ISSN 2278-3091
Volume 10, No.3, May - June 2021
International Journal of Advanced Trends in Computer Science and Engineering
Available Online at http://www.warse.org/IJATCSE/static/pdf/file/ijatcse661032021.pdf
https://doi.org/10.30534/ijatcse/2021/661032021

IoT Based Accident Detection and Life Guard System

Saranya S[1], Karthika G[2], Gayathri U[3], Ramya B[4], Avinashilingam N[5]
[1] Assistant Professor, Department of CSE, Dr. N. G. P. Institute of Technology, India, saranyas@drngpit.ac.in.
[2]Student, Department of CSE, Dr. N. G. P. Institute of Technology, India, karthiganesh232@gmail.com.
[3]Student, Department of CSE, Dr. N. G. P. Institute of Technology, India, gayathriulaganthan24@gmail.com.
[4]Student, Department of CSE, Dr. N. G. P. Institute of Technology, India, ramyabalamurugan7@gmail.com.
[5]Student, Department of CSE, Dr. N. G. P. Institute of Technology, India, avinashilingamn@gmail.com.

ABSTRACT

In an enormous population, people make vehicles for their needs, leading to heavy traffic. Every day, thousands of people die in road accidents across the world, creating a global hazard. In the existing system, when an accident occurs, information only is sending to emergency services through GSM, but there is no prospect for an insurance claim. This research paper describes the detection of the crash using a piezoelectric device by the observation of vibration caused by fatal crashes. There are two types of accidents: major accidents and minor accidents. These will be determined by establishing new crash pressure threshold values. Depending on the nature of the accident, official announcements can decide to make to either local emergency services and vehicle insurance companies, or both vehicle insurance and health insurance companies, as well as local emergency services.

Key words: Accident, Emergency services, Piezoelectric device, Insurance claims, Threshold value**.**

1. INTRODUCTION

The Internet of Things (IoT) refers specifically to the billions of physical appliances that are immediately linked across the developing world, all collecting and exchanging information. It properly refers to a social system of interconnected, internet-connected objects that square measure able to carefully collect and instantly transfer accurate information over a wireless net-work whereas no human intervention. The direct objects are un-restricted to electronic devices or some high-tech products but naturally include familiar things that we won't usually consider electronic like dustbins, chairs, affordable automobiles, etc. Mil-lions of countless people typically disappear every typical day in road accidents, focused most of the moment accidents are unserious, but so the tremendous tragic loss of mortal life due to un-reasonable delays in local emergency services. Humans will be unqualified to identify an accident site since we don't know where a possible accident will naturally occur. They typically provide adequate healthcare for an injured person, then really need first help instantly decide the specific place of the accident only by the location tracking and sending a message to a family member or the local emergency services. The potential accident Detection system properly represents a creative process of continuously tracking the vehicle vibration impact level at various stages of vehicle movements like traveling on modern highways, damaged roadsides, efficient vehicles intentionally hitting in speed breakers, and direct collisions**.**

2. RELATED WORK

Nanda et al. [1] demonstrated a device that detects incidents using vibration sensors is that an inexperienced driver may use another person's license to drive because the system does not authenticate whether or not the driving licenses belong to the person driving. Anil et al. [2] proposed a collision detection approach. The platform detects the accident using flex and accelerometer sensors, and the location of the accident is to notify emergency responders via a GSM modem. That RF module [3] has a limited range and focuses primarily on one sensor, probably resulting in a single point of failure. M. U. Ghazi et al. [4] Framework can save lives by allowing emergency responders to respond to accident scenes more quickly. The track felons who try to escape the scene of an accident are by which they were involved. VANETs have security and privacy vulnerabilities that might be addressed in the future and a highly dynamic topology that might cause routing issues [5]. The strategy [6] is that there is a risk of false alert if the driver loses the helmet by accident caused; also, more storage and processing capabilities are usually needed because the system must interface with cloud services. Faiz et al. [7] it has certain difficulties, such as the fact that the level of force experienced by the phone is not the same as the amount of energy experienced by the vehicle, and smartphones have battery limits. To provide [8] more details to a local hospital for the patient to be admitted as soon as the ambulance arrives. [9] Hence even though the ambulance reached the hospital in time, the patient has to wait for admission bed for availability. Patel K.H [10] when an accident occurs, information only will be sent to emergency services through GSM. But there is no prospect for insurance claiming.

3. PROPOSED APPROACH

This session discusses the proposed system, and the criticality of the accident is determined based on the vibration observed by the piezoelectric device and compared to a predefined threshold value. A minor accident occurs where the impact value is less than the threshold level. A severe accident occurs where the impact value exceeds the threshold value. Only family members will be notified immediately via SMS in the event of a minor accident. In the event of a severe accident, a global positioning system attached to the vehicle perfectly captures the specific location of the accident and the exact position where the accident occurred communicated to the emergency control room via SMS alert. Besides that, the injury event information is sent to the Health Care office for confirmation and to authorize insurance for immediate treatment. In addition, in case of a severe accident, the vehicle number and accident reports are sent to the vehicle insurance department through the Google Maps highly optimized SMS. The vehicle insurance for the accident vehicle also can be easily monitored using this system, as can the verification of car insurance for accident claims.

4. SYSTEM OVERVIEW

The description of the system design includes a block diagram of the proposed system and design methodology. It represents the systematic block diagram of this system. “IoT based Accident Detection and Life Guard system” as shown in Figure 1.

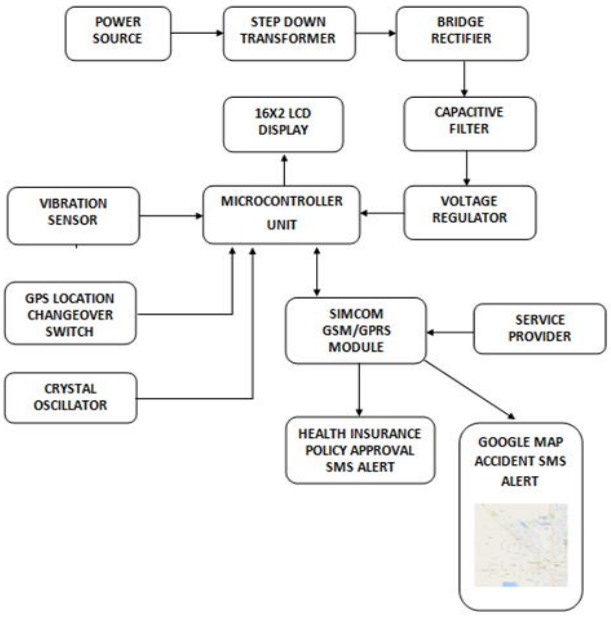

Figure 1: Block Diagram – “Accident Detection and Life Guard System”

In the block diagram, the circuit requires 5v to 12v power supply. AC mains are defined to acquire power from an AC power source, which is then step-downed by a step-down transformer to receive a low voltage AC signal from a high voltage AC signal. The AC data is converted through a bridge rectifier to collect the DC voltage required to power the microcontroller. As a result, the obtained DC power source is an unregulated and rippled DC power source. Also, capacitive filter and voltage regulator, such as the 7805, are used to obtain a regulated DC power source for the microcontroller operation.

The vibration sensor can be used for sensing the crash vibration effects for further comparison and processing. The 16X2 LCD is interfaced with the microcontroller unit to monitor the device and GPS location switches, as well as the Google map embedded SMS showing the location where the accident occurred, it can identify the accident location. The SIMCOM GSM modem can be used for interaction, and the SMS sending function enabled with the support of the GSM modem.

4.1 Design Methodology

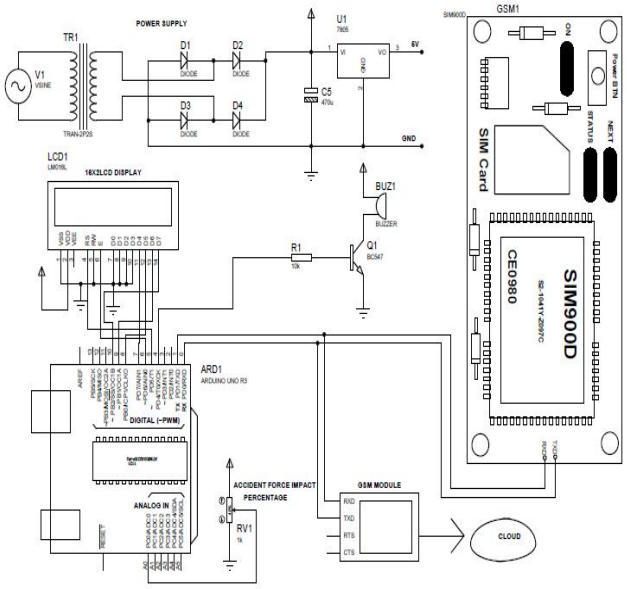

Figure 2: Schematic diagram of proposed system

The above Figure 2. The design describes the entire circuit diagram of this project. “An Accident Detection and Life Guard System Based on IoT” the digital pin 5,6,7,8,9 &10 is attached to the 16X2 LCD Display pins. And the 4th digital pin is connected to the NPN transistor driver to drive the piezoelectric buzzer. The vibration sensor pin is attached to the analog pins of the ARDUINO UNO Microcontroller unit. The SIMCOM GSM modem is used to transmit to send SMS is connected to the communication pin Rx and Tx of the Arduino Microcontroller unit**.**

5. METHODS

5.1 Accident detection

The accident Detection system represents a process of continuously tracking the vehicle vibration impact level at various stages of vehicle movements like traveling on highways, damaged roadsides, vehicles hitting in speed breakers, and collisions. If there is a collision, the crash that occurred is precisely calculated by carefully extracting the vibration values generated by the vehicle, and the determination is taken by comparing the thus collected values with the predefined threshold values.

Accident identification is the active process in which a real-time accident occurs with the potential use of our prototype. The accident is detected, acknowledged, and the criticality is determined. If finished, the accident is divided into two categories depending on the criticality and passes on to information sharing and, later, insurance claiming.

This current is used to power the kit, which will be active at the time of the crash. However, the device does not allow processing until the accident occurs, so a time delay is a program into the microcontroller. It is also attached to a piezoelectric sensor and other components.

5.2 Information sharing

In the accurate information generously sharing the phase after determining the organized criticality, the specific information is sharing according to the type of accident. It is also possible with the created SIMCOM GSM module, which consists of a single SIM card allocated to the circuit. There are two types of accidents: minor accidents and major accidents. When an accident occurs in case of a minor accident, the accident details will be sent to the family members and vehicle insurance office regarding the minor accident with the unique URL carrying the Google map integration of specific GPS location where the accident has occurred. In the event of a major accident, the alert message will be sent to the family members, the Medical insurance department with the policy number, the Vehicle insurance department with the vehicle number, and the Ambulance control room to send the ambulance immediately to the accident location.

The accident warning will be appropriately delivered to family members, allowing them to act immediately. The buzzer in the standard package will sound an alarm when the accident hap-pens, alerting anyone around. Once family members are quickly alerted of the exact position, the next priority is to inform local emergency services to ensure the safety of the human side of life. The SMS alert will notify the hospital's receptionist, they will en-able them to view it by clicking on the URL and seeing the location, or it will be informed to the patient. They can view it by clicking on the URL and see the position. They can start arranging beds while sending an ambulance to the location. (Note: This will be conveyed to the government's emergency services phone number.)

In the particular case of insurance companies, a separate hotline number will be allocated to this since all alerts are sent out through SMS. The SMS will usually contain links to Google Maps within which the specific location of the accident and the chassis number of the vehicle and hospital the patient is admitted to will be noted. The police department will be alerted about the accident in both cases quickly they may respond as possible.

5.3 Insurance claiming

Insurance claiming is the specific process that is combined to make with the previous module information sharing. The insurance request method begins after the information is collected with the insurance providers. The request is submitted directly sent as an SMS, along with a connection to a Google map indicating the location of the crash and the vehicle's chassis number. It can be used by the company to verify the trueness of the re-quest and to approve and later sanction the insurance amount.

This type is a comparatively simple phase involves is.

- Verification of provided details by the insurance company.
- Approval of the reasonable request by the company.
- Sending SMS to the victim of the accident that their re-quest has been tentatively approved.

This response is critical for the victim since it saves them a lot of time and paperwork. SMS sent to the health insurance office along with URL to Google Maps displaying the location of the accident, the patient's policy number, and the impact level of the vehicle crossed. This may then be utilized by the company to check the truthfulness of the request and to readily authorized and subsequently sanction the insurance amount, making for trust proof for the insurance sector to approve the patient's re-quest without much trouble, making insurance claiming straight-forward and uncomplicated for the user.

In the case of a severe accident, they will also undoubtedly require medical care, and so the result, they will want medical insurance. In such an instance, the details will be given to the health insurance provider business, together with the hospital's data, for verification.

6. RESULT AND DISCUSSION

The "IoT based Accident Detection and Life Guard System" is simulated using Proteus Software, and the results are shown below. The circuit models for the above system are provided, and sensors are attached to measure the output.

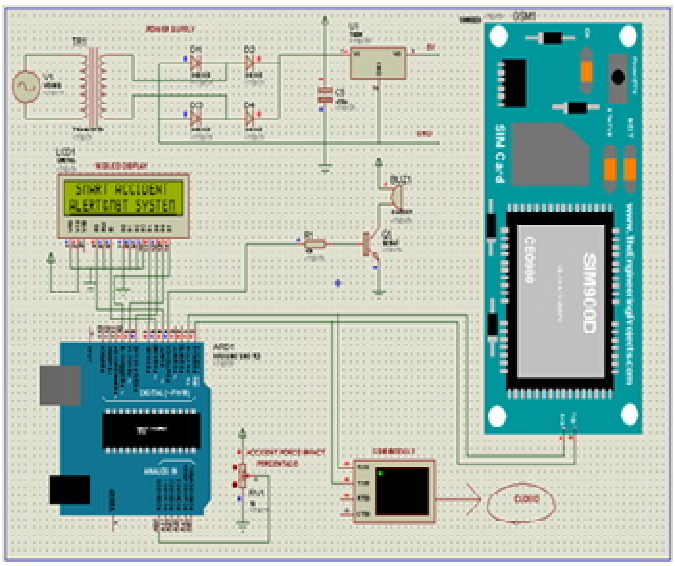

Figure 3: Smart accident alerting system

The above figure 3 shown the system initialization to provide hardware stabilization through a time delay provided by the microcontroller unit. Even if the kit is attached to an external power supply, it still has its power source, which generates 12V AC, which is then stepped down, rectified, and filtered into DC.

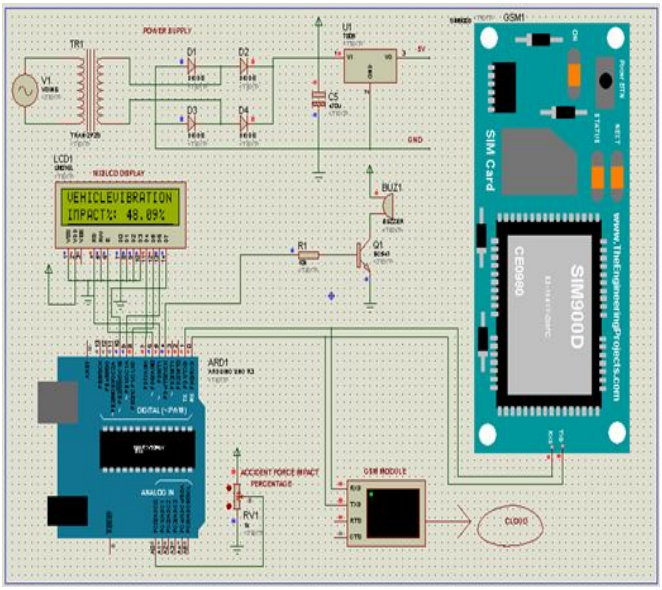

Figure 4: Impact Level of the vehicle

The above figure 4 represents the vibration impact level when the vehicle is running in the road side and hence obtained vibration level is being monitored in the 16X2 LCD Display.

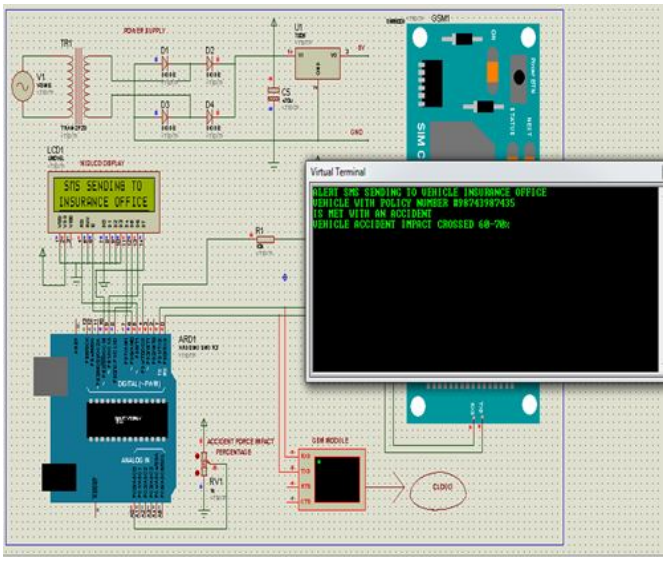

Figure 5: SMS sending to vehicle insurance office

The above figure 5 represents when the vehicle is met with an accident. The SMS notification sending to the vehicle insurance office via GSM and GPS.

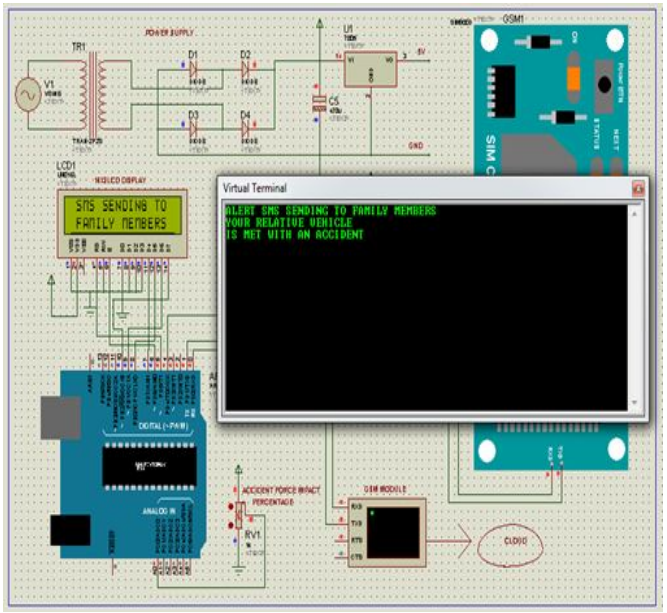

Figure 6: SMS sending to family members

The above figure 6 represents when the vehicle is met with an accident the SMS notification sending to the family members through GSM and GPS.

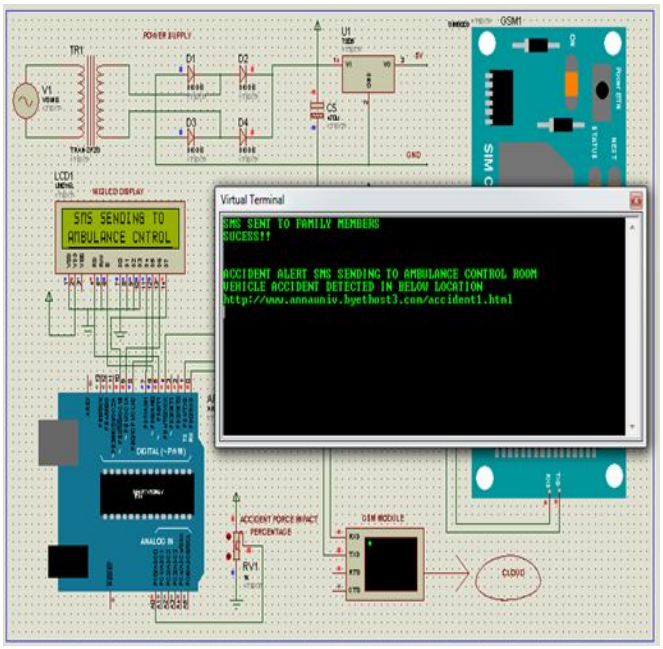

Figure 7: SMS sending to ambulance control room

The above figure 7 represents the SMS notification sending to the Ambulance control room with the URL carrying the accident location through GSM and GPS.

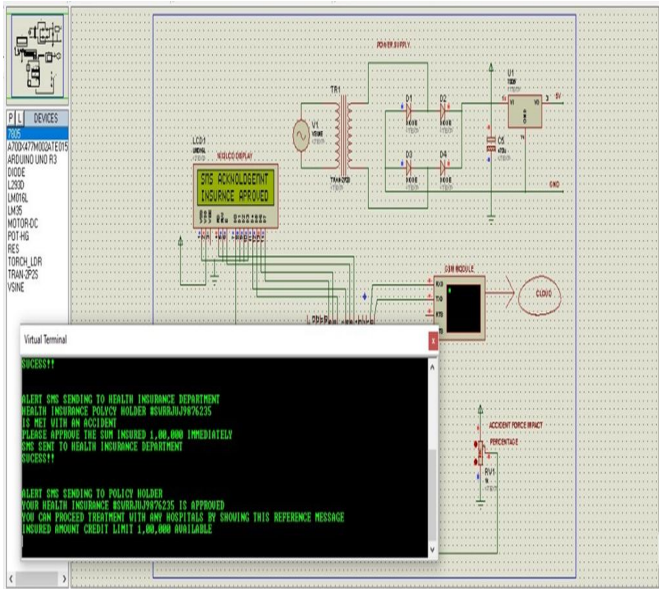

Figure 8: SMS sending to health insurance office

The above figure 8 represents the SMS notification sending to the health insurance office with the URL which shows the location of the accident along with the policy number of the patient and impact level of the vehicle crossed through GSM and GPS.

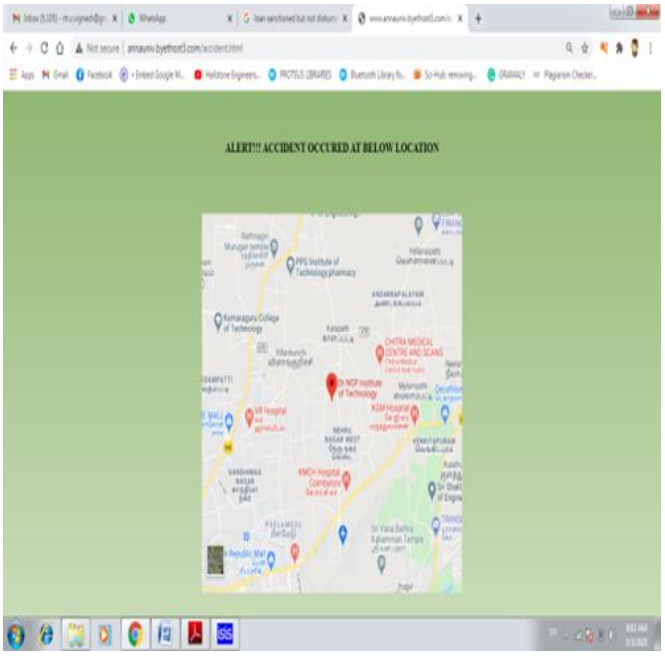

Figure 9: Integrate with Google Map

The above figure 9 represents the Google Map integration where the accident has been occurred which is passed to the accident control room through SMS notification.

7. CONCLUSION

The Internet of Things (IoT) is a constantly developing area of innovation that has successfully transported in a car, and several experiments have been performing that usually help in the coordination of healthcare meetings at the accident site and the recovery of family members. This device can also capture the specific location of the vehicle it is paired within. In the case of an accident, the device can immediately communicate with the local hospital and police station. As a result, the proposed system is essential for complete prevention and personal control of unfortunate accidents.

REFERENCES

1. S. Nanda, H. Joshi, and S. Khairnar, **An IOT based smart system for acci-dent prevention and detection**, in Proc. *4th Int. Conf. Comput. Commun. Control Autom. (ICCUBEA)*, Aug. (2018), pp. 1–6.
2. B. S. Anil, K. A. Vilas, and S. R. Jagtap, **Intelligent system for vehicular accident detection and notification**, in Proc. *International Conference Communication. Signal Processing*, Apr. (2014), pp. 1238–1240.
3. R. K. Megalingam, R. Nammily Nair, and S. Manoj Prakhya, **Wireless vehicular accident detection and reporting system,** in Proc. *Int. Conf. Mech. Electr. Technol.*, Singapore, Sep. 2010, pp. 636–640.

4. M. U. Ghazi, M. A. Khan Khattak, B. Shabir, A. W. Malik, and M. S. Ramzan, **Emergency message dissemination in vehicular networks: A review,** *IEEE Access*, vol. 8, pp**.** 38606–38621, (2020).

5. Manuja M, Kowshika S, Narmatha S, and G. Theresa W, **IoT based automatic accident detection and rescue management in Vanet,** *SSRG Int. J. Comput. Sci. Eng*., pp. 36–41, Feb. 2019.

6. S. Chandran, S. Chandrasekar, and N. E. Elizabeth, **Konnect: An Internet of Things (IoT) based smart helmet for accident detection and notification**, in Proc. *IEEE Annu. India Conf. (INDICON)*, Dec. 2016, pp. 1–4.

7. A. B. Faiz, A. Imteaj, and M. Chowdhury, **Smart vehicle accident detection and alarming system using a smartphone**, in Proc. *Int. Conf. Comput. Inf. Eng. (ICCIE)*, Rajshahi, Bangladesh, Nov. 2015, pp. 66–69.

8. Mohammed Abdul Kader, Md. Eftekhar Alam, Sabrina Momtaj, **IoT Based Vehicle Monitoring with Accident Detection and Rescue System**, *2019 22nd Int. Conf. on Comput. And Info. Tech (ICCIT)*, 18- 20 December, (2019).

9. Nazia Parveen, Ashif Ali, Aleem Al**, IOT Based Automatic Vehicle Accident Alert System** *IEEE 5th Int.Conf. Comput. Comm. & Auto (ICCCA).*(2020)

10. Patel K.H., **—Utilizing the Emergence of Android Smartphones for Public Welfare by providing Advance Accident Detection and Remedy by 108 Ambulance**, *Int. Journal of Engineering Research and Tech*, Vol 2. Issue 9, PP 1340-1342, September (2011).

11. Saad Masood Butt. **A Review Paper on "Accident Detection System Using Intelligent Algorithm for VANET** , *Computer Science & Software Engineering, University of Malaya, Malaysia Journal of Software Engineering and Applications* November (2016).

12. P.Kaliuga Lakshmi, C.Thangamani, **An Efficient Vehicle Accident detec-tion using Sensor Technology**, *IJARCET* Volume 5 Issue 3, March (2016).

13. V. Ahmed and N. P. Jawarkar, ''**Design of low cost versatile microcontroller based system using cell phone for accident detection and prevention**, in Proc. *6th International Conference Emerging. Trends Engineering. Technology*, Nagpur, India, Dec. (2013), pp. 73–77.

14. Unaiza Alvi ,Muazzam A. Khan Khattak ,Balawal Shabir Asad Waqar Malik, sher Ramzan Muhammad, **A Comprehensive Study on IoT Based Accident Detection Systems for Smart Vehicles,** *IEEE Access* ,july (2020).

15. Ajith Kumar.A, Jaganivasan.V, Sathish.T, Mohanram.S**, Accident Detection And Alerting System Using Gps &Gsm** *Int. Journal of Pure and Applied Mathematics* Vol 119 No. 15 (2018), 885-891.

16. ArifShaik ,Nataie Bowen ,Jennifer Bole, Gary Kunzi, Daniel Bruce, Ahmed Abdelgawad and Kumar yelamarthi , **Smart Car: An IOT Based Accident Detection System**, *IEEE Global Conf. Internet of Things (GCIoT),*(2018).

17. Federico guede-Fernandez, Mireya Fernandez-Chimeno Juan Ramos-Castro and Miguel A.Garcia-Gonzalez, **Driver Drowsiness Detection Based on Respiratory Signal Analysis**, *IEEE Access* (Volume: 7), (2019).

18. Jorge Z, Carlos T. , Juan C. and Pietro M. , **Providing Accident Detection in Vehicular Network through OBD-II Devices and Android based Smartphones**, Proceedings of the *IEEE 36th conference on Local Computer Networks*, Washington, DC, USA, PP.813-819, October (2011).

19. M. Srilatha, N. Vamshi, R. Aniruth, P. Narendar, Ch. Hareesh, **Automatic Accident Avoidance and Detection System using LabVIEW,** *International Journal of Advanced Trends in Computer Science and Engineering*, Volume 9, No.4, July – August 2020.