Enhanced Semantic E-Learning Framework for Complex Query Processing in Heterogeneous Web Services using XML

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ABSTRACT *Semantic e-learning has emerged as a next generation e-learning platform by enabling advanced manipulation, sharing, exchange, usage and complete understanding of the learning resources. The e-learning is an instructional program that uses the qualities and assets of the web to make an important learning condition.The semantic based e-learning methodology has emerged as an innovative methodology for providing rich-learning content extracted from various web resources.The problems identified in most of the semantic web based framework are the lack of discovery of the heterogeneous web services. Also, the e-learning content mainly focuses on the single domain ontologies.This paper has been implemented using XML dataset. Storing configuration settings and passing data between different systems are made good in XML file. Porter Stemming Algorithm was applied and stop words were removed from the query and the index was recovered. Result is extracted from the XML using Holistic Twig Joins Algorithm. In SQL data storage, the data is stored in a database and retrieved in SQL server. The comparative analysis revealed that the time consumption to get a simple query from the proposed e-learning framework by XML (dataset) is lesser than SQL (database).*

Keywords: *Semantic E-learning, query, Heterogeneous Web,XML.*

1. Introduction

One of the instructional programme is e-learning which uses the web qualities and web assets to create a significant learning condition.It provides easy access for learning the resources anytime and anywhere through a repository of learning resources and also supports features such as the personal definition of learning goals, dynamic learning, the association between the learners and the instructors.The main objective ofe-learning is to provide both open source opportunity and classroom. There are various sources of e-learning through Internetand however, they give only a comparative plain hypertext pages to all alternates.In semantic based technology,improved learning experience and effective delivery of content is used [1]. The main features of the semantic web are shared with understanding based on the ontologies as a backbone. Owing to the merits, semantic web technology is used widely in various industrial organizations, academic institutions, and research firms. The semantic web is used to express the information for the software agents in an accurate and machine-readable form to process, share, reuse and understand the terms in the data.The following layers are the basic architecture,

- XML layer is represented for the data structure.
- To represent the meaning of data, Resource Description Framework (RDF) layer is used.
- To represent the formal general agreement about the meaning of data, ontology layer is used.
- To enable the meaning of data with intelligent reasoning, the logic layer is used.

The semantic web bases are resources which are identified through their unique resources identifier or internationalized resources identifier. The next layer of semantic web is XML which has set of syntax rule for generating semantic rich markup language in a specific domain included with it namespaces. It is a mechanismfor generating unique names globally for the element and attributes of a markup language to avoid a vocabulary conflicts. Next to the XML is the Research Description Framework (RDF) which madean XML language to describe whole resources. The recent emergent of semantic web technologies namely discussion and annotation tools show E-learning system can able to offer high flexibility in semantic web.Semantic based web portal deals an incorporated interface through which reader as content developers can download or alter the data. Semantic based e-learning frameworks are knowledge based and the metadata are employed in the document or few external repository metadata. In the semantic web, query processing is the process of transforming a query delivered by the user into a dissimilar query based on the semantic application. The user provides a broad query due to absence of knowledge of the content and the structure of the database.

In heterogeneous based E-learning framework, the content is derived from various web services whereas thecontext allows users to share their resources of learning in semantic level instinctively [2]. The

services of unified query is discovered and processed. An unifying access to heterogeneous repositories is usually delayed by the information environmentwhich enables existing resources to be recognized and re-purposed for learning network. Heterogeneous e-learning framework contains complex query processing. The complex queries are included in data processing operations to empower the efficient semantic retrieval for e-learning content. All types of heterogeneous web-data content and complex query in data processing can be acquired using an effective match making mechanism butthe provided framework has both high scalability and flexibility that tend to improve the mechanism of match making and accuracy of the framework. The proposed e-learning framework was built by integrating different and efficient matching mechanisms in order to handle and acquire all typesof heterogeneous web-data content and complex query in data processing. It has been implemented using XML dataset.XML is probably better than SQLdatabase. In SQL data storage, the data is stored in a database and retrieved in SQL server. The comparative analysis shows that the time consumption to get a simple query from the proposed e-learning framework using XML (dataset) is lesser than SQL database (Fig.6).

2. ProblemDefinition

The greater part of the current learning device gives an e-learning which is a sort of adapting anyplace, whenever this manner intently connected with portable advancements. Since the clients are individual and do not impart at the same time, it is hard to finish the undertaking. There is no substantially more connection between the learners and the mentor. Consequently this is accessible in anyplace and it doesn't cooperate in gathering, so the data sharing is troublesome. Semantic e-learning has emerged as a next generation e-learning platform by enabling advanced manipulation, sharing, exchange, usage and complete understanding of the learning resources. The semantic framework is found as an appropriate methodology for extracting the relevant content in the e-learning applications. The problems identified in most of the semantic web based framework are the lack of discovery of the heterogeneous web services[18]. The proposed framework is to extend or enhance the single domain ontologies to the heterogeneous web services by building an improved e-learning framework using XML dataset.

3. Literature Review

This section provides an overview of the semantic-based e-learning approaches. Barbagallo and Formica [3] developed an ontology-based system by combining the similarity-based semantic search method and e-learning technologies. Sharif et al. [4] proposed semantic-based recommendation system to facilitate effective e-learning. The proposed model achieved higher precision and recall for the returned records. In exchanging the e-learning content from a variety of e-learning system, Masud[5] contributed ideas for semantic data interoperability, an agent-based query processing approach and distributed metadata management.Walia et al. [6] designed an E-Learning approach to improve the significance by adding human conceptual representation and reasoning mechanism for learning based on the knowledge and experience of the learner. Sarwar et al. [7] implemented an Ontology-based Adaptive e-learning Framework for providing semantic content to the learner. Alomari et al. [8] designed an automatic semantic e-learning system for the graphical representation of the course content with illustrations and semantic meaning using ontology. Vesin et al. [9] developed a modern e-learning system for adapting the learning content to the mobile device of the learners. Mahmoud et al. [10] defined a semantic web-based framework for the e-learning system for improving the potential of making the web content to be understandable. Yarandi et al. [11] developed an ontology-based adaptive e-learning system based on the design of semantic content to modify the teaching process for satisfying the needs of an individual learner. Antony et al. [12] proposed an adaptive e-learning system for classifying the users based on the similarity measure and providing adaptive recommendations to the individual users.

Srivastava et al. [13] developed an e-learning system based on the semantic web while focusing on the RDF and Web Ontology Language (WOL). Rui and Maode[14] introduced a semantic web-based e-learning framework for solving the drawbacks of the traditional e-learning platforms. Patel and Bhadka[15] solved the disadvantages of current e-learning environment according to the semantic web technology by quickly providing the relevant resources to the learner. Kannan and Saravanan[16] developed an ontology-based and semantic web-based e-learning support system for creating dynamic learning paths for the learners. Tiwari et al. [17] conducted a survey about different types of e-learning models.

4.Methodology

This section explains the proposed e-learning framework using XML dataset. Initially, the user query was obtained and preprocessed to remove the stop words.Porter Stemming Algorithm was applied

and Stop words were removed from the query and the index was recovered.Then, the keywords are extracted and the semantic words of the extracted keywords were obtained. The keywords were obtained and ranked based on the category. The words were extracted and weight of the words was computed based on the number of occurrence of the word in that document. The words were ranked based on the weight, and the approximate results were extracted from the database. Result is extractedfrom the XML by Holistic Twig Joins Algorithm. The Overall proposed e-learning framework using XML is shown in figure.1

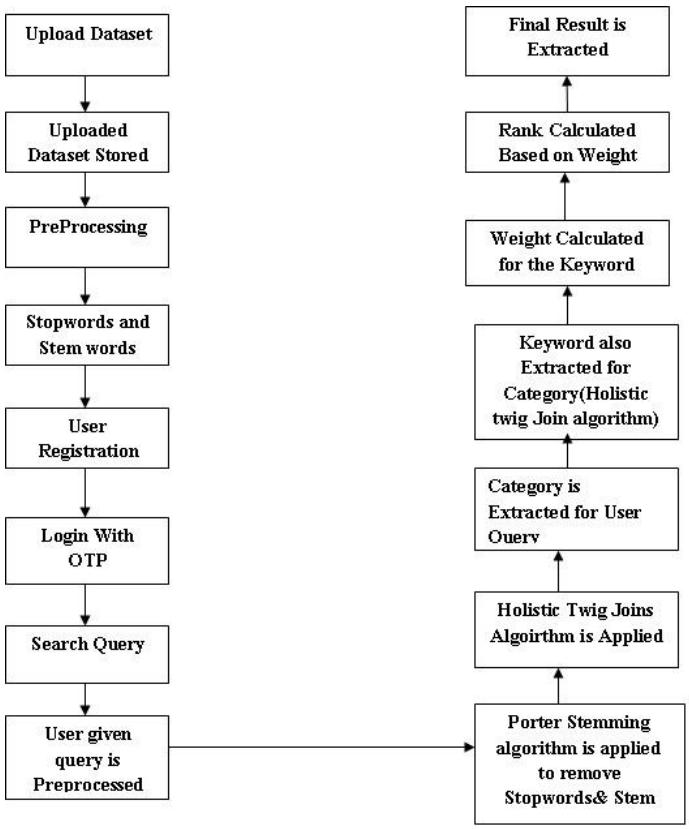

Figure 1. Overall proposed e-learning framework using XML

4.1 Preprocessing

Initially, the dataset was loaded. During the pre-processing stage, User query was obtained and preprocessed to remove the Stopwords. Stopword is the process of removing unwanted keywords (and, is, was, the, etc) from the user query. Then the Keywords were extracted.

Removal of Stopwords for the User Query

Let St are predefined stopwords.

```
String query=Qry.split(" \\s ");
LinkedList<String>wlist=new LinkedList<String>;
LinkedList<String>flist=new LinkedList<String>;
For(String w:query)
        wlist.add(w);
        flist.add(w);
End For
For(inti=0 to wlist_size)
For(int j=0 to St_size)
If(wlist_i.equals(St_j))
Flist.remove(wlist_i);
End If
End For
End For
```

4.2 Query Search and data retrieval

The user query was obtained and split into words. The stop words were removed and keywords were extracted. The semantic words of the keywords were found out and the category was identified. The rank of

the keywords was computed and exact matching of the keywords was extracted from the database. The approximate results are extracted from the database by using the previous history of the users.

Category for Searched Keyword after removing Stopwords

- Course

Figure.2 Category Retrieved for Index keyword

The after removing of stopwords, category was extracted for user query usingHolistic Twig Joins algorithm as shown in figure.2.

Artificial Intelligence
https://npteLac.in/courses/106106126/

Computer Networks
https://npteLac.in/courses/106105080/

Computer Organization
https://npteLac.in/courses/106106092/

Data Communications
https://npteLac.in/courses/106108098/

Data Structures And Algorithms
https://npteLac.in/courses/106102064/

Data Structures and Program Methodology
https://npteLac.in/courses/106103069/

Database Design
https://npteLac.in/courses/106106093/

Design Verification and Test of Digital VLSI Circuits
https://npteLac.in/courses/106103116/

Cryptography and Network Security
https://npteLac.in/courses/106105031/

Figure.3 Extracted words from category

The extraction of keyword fromcategoryis as shown in figure.3.The keywords were extracted, and the semantic words of the extracted keywords were obtained.

Compute Weight and Rank for the keyword

```
TreeMap<String,Integer> tm=new TreeMap();
For(i=0 to fileslength)
For(s=0 to Tlength)
        For(k=0 to Indexlength)
                For(c=0 to keylength)
                        If(Index[k].contains(key[c]))
                        C++;
                        End If
                End For
                For(x=0 to Catlength)
                        If(Index[k].contains(Cat[x]))
                        C++;
                        End If
                End For
                For(l=0 to Linklength)
                        If(Index[k].contains(Cat[l]))
                        C++;
                        End If
                End For
                For(l=0 to Medialength)
                        If(Index[k].contains(Cat[l]))
```

```
                    C++;
                    End If
            End For
    End For
    Tm.put(files[i], c);
    TreeMapAccendingtr=new TreeMapAccending();
            rank=tr.output(Tm)
    LinkedHashMap<String,Integer>vk=new LinkedHashMap();
    For(sort:rank.entryset())
            If(entry.getValue>0)
            Vk.put(key, value)
            End If
    End For
```

The words were extracted and weight of the words was computed based on the number of occurrence of the word in that document. The words were ranked based on the weight, and the approximate results were extracted from the database. Result is extracted from the XML by Holistic Twig Joins Algorithm.

Figure 4. Rank words based on weight.

The keywords were obtained and ranked based on the category as shown in Figure.4

4.3 Query pattern identification and generalization

A search system receives one or more queries from the user and provides corresponding information relevant to the user queries. The user can send a query to inquire about the facts such as characteristics, properties and attributes of a person, place or object, etc. Initially, a search system receives the query about the attribute of a topic. These queries may be filtered and normalized using different techniques and may be stored as query patterns. The search system can store the queries as query patterns and generalize the query patterns, to allow the users to obtain information about similar attributes of different topics or different attributes of similar topics.

Figure.5 Extracted approximate result

The approximate results were extracted from the XML file (dataset) as shown in figure.5

5. Performance Analysis

The proposed semantic-based e-learning (SLF) framework using XML dataset is compared with the existing e-learning SQL database. The comparative analysis shows that the consumption time to get a simple query from the proposed e-learning framework using XML (dataset) is lesser than SQL database as shown in figure.6.

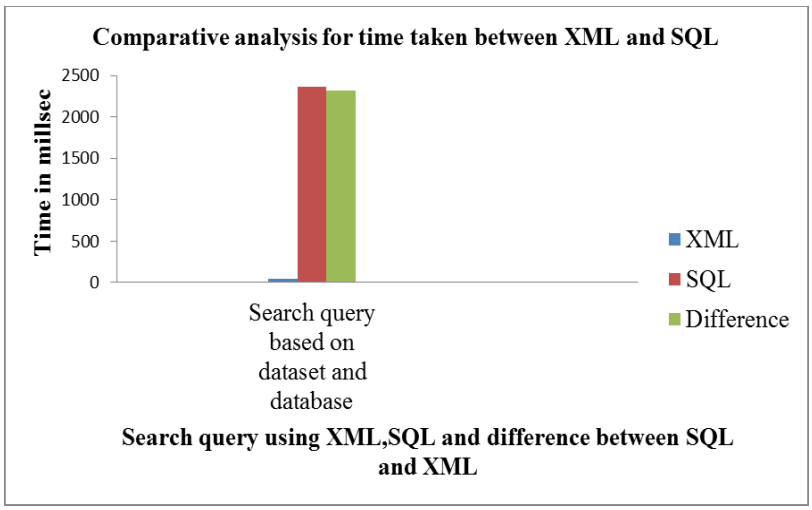

Figure.6 Time taken for proposed e-learning frameworkusing XML (dataset) with e-learning SQL Query (database).

6. Conclusion

Researchers tried to enhance the single domain ontologies to the heterogeneous web services by building an improved e-learning framework using XML. The proposed framework was built by integrating different and efficient matching mechanisms for handling all kinds of heterogeneous web data content. The proposed framework incorporates the processing of the complex query by XML in heterogeneous e-learning framework. The complex queries are included in data processing operations to empower the efficient semantic retrieval for e-learning content. It is suggested that the new operating systems can be expanded and upgraded easily by using XML. Without losing data new operating systems, new applications, new browsers can also be made easily. XML storing system is a plaintext format. Through which independent way of storing, delivering, transforming and sharing can be done. The time of consumption is less in XML than the database. This comparative analysis revealed a clear view about that the time taken to get simple query from the proposed semantic e-learning framework of search query using XML (dataset) is better than SQL (database).

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