



Accident Detection System Using GPS and GSM by IOT

R. Manish^{1,*}, M. Sumithra², Lokhitha D.², Mahalakshmi L.², Durga V.², Nirmala G.²

¹Applied Computing, University of Windsor, Canada

²Department of Information Technology, Panimalar Engineering College, India

Email: manishmoni1209@gmail.com; sumithram.id@gmail.com; lokhitha@gmail.com; mahalakshmi@gmail.com; durga@gmail.com; nirmalag@gmail.com

Abstract

The primary goal of accident detection implementation is to reduce traffic accidents that result in the loss of priceless human life and other valuable items. Accident detection systems that use GPS and GSM save lives by shortening the time it takes for emergency personnel to reach the scene of an accident. We made the decision to recognise an automobile collision and notify the emergency personnel as well as the driver's main contacts. The product's main goal was to increase security for consumers and their families. GPS (Global Positioning System) and GSM are its foundations (Global system of Mobile communication).

Keywords: Accident detection; Location; Safety measures; GPS, GSM, Arduino; SMS; IOT

1. Introduction

Traffic collisions were one of the major reasons for accidents on Indian roadways. The major causes of traffic accidents are bad roads and reckless driving. This system offers the ability to track and keep tabs on the car, and it assists in alerting the driver's primary contacts and first responders through SMS. The IOT is becoming an essential component of daily life. We now utilise more than 14 billion digital and technological gadgets annually, or two devices per person. In order to exchange data that may be utilised to be aware of the first responders, the phrase "Internet of Things" refers to the extension of network connectivity and processing capability to everyday items. mechanism for detecting accidents is a project that is being attempted to promptly inform the victim's main contacts of the location coordinates.

The invention of a transportation system has given humans the ability to have the highest civilisation above all other living things on the planet. Our everyday lives are greatly impacted by automobiles. We use it to get to work, communicate with friends and family, and transport our goods. But it may also do us harm and possibly result in our deaths from accidents. One of the most significant and fundamental danger factors when driving is speed. It influences a crash's severity as well as one's likelihood of getting into one. Despite many attempts made by various governments and non-governmental groups run a variety of campaigns to raise awareness against irresponsible driving, although accidents still happen sometimes. If the emergency services had been able to get the crash information in time, many lives may have been spared.

Doi : <https://doi.org/10.54216/JCHCI.040105>

Received: March 13, 2022 Accepted: June 17, 2022

2. Literature Survey

A car accident monitoring system was to be constructed utilising MEMS, GPS, and GSM technologies, according to the paper "Accident Detection and Alerting System Using GPS & GSM." The system includes an accelerometer, an MCU, a GPS module, and a GSM module for message transmission. Accelerator and Threshold Algorithm are used to identify accidents and falls, respectively. [1]

The "Accident Detection, Alert and Tracking System Based on IOT" paper claimed that it aids in avoiding accidents and in providing the necessary assistance as soon as possible after an accident occurs. It also makes it easy to trace a vehicle's location and alerts the driver when he has consumed alcohol or feels sleepy.[2]

It's a test, according to the document "IOT Based Automatic Vehicle Accident Alert System."

and contribute to the area of generation there. Through the Accelerator, which helps in locating the location, we are trying to happen upon anything by mistake. If the values of the x, y, and z parameters are more than the stated values, the situation will be corrected, and the code created to start the notification and SMS alert will run. [3]

Table 1: Year-wise mapping of the accident [5]

No. of Accidents & No. of persons involved : 2002 - 2011					
Year	No. of Accidents		No. of persons		Accident Severity *
	Total	Fatal	Killed	Injured	
2002	407497	73650(18.1)	82674	408711	20.8
2003	406726	73589(18.1)	85998	435122	21.1
2004	429910	79357(18.5)	92618	464521	21.5
2005	439255	83491(19)	94968	465282	21.6
2006	460920	93917(20.4)	105749	496481	22.9
2007	479216	101161(21.1)	114444	513340	23.9
2008	484704	106591(22)	119860	523193	24.7
2009	486384	110993(22.8)	125660	515458	25.8
2010	499628	119558(23.9)	134513	527512	26.9
2011	497686	121618(24.4)	142485	511394	28.6

According to the study "IOT Based Vehicle Accident Detection and Tracking System Using GPS Modem," when accidents happen, this system sends a brief message through Wi-Fi via the internet to WhatsApp of a

cell phone. Latitude and longitude values are provided in the message. These statistics can be used to pinpoint the accident's location. [4]

According to the article "IOT Based Accident Detection and Rescue System," accidents are automatically detected using a straightforward setup that will be installed in the vehicle. The integrated arrangement will dispatch an ambulance the location of the accident as soon as the car meets with an accident. The patient will then be connected to another setup that will continually monitor his vital signs once the victim has been taken into the ambulance. The patient will be connected to another setup that will continually monitor his vital signs, such as his pulse, temperature, and blood pressure, once the victim has been taken into the ambulance. [6]

Table 2: Comparison of our system with other system

Proposed Papers	Different Features included in the System				
	Alcohol Detection	Drowsiness Detection	Engine Locking System	Messaging System	Location Tracking
Our proposed system: Location Tracking Accident System & Preventio using Eye Blinking & Alcohol	Present	Present	Present	Present	Present
Real Time Google Map & Arduino based vehicle Tracking System[2]	Absent	Absent	Absent	Present	Absent
Vehicle Tracking System using GPS & GSM Technology [3]	Absent	Absent	Absent	Present	Present
An IOT Based Accident prevention & tracking system for night drivers[5]	Absent	Present	Absent	Absent	Absent
Vehicle accident prevent cum Location monitor system [6]	Present	Present	Absent	Absent	Present
Controlled inducement and measurement of drowsiness in a driving simulator	Absent	Present	Absent	Absent	Absent

3. Methodology

The process for locating the victim after an accident is a difficult task that has to be recognised. Finding the victim and alerting his or her main contacts through SMS about the disaster are the system's main objectives. If the driver is drowsy, the built-in eye blink sensor will determine whether they are. If they are, the alarm system will send a warning to the GSM. When an accident happens, the sensor detects it and sends the GPS the altitude, longitude, time, and vehicle identification. This technology also warns the blood bank and local hospitals as well as the police control centre. The car number is used to obtain information on the victim. The

SMS was then sent to the main The SMS sent to the victim's key contacts or family members is then made public, along with the victim's blood type.

3.1. Flow Diagram Of The Methodology

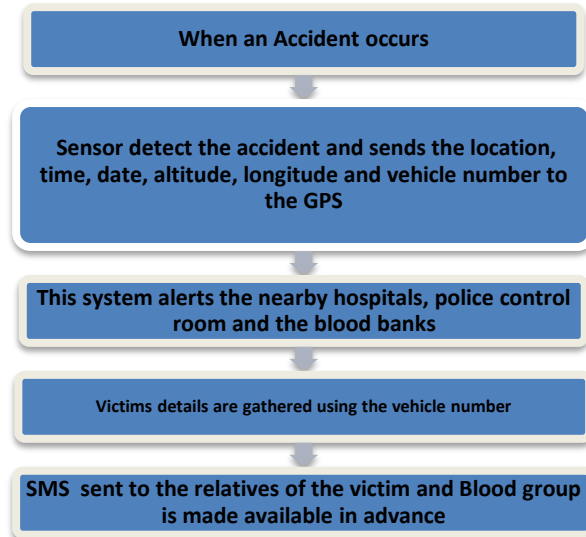


Figure 1: Flow diagram of the methodology

4. Proposed System

The core components of this system are an Arduino, an eye blink sensor, and an alcohol sensor with integrated GPS and GSM. The sensor's function is to correctly identify accidents, and the IOT's function is to tell those who need to know. The Eye Blink Sensor alerts the owner when the driver exhibits signs of sleepiness. When an accident happens, the sensor detects it and sends the GPS the altitude, longitude, time, and vehicle identification. This technology also warns the blood bank and local hospitals as well as the police control centre. The car number is used to obtain information on the victim. Then, the SMS was sent to the victim's principal contacts or family members, along with their blood type is made available beforehand.

Power supply, GPS, GSM, Arduino, L293D Driver, 2Morors, 16*2LCD Display, A Eye blink sensor, and MQ3 Sensor are among the components of our suggested system's hardware (Alcohol sensor). Keil ide (a Windows-based front end for the C compiler and assembler), VSM (to execute interactive simulation of real designs to assess the method to circuit simulation), ISIS 6 & ARES 6, and other software were utilised in our research (involved in circuit designing and simulation).

The goal of the project is to create an accident detection system that can identify an accident and promptly notify the rescue crew. The main control unit for hazard detection or warning is the Arduino, which aids in sending signals to various system components. getting pin of the GSM module and the GPS module's transmitting pin are utilised for communication. The GPS module will locate the car, and the information is retrieved by the receiver using the coordinates. The information is then transferred to Arduino, and the GSM module will alert the rescue crew.

4.1 Hardware Structure Of The Proposed System

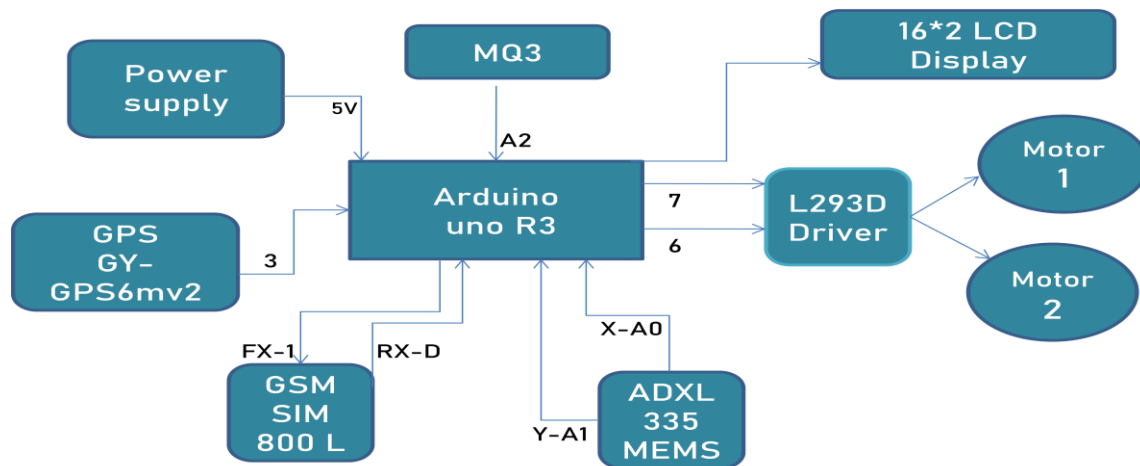


Figure 2: Hardware Structure of the system

4.2 Block Diagram Of The Proposed System

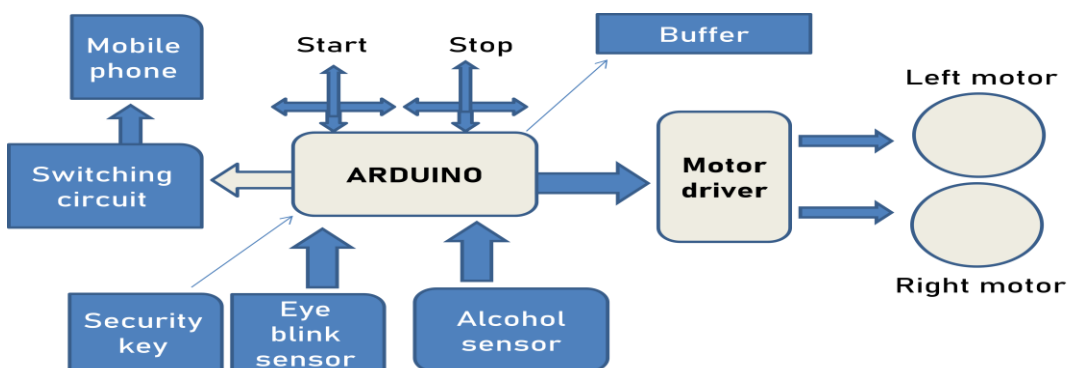


Figure 3: Block diagram of the system

4.2.1. ARDUINO UNO

A popular open-source microcontroller board called the Arduino UNO was created by Arduino.cc and is based on the ATmega328P microprocessor. The main control system for detecting or warning when an

accident happens is the Arduino. It gathers information from vibration sensors, GPRS, and GSM modules and outputs it either through a message or a display system. Here, the vibration sensor is crucial. This vibration sensor will pick up the vehicle's vibrations, serving as an accident detection system in turn. The GSM module on Arduino is used to transmit the message to the receiver after collecting data from all other modules.

4.2.2. GSM

GSM SIM900 module is chosen for establishing communication between the GPS, GSM, and the assigned mobile number. SIM900 refers to a tri-band work that operates at frequencies between 900 MHz and 1900 MHz, including EGSM900 MHz, PCS 1900 MHz, and DCS 1800 MHz. The GSM module's receiving pin and the GPS module's sending pin are utilised for communication with the mobile phone.



Figure 4: GSM 900 module of our system

4.2.3. GPS

The world is split into a number of coordinates that may be used by a GPS module to quickly determine a location on the planet. The GPS in use here is SIM28ML. This GPS module will determine the vehicle's location. The data retrieved by the GPS receiver is obtained through the coordinates, and it is sent to Arduino first before being sent to the stored contact through a GSM module. The GPS module's output is in NMEA format and operates in the 1575.42 MHz frequency band. This format provides data like position in real time.

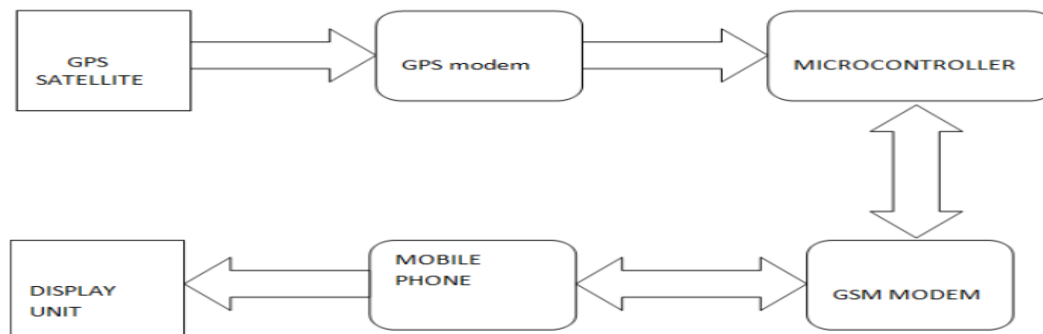


Figure 5: GPS

4.2.4. BUZZER

A buzzer or beeper is a mechanical, electromechanical, or piezoelectric audio signalling device. It buzzes or makes noise when electrical energy is given to it, and this behaviour lasts until the energy is cut off. The buzzer utilised in this project plays a sound to notify the user of the event associated with capacity changes. Two terminals are on the buzzer (positive and ground).

4.2.5. POWER SUPPLY

Here, we utilised a USB-powered +5V dc power source. This block's primary job is to supply necessary circuits with the necessary voltage. Two IR sensors, a buzzer, and an LCD display all get +5V.

5. IMPLEMENTATION

In this project, an accident detection device will be installed inside the front section of the automobile or vehicle. This accident detection system component is made up of two metallic plates that are kept as close to one another as possible. Two metal plates that are within the automobile will come into touch with each other in the event of an accident if it strikes another vehicle or an item. The buzzer will start playing as soon as the Arduino receives the signal from the metal plates. We have also included an alcohol sensor, which helps to reduce accidents brought on by drunk driving. If any message about being drunk and driving appears sent along with the location and car number to the police control room. In the event of an accident, we will notify the victim's main contacts as well as the owner of the vehicle.

The Arduino gets the signal from the GPS modem if there is a serious collision involving the automobile or vehicle and the alcohol sensor, which is situated close to the steering wheel. Whether the driver is asleep or not will be determined by the Eye Blink Sensor, which will send a message to GSM if the driver is asleep. The SMS is then transmitted to the GSM modem. The data is transmitted by SMS using a GSM modem. The family members, police control room, hospital, and blood centre will all receive the SMS. bank. so that they may take the required steps to aid the victim of the accident.

```
eyeblick_alcohol
#include <LiquidCrystal.h> //Load Liquid Crystal Library

LiquidCrystal LCD(2,3,4,5,6,7);

int eye = 0;

int alc=0;

int cnt1=0;

void setup()

{

Serial.begin(9600);

LCD.begin(16,2); //Tell Arduino to start your 16 column 2 row LCD

pinMode(9, INPUT);

pinMode(8, OUTPUT);

digitalWrite(8, LOW);

LCD.setCursor(0,0); //Set LCD cursor to upper left corner, column 0, row 0
```

```
eyeblick_alcohol

LCD.print("NORMAL"); //Print Message on First Row

}

void loop()

{

//LCD.setCursor(0,0); //Set LCD cursor to upper left corner, column 0, row 0

//LCD.print("ALCOHOL: "); //Print Message on First Row

alc=analogRead(A0);

if(alc>800)

{

LCD.setCursor(0,0); //Set LCD cursor to upper left corner, column 0, row 0

LCD.print("ALCOHOL DETECTED"); //Print Message on First Row

digitalWrite(8,HIGH);

delay(2000);
```

```
eyeblick_alcohol
LCD.setCursor(0,0); //Set LCD cursor to upper left corner, column 0, row 0
LCD.clear(); //Print Message on First Row
digitalWrite(8,LOW);
LCD.setCursor(0,0); //Set LCD cursor to upper left corner, column 0, row 0
LCD.print("NORMAL"); //Print Message on First Row

}

//LCD.setCursor(10,0); //Set LCD cursor to upper left corner, column 0, row 0
//LCD.print(" "); //Print Message on First Row
//LCD.setCursor(10,0); //Set LCD cursor to upper left corner, column 0, row 0
//LCD.print(alc); //Print Message on First Row

if(digitalRead(9)==0)
{
```

Figure 6: Coding for Eye blink sensor

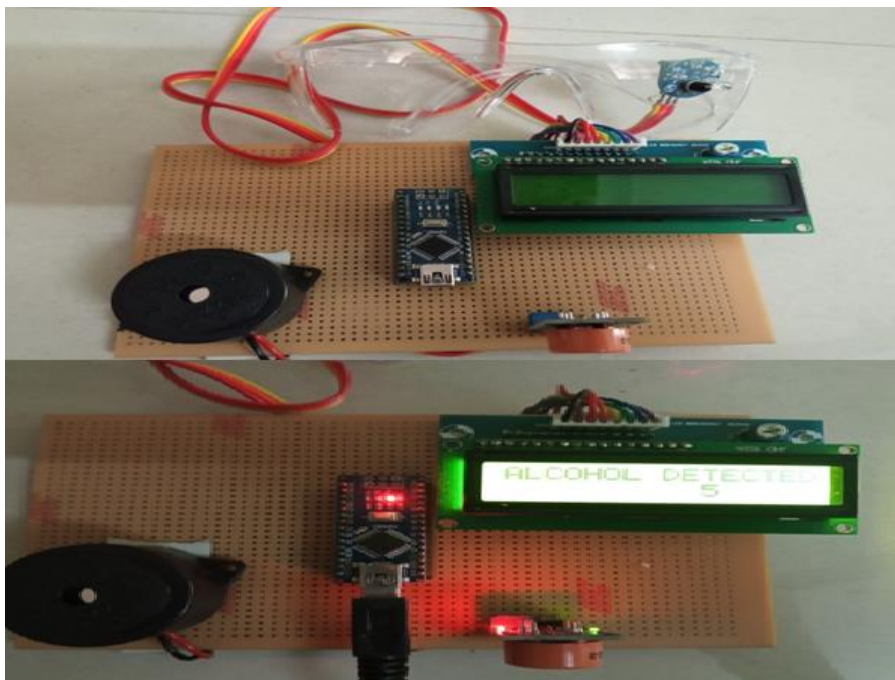


Figure 7: Implemented Hardware components

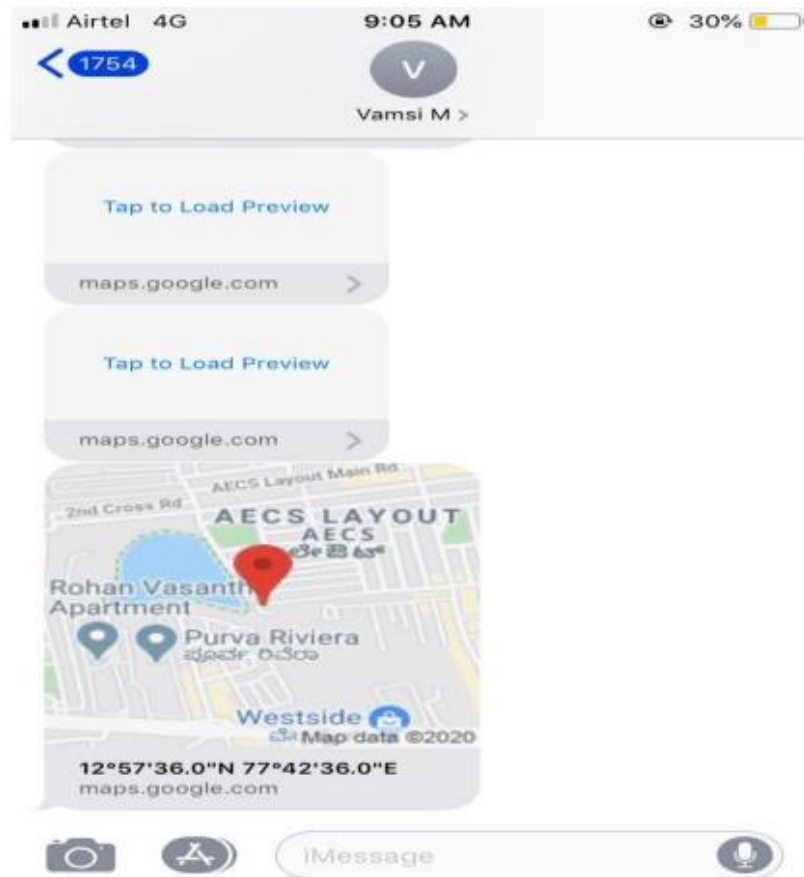


Figure 8: Location Identified Output

6. FUTURE SCOPE OF THE PROJECT

The project we are talking about has many different practical applications. They are, and all kinds of vehicles with engines can apply accident prevention methods. i.e. a diesel or gasoline engine. The GPS and GSM system may be used to automatically calculate the penalty for exceeding the speed limit in a restricted region, reducing the need for human labour and saving time and money.

The suggested system focuses on the detection of accidents using alcohol and eye blink sensors.

The appropriate people will receive the notice when an accident happens.

However, this might be improved by installing a camera in the car to record the driver's behaviour, such as drowsiness or anxiety.

7. Conclusion

The accident detection system is addressed by the proposed system. The brain of the system, Arduino, assists in sending messages to various system components. Accident detection systems that use GPS and GSM save lives by shortening the time it takes for emergency personnel to reach the scene of an accident. We made the decision to recognise an automobile collision and notify the emergency personnel as well as the driver's main contacts. The product's main goal was to increase security for consumers and their families. GPS (Global Positioning System) and GSM are its foundations (Global system of Mobile communication).

References

- [1] "Global status report on road safety 2015", World Health Organization, 2016. [Online]. Available: http://www.who.int/violence_injury_prevention/road_safety_status/2015/en/. (Accessed: 22- Mar- 2016)
- [2] M.Ruikar, "National statistics of road traffic accidents in India", Journal of Orthopedics, Traumatology and Rehabilitation, vol. 6, no. 1, p. 1, 2013.
- [3] V. Goud, "Vehicle Accident Automatic Detection and Remote Alarm Device", International Journal of Reconfigurable and Embedded Systems (IJRES), Vol. 1, no. 2, 2012.
- [4] GSM User Manual, SIMCOM Ltd, August 2006.
- [5] Aishwarya, Ashish Rai, Charitha, Prasanth M.A and Savitha S.C. "An IoT Based Accident Prevention & Tracking System for Night Drivers." (2015).
- [6] GPS Beginner`s Guide, Garmin Ltd, 2008.
- [7] G. Liang, "Automatic Traffic Accident Detection Based on the Internet of Things and Support Vector Machine", IJSH, Vol. 9, no. 4, pp. 97-106, 2015.
- [8] S.L. Lin and Z. Liu, "Parameter selections in SVM with RBF kernel function", Journal-Zhejiang University of Technology, vol. 35, no. 2, pp. 163, 2007.
- [9] B. Prachi, D. Kasturi and C. Priyanka, "Intelligent Accident-Detection And Ambulance- Rescue System", International Journal Of Scientific & Technology Research, Vol. 3, No. 6, 2016.
- [10] Zaobo He, Zhipeng Cai, Jiguo Yu, Xiaoming Wang, Yunchuan Sun, and Yingshu Li, has discussed on "Cost-Efficient Strategies for Restraining Rumor Spreading in Mobile Social Networks", Proc-IEEE, vol.66, no.3 2017
- [11] Hyung-Sin Kim, Hongchan Kim, jeongyeo Paek and Saewoong Bahk has discussed on "Load Balancing Under Heavy Traffic in RPL Routing Protocol for Low Power and Lossy Networks", Proc-IEEE, vol.16, no.4, pp. 1536-1233 2017
- [12] "Statistics of Accident & casualties – Bangladesh Road Transport Authority (BRTA)", Brta.gov.bd, 2017. [Online]. Available: <http://www.brta.gov.bd/newsite/en/statistics-of-accident-casualties/>. [Accessed: 3- Sep- 2017].
- [13] M.Rahman, J. Mou, K. Tara, M. Sarker "Real-Time Google Map And Arduino Based Vehicle Tracking System" in 2nd International Conference on Electrical, Computer & Telecommunication Engineering (ICECTE), 2016, pp.1-4.
- [14] B.Wukkadada, A. Fernandes " Vehicle Tracking System Using GLOBAL POSITIONING SYSTEM and GSM Technologies" IOSR Journal of Computer Engineering (IOSR-JCE), PP 05-08
- [15] S.Lee, G. Tewolde, J. Kwon " Design And Implementation Of Vehicle Tracking System Using GPS/GSM/GPRS Technology And Smartphone Application" IEEE World Forum on Internet of Things (WF-IoT), 2014, PP 1-6
- [16] Das, Abhirup & Ray, Abhisek & Ghosh, Abhisek & Bhattacharyya, Swarasree & Mukherjee, Debaleena & Rana, Tapan. (2017). "Vehicle accident prevents cum location monitoring system." 101-105. 10.1109/IEMECON.2017.8079570.[7]
- [17] "Accelerometer. Sensor", Working, Types, Specification, Selection, Applications", Instrumentation-Electronics, 2017. [Online]. Available: <http://www.instrumentationtoday.com/accelerometer/2011/08/>. [Accessed: 3- Sep- 2017].

- [18] “Altaf SV, Abhinay S, Ansari E, Kaunain Md, Anwer R. Alcohol Detection and Motor Locking System. International Journal of Advanced Research inElectrical, Electronics and Instrumentation Engineering. 2017; 6(2): 989-993.”.
- [19] “Controlled Inducement and measurement of drowsiness in a driving simulator”. (2010) Authors: Helios De Rosario, a* José S.Solaz, a Noelia Rodríguez,bLuis M. Bergasac doi:10.1049/iet-its.2009.0110)
- [20] “.Nimisha Chaturvedi, Pallika Srivastava. “Automatic Vehicle Accident and Messaging by GSM and GLOBAL POSITIONING SYSTEM Modem “,Volume:05 Issue: 03 | Mar-2018
- [21] M. Sumithra and Dr. S. Malathi, “A Novel Distributed Matching Global and Local Fuzzy Clustering (DMGLFC) FOR 3D Brain Image Segmentation for Tumor Detection”, IETE Journal of Research, doi.org/10.1080/03772063.2022.2027284, 2021
- [22] B.Buvanswari and T.Kalpalatha Reddy, “A Review of EEG Based Human Facial Expression Recognition Systems in Cognitive Sciences” International Conference on Energy, Communication,Data analytics and SoftComputing(ICECDS),CFP17M55-PRJ:978-1-5386-1886-8”,August 2017.
- [23] M. Sumithra and Dr. S. Malathi, ” Modified Global Flower Pollination Algorithm-based image fusion for medical diagnosis using computed tomography and magnetic resonance imaging”, International Journal of Imaging Systems and Technology, Vol. 31, Issue No.1, pp. 223-235, 2021
- [24] K. Sridharan , and Dr. M. Chitra "SBPE: A paradigm Approach for proficient Information Retrieval , Jokull Journal" , Vol 63, No. 7;Jul 2013
- [25] M. Sumithra and Dr. S. Malathi, “3D Denselex NET Model with Back Propagation for Brain Tumor Segmentation”, International Journal OfCurent Research and Review, Vol. 13, Issue 12, 2021.
- [26] B.Buveneswari and Dr.T. Kalpalatha Reddy,“EEG signal classification using soft computing techniques for brain disease diagnosis”,Journal of International Pharmaceutical Research ,ISSN : 1674-0440,Vol.46,No.1,Pp.525-528,2019.
- [27] K. Sridharan , and Dr. M. Chitra "Web Based Agent And Assertion Passive Grading For Information Retervial", ARPN Journal of Engineering and Applied Sciences, VOL. 10, NO. 16, September 2015 pp:7043-7048
- [28] M. Sumithra and Dr. S. Malathi, “Segmentation Of Different Modalities Using Fuzzy K-Means And Wavelet ROI”, International Journal Of Scientific & Technology Research, Vol. 8, Issue 11, pp. 996-1002, November 2019.
- [29] M. Sumithra and S. Malathi, “ A Survey of Brain Tumor Segmentation Methods with Different Image Modalities”, International Journal of Computer Science Trends and Technology (IJCT) – Vol. 5 Issue 2, Mar – Apr 2017
- [30] B.Buveneswari and Dr.T. Kalpalatha Reddy, “High Performance Hybrid Cognitive Framework for Bio-Facial Signal Fusion Processing for the Disease Diagnosis”, Measurement,ISSN: 0263-2241, Vol. 140, Pp.89-99,2019.
- [31] M. Sumithra and Dr. S. Malathi, “A Brief Survey on Multi Modalities Fusion”, Lecture Notes on Data Engineering and Communications Technologies, Springer, 35, pp. 1031-1041,2020.
- [32] M. Sumithra and S. Malathi, “A survey on Medical Image Segmentation Methods with Different Modalities”, International Journal of Engineering Research and Technology (IJERT) – Vol. 6 Issue 2, Mar 2018.
- [33] B.Buveneswari and Dr.T. KalpalathaReddy,“ELSA- A Novel Technique to Predict Parkinson's Disease in Bio-Facial”,International Journal of Advanced Trends in Computer Science and Engineering, ISSN 2278-3091,Vol.8,No.1,Pp. 12-17,2019

[34] K. Sridharan , and Dr. M. Chitra , Proficient Information Retrieval Using Trust Based Search On Expert And Knowledge Users Query Formulation System, Australian Journal of Basic and Applied Sciences, 9(23) July 2015, Pages: 755-765.

[35] B.Buveneswari and Dr.T. Kalpalatha Reddy, "ACPT- An Intelligent Methodology for Disease Diagnosis",Journal of Advanced Research in Dynamical and Control Systems,ISSN : 0974-5572,Vol.11,No.4,Pp.2187-2194,2019.

[36] Sumithra, M., Shruthi, S., Ram, S., Swathi, S., Deepika, T., "MRI image classification of brain tumor using deep neural network and deployment using web framework", Advances in Parallel Computing, 2021, 38, pp. 614–617.

[37] K. Sridharan , and Dr. M. Chitra "RSSE: A Paradigm for Proficient Information Retrieval using Semantic Web" , Life Science Journal 2013;10(7s), pp: 418-425.