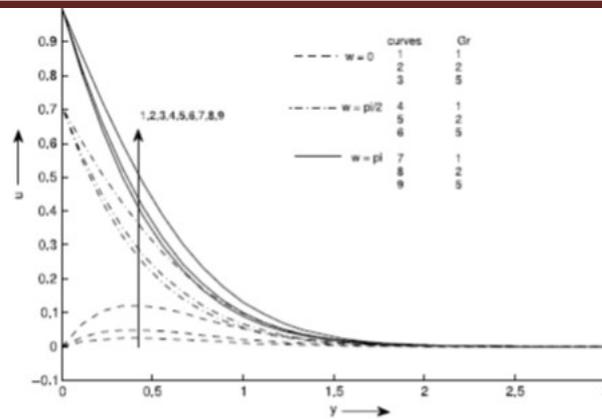


Fig.3 Velocity profile for different values of y and Gr at $M^2 = 3, t = 0.5, Pr = 6.2, \theta = 0.15$

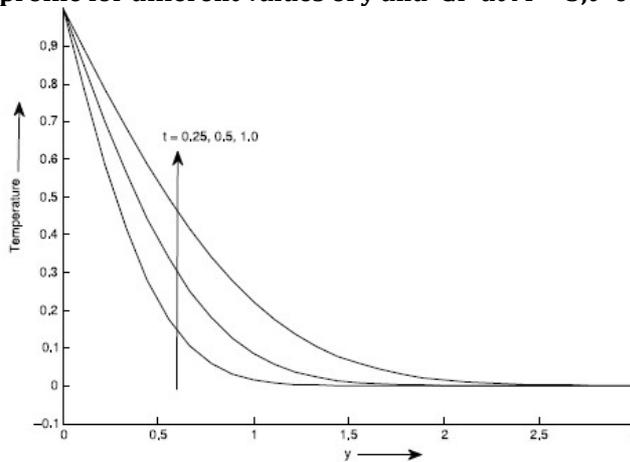


Fig 4 Temperature profile for different values of y and t at $M^2 = 3, Gr = 5, Pr = 6.2, \theta = 0.15$

Fig.1 shows the effect of magnetic parameter M on the velocity. The amplitude of velocity as well as the boundary layer thickness decreases when M is increased. This is due to the fact that the effect of transverse magnetic field which results in Lorentz force is similar to the drag force. Fig.2 shows the influence of dimensionless time t on the velocity profiles. It is observed that velocity is an increasing function of time t . Fig.3 shows the effect of Grashof number Gr and it is found that velocity increases with increase in Gr . Fig.4 shows the effect of dimensionless time t on the temperature profiles. It is observed that velocity is a decreasing function of time t . This graphical representation is in good agreement with the boundary conditions on temperature as in equation(11).

REFERENCES

1. Chamkha, A. J., Jena, S. K. and Mahapatra, S. K. 2015. MHD Convection of Nanofluids: A Review. *J. Nanofluids*, 4,3: 271-292.
2. Choi, S.U.S. and Eastman, J.A. 1995. Enhancing thermal conductivity of fluids with nano particles, *Mater Aci*, 231:99-105.
3. Das, S., R. Jana, R.N. and Makinde, O.D. 2014. MHD Boundary layer slip flow and heat transfer of nanofluid past a vertical stretching sheet with non-uniform heat generation/absorption, *Int J Nanosci*, 13
4. Das, S., Mandal, H.K., Jana, R.N. and Makinde, O.D. 2015. Magneto-Nanofluid flow past an impulsively started porous flat plate in a rotating frame, *Nanofluids*, 4 :167-175
5. Makinde, O.D., Khan, W.A. and Khan, Z.H. 2013. Buoyancy effects on MHD stagnation point flow and heat transfer of a nanofluid past a convectively heated stretching/shrinking sheet, *Int J Heat Mass Transfer*, 62:526-533.
6. Nadeem, Mehmood, R and Noreen Sher Akbar. 2014. Thermo-diffusion effects on MHD oblique stagnation-point flow of a viscoelastic fluid over a convective surface, *Eur Phys J Plus*, 129 (182) : 1-18
7. Nadeem, S., Rashid Mehmood. and Noreen Sher Akbar. 2015. Partial slip effect on non-aligned stagnation point nanofluid over a stretching convective surface, *Chin Phys B*, 24 (1)
8. Nadeem, S., Mehmood, R. and Akbar, N.S. 2015. Oblique stagnation point flow of CNT based fluid over a convective surface, *J Comput Theor Nanosci*, 12 :1-8.

9. Nadeem, S., Mehmood, R. and Motsab, S.S.2015.Numerical investigation on MHD oblique flow of a Walter's B type nano fluid over a convective surface, Int J Therm Sci, 92 (C) :162-172.
10. Nadeem, S., Mehmood, R. and Akbar, N.S.2015. Combined effects of magnetic field and partial slip on obliquely striking rheological fluid over a stretching surface, J Magn Mater, 378 : 457-462.
11. Ostrach, S.1953. An analysis of laminar free-convection flow and heat transfer about a flat plate parallel to the direction of the generating body force, NACARep, 1111:63-79.
12. Oztop, H.F. and Abu-Nada, E.2008. Numerical study of natural convection in partially heated rectangular enclosures filled with nano fluids, Int J Heat Fluid flow, 29:1326-1336.
13. Seigel, R.1958. Transient free convection from a vertical flat plate, Trans Amer Soc Mech Eng, 80:347-359.

CONFORMALLY BERWALD FINSLER SPACE WITH (α, β) - METRIC

¹Sheelavathi R, ²Vasantha D M

¹Research scholar, ²Associate Professor

¹School of Mathematics,

¹REVA University, Bengaluru-560064, India

ABSTRACT: In this paper, we find the condition for the Finsler space with the generalized m-Kropina metric $L(\alpha, \beta) = \alpha^{m+1} / \beta^m$, $m \neq 0, -1$, where α is a Riemannian metric and β is a differential 1-form, to be conformally Berwald Finsler space.

Keywords: Finsler space, Berwald space, Conformally Berwald space.

I. Introduction

The concept of conformal theory of Finsler spaces had been introduced by M. S Knebelman [1] in 1929 and in 1976 M. Hashiguchi [2] studied the theory of conformal change of Finsler metrics based on Matsumoto's approach to Finsler geometry. The theory of two dimensional Finsler space had been studied by M. Matsumoto [4]. Nabil L. Youssef, S. H. Abed and A. Soleiman [6] discussed the conformal change of special Finsler spaces. Shun-Ichi Hojo, M. Matsumoto and K. Okubo [5] discussed the theory of conformally Berwald Finsler space and its application to (α, β) -metrics.

In this present paper, we consider the Finsler space with the generalized m-Kropina metric $L(\alpha, \beta) = \frac{\alpha^{m+1}}{\beta^m}$, $m \neq 0, -1$, to find the condition for conformally Berwald Finsler space.

II. Preliminaries

Definition 2.1: Let $F^n = (M^n, L)$ and $\bar{F}^n = (M^n, \bar{L})$ be two Finsler spaces on the same underlying manifold M^n . If the angle in F^n is equal to that in \bar{F}^n for any tangent vectors, then F^n is called conformal to \bar{F}^n and the change $L \rightarrow \bar{L}$ of the metric is called a conformal change. In other words, if there exists a scalar function $c = c(x)$ such that $\bar{L} = e^c L$, then the change is called conformal change.

Thus, for an (α, β) -metric, $\bar{L} = e^c L(\alpha, \beta)$ is equivalent to $\bar{L} = (e^c \alpha, e^c \beta)$ by homogeneity. Thus, the conformal change of

(α, β) - metric can be expressed as $(\alpha, \beta) \rightarrow (\bar{\alpha}, \bar{\beta})$, where $\bar{\alpha} = e^c \alpha$, $\bar{\beta} = e^c \beta$. Therefore, we have

$$\begin{aligned} \bar{a}_{ij} &= e^{2c} a_{ij}, \bar{b}_i = e^c b_i, \bar{a}^{ij} = e^{-2c} a^{ij}, \\ \bar{b}^i &= e^{-c} b^i, b^2 = a^{ij} b_i b_j, \bar{b}^2 = \bar{a}^{ij} \bar{b}_i \bar{b}_j. \end{aligned} \quad (2.1)$$

From (2.1), it follows that, the conformal change of Christoffel symbols is given by

$$\bar{\gamma}_j^i{}^k = \gamma_j^i{}^k + \delta_j^i c_k + \delta_j^k c_i - c^i a_{jk} \quad (2.2)$$

where $c_k = \partial_k c$ and $c^i = a^{ij} c_j$. And we use following the symbols

$$r_j = \frac{b_{kj} + b_{jk}}{2},$$

$$s_{ij} = \frac{b_{ij} - b_{ji}}{2},$$

$$s_j = b^i s_{ij},$$

where the covariant differentiation $(i; j)$ is the one with respect to associated Riemannian space with the metric α .

The Berwald connection $B\Gamma = (G_j^i{}^k, G_0^i{}^j, 0)$ is a Finsler connection which is uniquely determined from the fundamental function

$L(x, y)$ by the following Okada's axiomatic system [3]:

(a) L - metrical: $L_{;i} = 0$,

(b) $(h)h$ - torsion tensor $T_j^i{}^k = G_j^i{}^k - G_k^i{}^j = 0$,

- (c) Deflection tensor $D_j^i = y^h G_k^i{}_{,j} - G_j^i = 0$,
- (d) $(v)hv$ - torsion tensor $F_j^i{}_{,k} = \delta_k^i G_j^i - G_k^i{}_{,j} = 0$,
- (e) $(h)hv$ - torsion tensor $C_j^i{}_{,k} = 0$,

where the symbol (\mathbb{D}) in (a) denotes the h- covariant differentiation with respect to the Finsler connection.

Now, we shall find the Berwald connection $B\Gamma$ in F^n . Putting

$$2G^i = \gamma_0^i{}_0 + 2 B^i, \tag{2.3}$$

we have from (b), (c) and (d),

$$\begin{aligned} G_j^i &= \delta_j^i G^i = \gamma_0^i{}_{,j} + B_j^i, \\ G_j^i{}_{,k} &= \delta_j^i G^i{}_{,k} = \gamma_j^i{}_{,k} + B_j^i{}_{,k}, \end{aligned} \tag{2.4}$$

where $B_j^i{}_{,k} = \delta_k^i B_j^i$ and $B_j^i = \delta_j^i B^i$.

Definition 2.2: A Finsler space F^n is called a Berwald space if G_j^i are the functions of position alone.

Definition 2.3: A Finsler space $F^n = (M^n, L)$ is called conformally Berwald, if there exists a conformal change

$L \rightarrow \bar{L} = e^{c(x)}L$ such that the changed space $\bar{F}^n = (M^n, \bar{L})$ is a Berwald Finsler space.

III. conformally Berwald Finsler space

In this section, we shall find the condition for Finsler space with an (α, β) -metric $L(\alpha, \beta) = \frac{\alpha^{m+1}}{\beta^m}$, where α is a Riemannian metric and β is a differential 1-form, to be conformally Berwald by proving the following theorem.

Theorem 3.1: Let F^n be the Finsler space with an (α, β) -metric $L(\alpha, \beta) = \frac{\alpha^{m+1}}{\beta^m}$, where $m \neq 0, -1$. Then F^n is conformally Berwald, if the following conditions are holds true,

$$\begin{aligned} n_{ij} &= \frac{(b_i r_j + b_j r_i)}{b} + \frac{(u-r)b_i b_j}{b^2} - a_{ij} u \\ s_{ij} &= \frac{b_i s_j - b_j s_i}{2b^2} \\ c_j &= \frac{2bm r_j + (u-rm)b_j}{b^2} \text{ is the gradient.} \end{aligned}$$

Proof: Let F^n be a Finsler space with the generalised m-Kropina metric

$L(\alpha, \beta) = \frac{\alpha^{m+1}}{\beta^m}$, $m \neq 0, -1$. Then F^n is a Berwald space if and only if there exists covariant vector $\lambda_i(x)$ satisfying

$$\bar{b}_{i,j} = m(b^r \bar{a}_{ij} \lambda_r - \bar{b}_j \lambda_i) + \bar{b}_i \lambda_j, \tag{3.1}$$

for the generalised m-Kropina metric.

But we have $\bar{b}_{i,j} = e^c (b_{i,j} - c_i b_j + b^r c_r a_{ij})$ and $\bar{b}^i = e^{-c} b_i$,

therefore equation (3.1) can be written as,

$$\begin{aligned} e^c (b_{i,j} - c_i b_j + b^r c_r a_{ij}) &= m(e^{-c} b^r e^{2c} a_{ij} \lambda_r - e^c b_j \lambda_i) + e^c b_i \lambda_j, \\ \Rightarrow b_{i,j} - c_i b_j + b^r c_r a_{ij} &= m b^r a_{ij} \lambda_r + b_i \lambda_j - m b_j \lambda_i. \end{aligned} \tag{3.2}$$

Now consider $n_{ij} = \frac{b_{ij} + b_{ji}}{2}$
and $s_{ij} = \frac{b_{ij} - b_{ji}}{2}$,

which are equivalent to

$$n_{ij} = b^r a_{ij} (m \lambda_r - c_r) - \frac{(m-1)}{2} (b_i \lambda_j + b_j \lambda_i) + \frac{(c_i b_j + c_j b_i)}{2}, \tag{3.3}$$

$$s_{ij} = \frac{(c_i b_j - c_j b_i)}{2} + (m+1) \frac{(b_i \lambda_j - b_j \lambda_i)}{2}. \tag{3.4}$$

Multiplying equation (3.4) by b^i , gives

$$s_j = \frac{(c_i - (m+1)\lambda_i) b^i b_j}{2} - \frac{b^2 (c_j - (m+1)\lambda_j)}{2}. \tag{3.5}$$

To eliminate λ_i from the equation (3.5), we proceed as follows multiplying above by b_i , we get

$$\frac{2s_j b_i}{b^2} = (c_i b_j - c_j b_i) + (1+m)(\lambda_i b_i - \lambda_i b_j),$$

therefore $\frac{2s_i b_j}{b^2} = (c_j b_i - c_i b_j) + (1+m)(\lambda_i b_j - \lambda_i b_i),$

by subtracting above two equations, yields

$$\frac{s_j b_i}{2b^2} - \frac{s_i b_j}{2b^2} = \frac{(c_i b_j - c_j b_i)}{2} + (1+m) \frac{(\lambda_i b_i - \lambda_i b_j)}{2} \quad (3.6)$$

Now substituting (3.6) in (3.4), gives

$$s_{ij} = \frac{b_i s_j - b_j s_i}{2b^2}, \quad (3.7)$$

which is one of the required condition.

Next, we shall consider (3.3), put

$$u = b^r (c_r - m\lambda_r), \quad b^i \eta_j = b \eta_j, \quad b^i \eta_j = b r. \quad (3.8)$$

Transvecting equation (3.3) with b^i , we get

$$b \eta_j = \frac{(c_i b_j b^i + c_j b^2)}{2} - b_j u - \frac{(m-1)}{2} (b^2 \lambda_j + b_j b^i \lambda_i). \quad (3.9)$$

Multiplying above by b^i , by homogeneity and using (3.8), we obtain

$$c_i b^i = m r + u. \quad (3.10)$$

Substitute (3.10) in (3.9), gives

$$c_j = \frac{2b m r_j + (u - r m) b_j}{b^2}, \quad (3.11)$$

which is another required condition.

Now by using (3.11) and (3.8), (3.3) reduces to

$$\eta_j = \frac{(b_i r_j + b_j r_i)}{b} + \frac{(u-r) b_i b_j}{b^2} - a_{ij} u, \quad (3.12)$$

which is the final required condition.

Hence the proof.

References

1. M. S. Knebelman, "Conformal geometry of generalized metric spaces", Proc. Nat. Acad. Sci., USA, 15 (1929), 337-379.
2. M. Hashiguchi, "On conformally transformations of Finsler metrics", J.Math. Kyoto Univ. 16(1976),25-50.
3. T. Okada, "Minkowskian product of Finsler spaces and Berwald connection", J. Math. Kyoto Univ., 22 (1982), 323-332.
4. M. Matsumoto, "Foundations of Finsler geometry and special Finsler spaces", Kaiseisha press, Otsu, Saikawa, Japan, (1986).
5. Shun-Ichi Hojo, M. Matsumoto and K. Okubo, "Theory of conformally Berwald Finsler spaces and applications to (α, β) -metrics", Balkan Journal of Geometry and its applications, 5(1) (2000), 107-118.
6. Nabil L. Youssef, S. H. Abed and A. Soleiman, "Conformal change of special Finsler spaces", Balkan Journal of Geometry and Its Applications, 15 (2) (2010), 151-162.

Comparative Study of Optimization Techniques in Transportation Problem

Suma C & Haritha A

Sumac236@gmail.com

harithaehs@gmail.com

ABSTRACT: *The transportation problem is an applications of quantitative analysis for solving problems related to business. It also relates to distribution of products or services with minimum cost. The aim is to minimize the cost and choose the minimum route with maximum profit. To minimize the cost finding an optimal solution is important. To obtain an optimal solution finding an initial basic feasible solution is the prime requirement in transportation problem. In this paper the initial basic feasible solution is calculated by using different methods. The optimal solution is verified by using various techniques. In this paper we compared the standard optimization techniques used to solve transportation problem with examples*

Keywords: *Transportation problem, Optimal solution, Feasible solution*

Introduction: The aim of the transportation problem is to transport various amounts of a single homogeneous commodity, which are initially stored at various origins to different destinations in such a way that the total transportation cost is minimum. Simplex algorithm was used to solve any linear programming problem for which the solution exists. When the number of variables and constraints increased simplex algorithm became more laborious. So transportation problem was used. The transportation problem is a special category of Linear Programming Problem [2], [5]. "The distribution of a product from several sources to numerous localities" this was a study presented by F.L Hitchcock back in 1941. This was the first important contribution to the solution of transportation problem. In 1947 T.C Koopmans presented a study called "Optimum utilization of the transportation system". These contributions led to the development of transportation models. The problem involved number of shipping sources and a number of destinations. Each shipping source has a certain capacity. Each destination has a certain requirement which is associated with a certain cost of shipping from the source to the destinations. ie the transportation of a product available at several sources to a number of different destinations[1]The main objective of TP is to determine the amounts transported from each source to each destination to minimize the total transportation cost while satisfying the supply and demand restrictions. The transportation problem can be used for a variety of situations like Scheduling, Production, Investment, Plant control, Inventory control, product mix problems, and many others

Steps to obtain a solution in transportation problem [2]

- 1: Mathematical formulation of the transportation problem
- 2: Finding an initial basic feasible solution
- 3: Find the optimal solution

In this paper we concentrate on balanced transportation problem. The balanced transportation problem is the one where the quantity of demand is equal to the quantity to be supplied.

The initial basic feasible solution is obtained by applying [2], [5]: (i) North-West Corner Rule and (ii) Vogel's Approximation Method. (iii) Least cost method

. Next we use MODI (Modified Distribution) method to get an optimal solution. "Stepping Stone Method" developed by Charnes and Cooper [3] was also used to find an optimal from IBFS

Representation of transportation problem using nodes and arcs

There are m sources and n destinations represented by a node. The source and the destination are linked by arcs. The arcs represent the cost per unit C_{ij} and the amount shipped X_{ij} . Units of supply is a_i at source i and the demand is b_j at the destination j . The objective is to find x_{ij} and minimize the transportation cost and satisfy the supply and demand restrictions

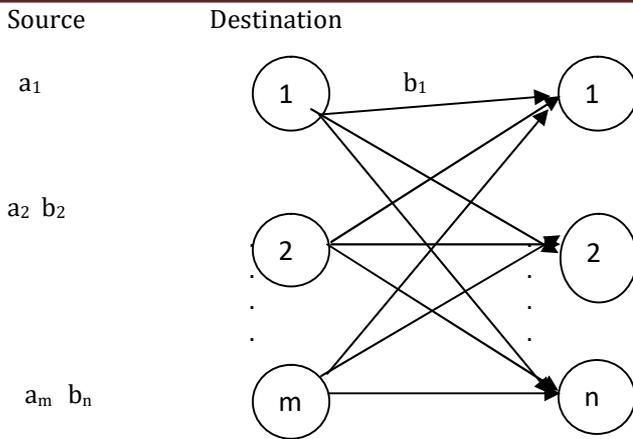


Figure 1: Network representation of Transportation problem

Mathematical Formulation of Transportation Problem

Let X_{ij} = quantity of product supplied from source i to destination j .

C_{ij} = cost of transportation of unit quantity from source i to destination j

a_i = amount of quantity of the product available at source i .

The constraint i ensures that the total units transported from the source i is less than or equal to its supply

b_j = the number of demand units required at destination j

The constraint j ensures that the total units transported to the destination j is greater than or equal to its demand

The objective of the transportation problem is to minimize the total cost of transportation Z between the source and the destination

$$\text{Minimize } Z = \sum_{i=1}^m \sum_{j=1}^n C_{ij} X_{ij}$$

$$\text{Subject to the constraints } \sum_{j=1}^n X_{ij} = a_i, i=1,2,\dots,m$$

$$\sum_{i=1}^m X_{ij} = b_j, j=1,2,\dots,n$$

$$x_{ij} \geq 0 \text{ for all } i,j$$

A necessary and sufficient condition for the existence of a feasible solution for the transportation problem is that the total supply is equal to the total demand, the problem is balanced transportation problem. The negative quantity cannot be supplied from sources to destinations. Therefore the constraint $x_{ij} \geq 0$ for all i,j is used

Methods for developing a initial basic feasible solution for a balanced transportation problem

1 North West method: This is one of the simplest method to get the the initial basic feasible solution developed by

Hitchcock. Since cost factor is not considered there is no guarantee that the best solution is obtained

This method [7] was described in 1939 by Salvemini and in 1951 by Frechet.

This method is described in the following steps:

Step 1: Construct an empty $m \times n$ matrix.

Step 2 : Indicate the rows total and columns total at the end.

Step 3: Starting with (1,1) cell at the north west corner of the matrix, allocate maximum possible quantity such that

the allocation can neither be more then the quantity required by the required warehouse nor more than the quantity available at each supply centre.

Step 4: Adjust the supply and demand numbers in the respective rows and columns allocations.

Step 5: If the supply for the first row is exhausted then move down to the first cell in the second row and first

column and go to step 4.

Step 6: If the demand for the first column is satisfied, then move to the next cell in the second column and first row

and go to step 4

Step 7: If for any cell, supply equals demand then the next allocation can be made in cell either in the next row or column.

Step 8: Continue the procedure until the total available quantity is fully allocated to the cell as required.

Table 1

To From	W1	W2	W3	a1
F1	4	8	8	56
F2	16	24	16	82
F3	8	16	24	77
b1	72	102	41	

Table 2

To From	W1	W2	W3	a1
F1	4(56)	8	8	56
F2	16(16)	24(66)	16	82
F3	8	16(36)	24(41)	77
b1	72	102	41	215 215

The total cost in northwest corner method is $4*56+16*16+24*66+16*36+24*41=3624$

2: Least cost method or matrix minima method

Step 1: Select the cell with the lowest transportation cost among all the rows or columns of the transportation table.

Step 2: Allocate as many units as possible to the cell determined by step 1 and eliminate that row in which either capacity or requirement is exhausted.

Step 3: Adjust the capacity and requirement for the next allocations.

Step 4: Repeat steps 1 to 3 for the reduced table until the entire capacities are exhausted to fill the requirement at different destinations.

Table 3

To From	W1	W2	W3	a1

F1	4(56)	8	8	56
F2	16	24(41)	16(41)	82
F3	8(16)	16(61)	24	77
b1	72	102	41	215 215

The total cost in Least cost method or matrix minima method is
 $4*56+24*41+16*41+8*16+16*61=2968$

3: Vogels approximation method

Step 1: Identify the lowest and the next lowest cost cell for each row of the table. Place the differences of the lowest and the next lowest cell to the right of that row.

Step 2: Find the differences of each column and place it below each column. The differences in step 1 and step 2 are called penalties.

Step 3: Find the row or column relative to the highest penalties. In the selected row or column allocate the maximum possible units to the least cost cell.

Step 4: Adjust the supply and demand and cross the satisfied row or column.

Step 5: Again find the differences between the row and column ignoring the deleted rows and columns and goto step 3.

Step 6: Repeat the above steps until all the row and column totals are satisfied.

Table 4

To From	W1	W2	W3	a1
F1	4	8	8	56
F2	16	24	16	82
F3	8	16	24	77
b1	72	102	41	

Table 5

To From	W1	W2	W3	a1	Row Penalty
F1	4	8(56)	8	56	4 0 -- -- --
F2	16	24(41)	16(41)	82	0 8 8 24 --
F3	8	16(5)	24	77	8 8 8 16 16
b1	8(72)	102	41		
Column Penalty	4 -- -- -- --	8 8 8 8 16	8 8 8 -- --		

The total cost in vogels approximation method is $8*56+24*41+16*41+8*72=2744$

There exists an optimal solution to a balanced transportation problem. The Solution is optimal if it minimizes the total cost of transportation. Using the initial basic feasible solution we get optimal solution, this optimal solution is obtained from the above three methods. We find whether the number of allocated cells is equal to $m+n-1$, m =no of rows and n = no of columns. The above three methods are meant only to provide us with a starting point, We often will have to employ an additional procedure to reach an optimal solution. Thevogels approximation method is preferred over the other two methods because the initial basic feasible solution obtained with VAM is either optimal is very close to the optimal solution. It is found that VAM yields an optimum solution in 80 percent of the problems [10].

Optimality test using modi method...

The procedure to attain optimal solution of transportation problem using MODImethod is as follows:

Step I: Assign u_i and v_j for $i \in \{1, \dots, m\}$ and $j \in \{1, \dots, n\}$ in the upper and right corner of the transportation table respectively. Now put $u_i=0$ and derive other values of u_i and v_j using formula $C_{ij}=u_i+v_j$

Step II: Determine the penalties $P_{ij}=u_i+v_j-c_{ij}$

Step III: If all penalty costs are positive or zero then it indicates optimal solution. If not, then allocate ' θ ' to the cell having most negative P.

Step IV: Starting from the selected cell make one closed loop and alternately assign + and - sign.

Step V: Look for the maximum possible increment in the value of ' θ ' which is minimum amongst the (-) sign unit cost.

Step VI: Now adding and subtracting C_{ij} by the value of ' θ ', where there is (+) and (-) sign respectively.

Step VII: Repeat above procedure until optimum solution is reached.

Allocation Table is Table 6

To From	W1	W2	W3	a1
F1	4	8 (56)	8	56
F2	16	24 (41)	16 (41)	82
F3	8 (72)	16 (5)	24	77
b1	72	102	41	

Iteration 1 of optimality test

1: Find u_i and v_j for all occupied cells (i,j) where $c_{ij}=u_i+v_j$

1: substituting $v_2=0$ we get

2. $c_{12}=u_1+v_2 \Rightarrow u_1=c_{12}-v_2 \Rightarrow u_1=8-0 \Rightarrow u_1=8$

3. $c_{22}=u_2+v_2 \Rightarrow u_2=c_{22}-v_2 \Rightarrow u_2=24-0 \Rightarrow u_2=24$

4. $c_{23}=u_2+v_3 \Rightarrow v_3=c_{23}-u_2 \Rightarrow v_3=16-24 \Rightarrow v_3=-8$

5. $c_{32}=u_3+v_2 \Rightarrow u_3=c_{32}-v_2 \Rightarrow u_3=16-0 \Rightarrow u_3=16$

6. $c_{31}=u_3+v_1 \Rightarrow v_1=c_{31}-u_3 \Rightarrow v_1=8-16 \Rightarrow v_1=-8$

Table 7

To From	D1	D2	D3	a1	u_i
S1	4	8 (56)	8	56	$u_1=8$
S2	16	24 (41)	16 (41)	82	$u_2=24$

S3	8 (72)	16 (5)	24	77	$u_3=16$
b1	72	102	41		
vj	$V_1=8$	$V_2=0$	$V_3=8$		

2. Find d_{ij} for all unoccupied cells(i,j), where $d_{ij}=c_{ij}-(u_i+v_j)$

1. $d_{11}=c_{11}-(u_1+v_1)=4-(8-8)=4$
2. $d_{13}=c_{13}-(u_1+v_3)=8-(8-8)=8$
3. $d_{21}=c_{21}-(u_2+v_1)=16-(24-8)=0$
4. $d_{33}=c_{33}-(u_3+v_3)=24-(16-8)=16$

Table 8

	D_1	D_2	D_3	a1	u_i
S1	4 [4]	8 (56)	8 [8]	56	$u_1=8$
S2	16 [0]	24 (41)	16 (41)	82	$u_2=24$
S3	8 (72)	16 (5)	24 [16]	77	$u_3=16$
Demand	72	102	41		
vj	$v_1=-8$	$v_2=0$	$v_3=-8$		

Since all $d_{ij} \geq 0$ final optimal solution is arrived

Table 9

	D_1	D_2	D_3	a1
S1	4	8 (56)	8	56
S2	16	24 (41)	16 (41)	82
S3	8 (72)	16 (5)	24	77
b1	72	102	41	

The minimum total transportation cost = $8 \times 56 + 24 \times 41 + 16 \times 41 + 8 \times 72 + 16 \times 5 = 2744$

Optimality test using stepping stone method

The stepping stone method was introduced by Cooper and Charnes in 1945. In this method a closed loop is formed that starts from an unoccupied cell but rest of the cells are occupied. Consecutive cells in loop lies either in same row or same column. [13]

The procedure of stepping stone method is as follows: [4, 8, 10]

Step I: Select an unoccupied cell. Starting from the cell make a loop and assign (+) and (-) signs alternatively on each corner cell

of the closed path just traced and begin with the plus sign at unoccupied cell to be evaluated.

Step II: Calculate an improvement index by first adding the unit cost figure with plus sign and subtracting the unit cost with minus sign.

Step III: Repeat the same above steps with all unoccupied cells.

Step IV: If any one of the improvement index appears to be negative, then it indicates that the given basic feasible solution is not optimal and implies that cost of transportation can be reduced further. Therefore, allocate the maximum possible value in the selected cell which is minimum of the value with negative sign.
 Step V: Repeat above steps until all improvement indexes become positive or zero, which indicates optimum solution.

Allocation Table is Table 10

To From	W1	W2	W3	a1
F1	4	8 (56)	8	56
F2	16	24 (41)	16 (41)	82
F3	8 (72)	16 (5)	24	77
b1	72	102	41	

Iteration 1 of optimality test

Create closed loop for unoccupied cells we get

Table 11

Unoccupied cell	Closed path	Net cost change
F1W1	F1W1→F1W2→F3W2→F3W1	4 - 8 + 16 - 8 = 4
F1W3	F1W3→F1W2→F2W2→F2W3	8 - 8 + 24 - 16 = 8
F2W1	F2W1→F2W2→F3W2→F3W1	16 - 24 + 16 - 8 = 0
F3W3	F3W3→F3W2→F2W2→F2W3	24 - 16 + 24 - 16 = 16

Since all net cost change ≥ 0 , final optimal solution is arrived

Table 12

To From	W1	W2	W3	a1
F1	4	8 (56)	8	56
F2	16	24 (41)	16 (41)	82
F3	8 (72)	16 (5)	24	77
b1	72	102	41	

The minimum total transportation cost = $8 \times 56 + 24 \times 41 + 16 \times 41 + 8 \times 72 + 16 \times 5 = 2744$

Conclusion:

In this paper we discussed three methods for finding initial basic feasible solution for the transportation problem. The transportation model provides a framework to determine the best ways for logistics and supply chain problems. The vogels approximation method is preferred over the other two methods because the initial basic feasible solution obtained with VAM is either optimal or is very close to the optimal solution. This is shown with an example. It is found that VAM yields an optimum solution in 80 percent of the problems. After finding the initial basic solution we found the optimal solution using two methods i.e. MODI method and stepping stone method. This was also done with an example. The modified distribution (MODI) method is the modified version of the stepping stone method. But MODI method is preferred over SSM as it overcomes the problem of evaluating all unoccupied cells which is encountered by the Stepping stone method. Hence, it is convenient to use this method while solving large problems. AtoZmath.com is available for computation of transportation problems.

References

1. Premkumar Gupta and D S Hira Operation research S Chand & Company
2. P.K. Gupta and Man Mohan, 2003, Problems in Operation Research, Sultan Chand & Sons, New Delhi, pp. 275-276.
3. A. Charnes, W.W. Cooper and A. Henderson, An Introduction to Linear Programming, Wiley, New York, 1953.
4. <http://www.universalteacherpublications.com/univ/ebooks/or/Ch5/stepst.htm>
5. KAPOOR V. K. and KAPOOR S., Operations Research-Techniques for Management, Sultan Chand & Sons, 2006.
6. Aardal, K., Nemhauser, G. L., and Weismantel, R. (2005). On the History of Combinatorial Optimization, Handbooks in Operation Research and Management Sciences Vol. 12, Discrete Optimization, Elsevier B.V., Netherlands, 22-25
7. http://wps.prenhall.com/wps/media/objects/1159/1186960/cdrom_modules/module_b.pdf
8. Mohan, R.S. (2008). Transportation Model, Operations Research. Tata McGraw Hill, New Delhi, 183-191.
9. Sinha, S. M. (2006). Transportation Problems, Mathematical Programming: Theory and Method, Reed Elsevier, New Delhi,
10. <http://orms.pef.czu.cz/text/VogelAproxim.html>
11. <http://www.youtube.com/watch?v=RnZnIlksdwU>
12. Swarup, K., Gupta, P. K. and Mohan, M. (2007). Transportation Problem, Operations Research, Sultan Chand & Sons, New Delhi, 247-293.
13. Charnes, A. and W.W. Cooper, 1954 'The Steeping Stone Method of Explaining Linear Programming Calculations in Transportation Problems' Management Science
14. Hamdy A. Taha, 2004 "Operations Research: An Introduction Prentice Hall of India, New Delhi