

IOT Based Driver Drowsiness Detection and Health Monitoring System

Dr.K.S.Tiwari*, Supriya Bhagat¹, Nikita Patil², Priya Nagare³

Electronics and Telecommunication, Savitribai Phule Pune University
Modern Education Society College Of Engineering, Pune-41101

Received: February 03, 2019

Accepted: March 28, 2019

ABSTRACT: This paper introduces driver drowsiness and health parameters causing fatigue. Generally road accidents causes by fatigue Driver fatigue is a very serious problem causing in many thousands of road accidents each year. It is not possible to calculate the exact number of accidents because of drowsiness but research shows 20% of accidents happens only because of fatigue (rospa). This project provides USB Camera for Eye-Blink Monitoring System and provide buzzer that alerts the driver during the drowsy condition. Driver's location can be track using GPS. In the proposed web application design admin will be controlling the parameters of the system and send message to the colleague. The health monitor of driver is taken care by wearable heart beat sensor, temperature sensor. Alcohol sensor is provided to detect the alcoholic condition of a rider, and when this condition exists the vehicle speed goes down.

Key Words: Eyes Detection, Health Monitoring, Alcohol Detection.

I. INTRODUCTION

Internet of Things (IOT) is the systems administration of physical items that contains gadgets implanted inside their design so as to impart and detect collaborations among one another or concerning the outer condition. In the up and coming years, IOT-based innovation will offer propelled dimensions of administrations and for all intents and purposes change the manner in which individuals lead their day by day lives[6]. Headways in prescription, control, quality treatments, farming, keen urban areas, and brilliant homes are only a not many of the absolute precedents where IOT is emphatically settled.

In India, drowsy driving is a major problem. The risk and often ruinous results of drowsy driving are alerting. Drowsy driving is the dangerous combination of driving and sleepiness or fatigue. This generally happens when a driver has not slept sufficient, but it can also happen due to medications, alcohol or shift work. Fig.1 shows the graph of "Drowsy driving car accidents" in particular year. It shows year verses no of fatal crashes.

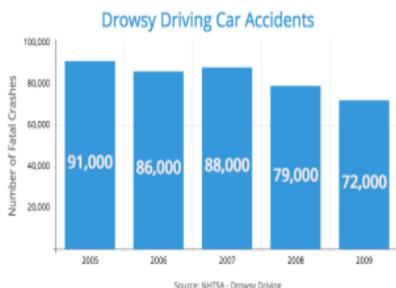


Fig.1 Accidents due to drowsy driving

However the level of drinking and driving has gone increasing. Every year probably 200 peoples killed in drinking and driving. It is not only driver who suffer, but his passengers, other travelers are also involved. In 2016, it is researched that 100 footsloggers were seriously injured or killed by drink drivers, and also 390 car passengers. In that year 40 children were killed or seriously injured by drink drivers.

No one knows the exact movement when our body goes sleepy. It's clearly dangerous falling asleep at driving, but it affects ability of driver to drive safely. As shown in the fig.1 in 2013 72,000 crashes, 44,000 injuries and 800 deaths (National Highway Traffic Safety Administration) happened because of drowsiness of driver.



Fig.2 (a) Open eyes



Fig.2 (b) Close eyes

This has become major challenge to develop a system for the prevention of this issue. In this system the analysis of eyes state and health parameters determined. The raspberry-pi and USB Camera were used to recognize the driver's eyes state. Fig.2 (a) shows the open eyes state of driver and Fig.2 (b) shows the close eyes state of driver. If any drowsy condition occurred which means driver's eyes closed for more than 5 seconds then buzzer was activated and alerts the driver. The Health parameters like body temperature and heart beats were measured using temperature sensor and heart beat sensor respectively. An alcohol sensor detects the attentiveness of alcohol gas in the air. If alcohol detected, then speed of motor goes lower. GPS is used to track the driver's location, because of this his colleague could be reach at there and hospitals could also reach at there for helping him. This data is sent on the server (Cloud) and server sends message to the colleague to inform about driver's condition.

II. LITERATURE SURVEY

Now a days, there is increasing research interest on developing remote access model for driver drowsiness detection and health monitoring parameters. Previous works investigated the reasons of fatigue.

Research paper on "Survey on Driver's Drowsiness Detection System" [1] Omkar Dharmadhikari introduced detection of driver drowsiness based on yawning measurement and head position of driver.

Research paper on "Drowsy Driver Detection Through Facial Movement Analysis" [2] Esra Vura and Mujdat Cetin proposed on Facial Action Coding system and maintained the database using machine learning.

Research paper on "IOT BASED DRIVER ALERTNESS AND HEALTH MONITORING SYSTEM" [6] T. Shwetha, J. Panduranga Rao, B. Sreenivasu introduced based on IOT and used webcam for detecting eyes state of driver, temperature and pulse rate sensor for monitoring health of driver.

Research paper on "AUTOMATIC DRIVER DROWSINESS ALERT AND HEALTH MONITORING SYSTEM" [7] B.T. Petkar, Ganga T K introduced the system using different sensors and microcontroller.

III. DESIGN REQUIREMENT

A. Hardware

- Raspberry-pi 3
- USB Camera
- Temperature Sensor(DHT-11)
- Heart Beat Sensor

- Alcohol Sensor(MQ-3)
- Speed Limiter
- GPS
- Buzzer

B. Software

- Python IDE
- Communication Protocol:
- HTTP
- OpenCV

IV. BLOCK DIAGRAM

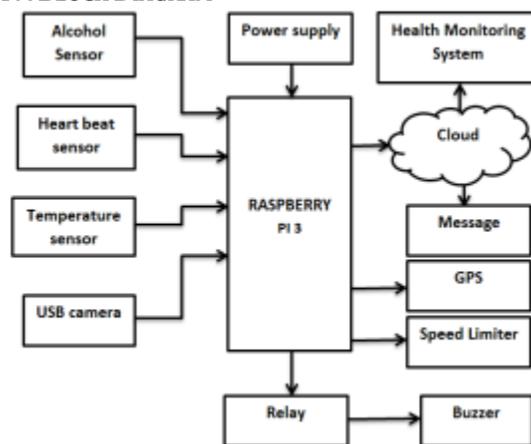


Fig.3 Block diagram

Description of Block Diagram:

Above fig.3 shows the block diagram of IOT based driver drowsiness detection and health monitoring system. It consists of raspberry pi-3, Sensors, GPS, USB camera, speed limiter and buzzer. Heart beat sensor and temperature sensor are taken as an input to raspberry pi-3. These sensors are used to measure the health parameters [6]. Alcohol Sensor is used to detect the alcoholic state of driver. For controlling this condition speed limiter is provided. When alcohol is detected, the speed of vehicle goes down.

USB Camera is provided for continuously monitoring the position of eyes of driver. When driver's eyes are closed for more than 5 seconds then buzzer will on. Because of sound of buzzer driver get wake-up. So, the accident can be avoided.

The whole data sent to the health monitoring system of server. The information is about driver's condition are sent to the driver's colleague through message. Even if any emergency condition occurred the location of driver can be track via GPS [7]. So that the driver get help from the hospitals.

A. Information of Raspberry pi 3

Raspberry Pi 3 is small operating system consists processor, GPIO pins, USB ports and capability of interfacing CSI, DSI. Fig.4 shows the configuration of raspberry pi [6].

As presented in 2016, Raspberry Pi 3 B accompanies a quad center processor demonstrates preferable execution multiple times progressively over Raspberry Pi 1 and speed will be 80% more than Raspberry Pi 2.

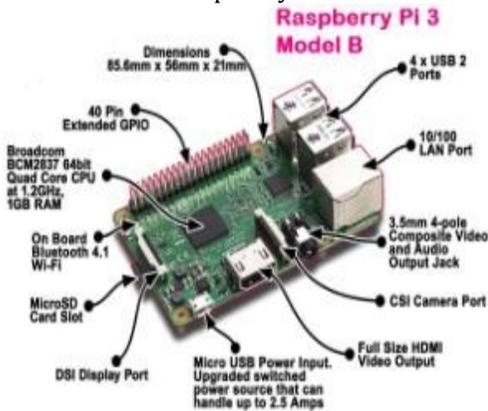


Fig.4 Raspberry Pi 3

Features of Raspberry Pi 3:

- 1.4 GHz frequency and 64-bit is bit rate, Broadcom BCM2387 ARM Cortex-A53 Quad Core Processor, which is multiple times quicker than Raspberry Pi 1.
- 1GB RAM (SDRAM) which enables you to run further developed applications
- On-board remote LAN used to associate gadget through remote
- On-board Bluetooth
- 4 USB ports for correspondence
- 300Mbit/s Ethernet.
- 40 general input output pins.
- Full measure HDMI 1.3a port
- 10/100 Base Ethernet attachment
- Combined 3.5mm simple sound and composite video jack
- Camera interface (CSI), for associating camera
- Display interface (DSI) utilized for associating Raspberry Pi contact screen show
- micro SD space for external storage
- Micro USB control source

C. Heartbeat Sensor

Heart beat can be measured using optical power variation. If driver's finger is on sensor then sensor starts working and measures the pulses of driver and gives the output to the Raspberry Pi. Fig.5 shows the actual heartbeat sensor. It has 3 pins i.e. +5V, ground and out pin. Heart beat sensor uses photo phlethysmography principle. It measures volume of blood so the light intensity changes.



Fig.5 Heartbeat Sensor

C. Temperature Sensor DHT11

Pin configuration of DHT11 sensor shown in fig. 6. It has three pins i.e. VCC, GND and DATA pin. Data pin is digital pin therefore this sensor is called digital sensor. DHT11 sensor has ability to measure the temperature as well humidity. It has high reliability and excellent long term stability. It has NTC type thermistor and resistive element. It requires +5V supply voltage. Temperature range of this sensor is 0-50 C with +/- 2 C errors, humidity range is 20-90%RH.

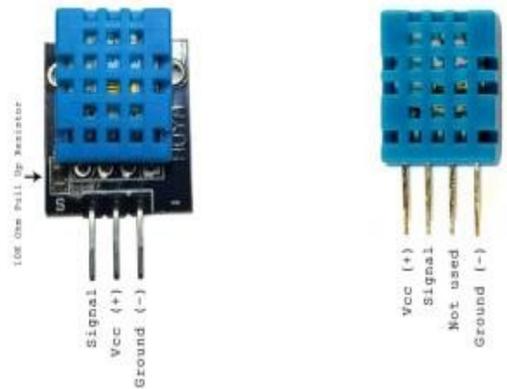


Fig.6 Temperature Sensor

D. Alcohol sensor(MQ3)

This sensor is utilized for identifying liquor focus on your breath. It has high affectability and quick reaction. It is ease semiconductor sensor which can distinguish liquor fixation from 0.05 mg/L to 10 mg/L. This sensor can give both simple and computerized yield. It is effectively compact with Raspberry Pi, Arduino sheets, microcontrollers. Fig.7 demonstrates liquor sensor MQ3. It has 4 pins VCC, ground, computerized yield and simple yield stick.

Characteristics:

- 5V DC or AC circuit
- Requires heater voltage
- Operation Temperature: -10 to 70 degrees C
- Heater consumption: less than 750mW



Fig.7 Alcohol Sensor MQ3

E. USB Camera

USB camera can easily interface with any operating system. The USB technology has transfer rate 480 Mb/s. It is also available with transfer rate of up to 5Gb/s. Edmund optics offers variety of USB cameras. EO USB cameras are available in CMOS as well as CCD sensor types. Fig.8 shows USB camera.



Fig.8 USB camera

F. GPS System

Global Positioning System is a satellite route framework that outfits area and time data in all atmosphere conditions to the client. GPS is utilized for route in planes, boats, vehicles and trucks moreover. The framework gives basic capacities to military and regular citizen clients around the world. Global positioning system gives nonstop constant, route and timing around the world. Fig. 9 shows how exact connection is happening using GPS.



Fig.9 GPS tracking system

G. Speed limiter

Speed limiter is used to reduce the speed of vehicle during emergency. In this project speed limiter is used when alcoholic state is occurred the speed of vehicle goes down. So the accident can be avoided.

H. Buzzer

As a sort of electronic ringer with coordinated structure, bells, which are provided by DC control, are generally utilized in PCs, printers, scanners, cautions, electronic toys, car electronic gadgets, phones, clocks and other electronic items for voice gadgets. Signals can be arranged as dynamic and uninvolved ones. A bell or beeper is a sound flagging gadget, which might be mechanical, electromechanical, or piezoelectric.

I.Cloud Computing

Cloud registering makes PC framework assets, particularly capacity and figuring power, accessible on interest without direct dynamic administration by the client. The term is commonly used to depict server farms accessible to numerous clients over the Internet. Extensive mists, prevalent today, regularly have capacities conveyed over different areas from focal servers. On the off chance that the association with the client is generally close, it might be assigned an Edge server.

Cloud module is used in this system for monitoring the database by health monitoring center and send message to driver's colleague.

V. RESULTS



Fig.10 Hardware Setup

Hardware setup is shown in Fig.10. Python software allows selecting the region of interest (ROI) around the eyes. Eyes are detected with a rectangular or square box as shown in fig. 11. Open and closed eyes are detected by system. Drowsy condition is achieved by detecting open and closed eyes. If the driver is drowsy then alert will generated.

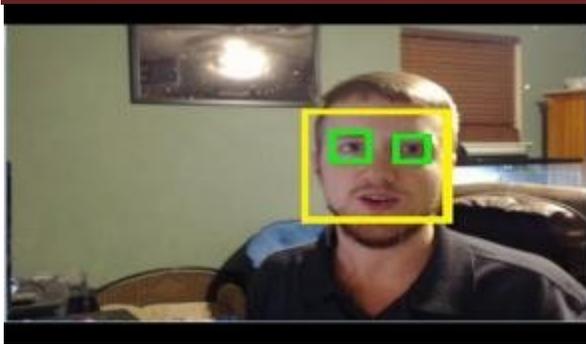


Fig.11 Sleep state of person

Also determine the health parameters i.e. heart beat and body temperature is shown in the form of graph or table. As shown in fig. 12

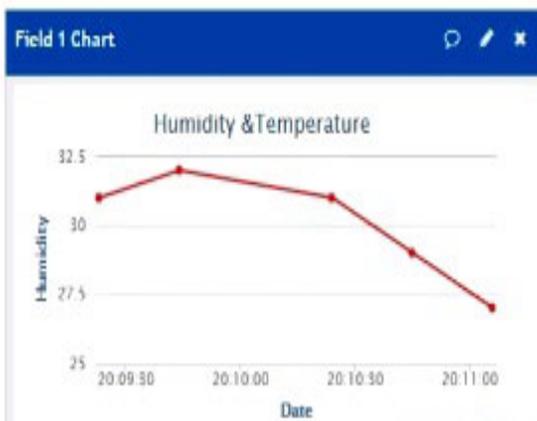


Fig.12 Graph of humidity and temperature

VI. CONCLUSION AND FUTURE WORK

A. Conclusion

This paper analysis and design the driver drowsiness detection and health monitoring system using IOT. Purpose of our project is to help solving real life problem in very cost effect way. Whenever the driver feels drowsy and closes his eyes for more than a second, the buzzer is blown. This system used temperature and heartbeat sensor to measure the health parameters of the driver. Alcohol sensor is used to check the alcoholic state of driver. When alcohol is detected then the vehicle will goes low speed. Even if any

emergency condition is occurred doctors or his colleague can reach at him via GPS. As a result the accident ratio decreases. Hence, our project if commercially developed will help in saving the precious life of driver.

B. Future work

- Instead of using alarm we can use water sprinkler for waking up the driver.
- In place of speed limiter we can use automatic braking system to stop the vehicle.

VII. REFERENCES

1. Omkar Dharmadhikari, Omkar Dharmadhikari "Survey on Driver's Drowsiness Detection System" International Journal of Computer Applications (0975 - 8887) Volume 132 - No.5, December 2015
2. Esra Vura and Mujdat Cetin "Drowsy Driver Detection Through Facial Movement Analysis" ICCV 2007, Workshop on HCI
3. Kenneth Sundaraj and Murugappan Murugappan "Detecting Driver Drowsiness Based on Sensors: A Review" Sensors 2012, 12, 16937-16953; doi:10.3390/s121216937
4. Vandna Saini, Rekha Saini "Driver Drowsiness Detection System and Techniques: A Review" Vandna Saini et al, / (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 5 (3), 2014, 4245-4249
5. Ji Hyun Yang, Zhi-Hong Mao "Detection of Driver Fatigue Caused by Sleep Deprivation" IEEE Transactions on Systems, Man, and Cybernetics—part a: systems and humans, vol. 39, no. 4, July 2009
6. T. Shwetha, J. Panduranga Rao, B. Sreenivasu "IoT BASED DRIVER ALERTNESS AND HEALTH MONITORING SYSTEM" International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE) Volume 6, Issue 10, October 2017
7. B.T. Petkar, Ganga T K "AUTOMATIC DRIVER DROWSINESS ALERT AND HEALTH MONITORING SYSTEM" International Journal of Engineering Research and Technology (IJERT), 2018