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Shreyansh Kumar Singh
Department of Electronics and Communication Engineering, BIT Mesra, Patna campus, Bihar, India

Devansh Upadhyaya
Department of Electronics and Communication Engineering, BIT Mesra, Patna campus, Bihar, India

Dr. Megha Dadel
Department of Electronics and Communication Engineering, BIT Mesra, Ranchi, Jharkhand, India

Dr. Shiv Kumar Choubey
Department of Electronics and Communication Engineering, BIT Mesra, Patna campus, Bihar, India

Corresponding Author:
Dr. Megha Dadel
Department of Electronics and Communication Engineering, BIT Mesra, Ranchi, Jharkhand, India

Accident detection & alert system for 2-wheel vehicles using helmet

Shreyansh Kumar Singh, Devansh Upadhyaya, Megha Dadel and Shiv Kumar Choubey

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Abstract
The rise in vehicles has increased the rate of road accidents which are playing one of the major roles in causing life loss. Moreover, poor emergency facilities enhance risk of severity caused by an accident. The severity can be brought down by providing medical facilities at right time.
The proposed work is based on a system which integrates MQ-3, Eye Blink Sensor, Ultrasonic Distance Sensor and Arduino UNO. MQ-3 helps in detection if the driver is drunk or sober or not and turn off the motor. Eye Blink Sensor detects the sleep state of the driver and turn off the motor in case the driver is in sleep state. Ultrasonic Distance Sensor provides alert for the nearby vehicle approaching towards the driver.
The objective of this system is to provide adequate help in definite time frame and reducing the risk of accident.

Keywords: Alcoholic detection, anti-sleep system and ultrasonic distance sensor

1. Introduction
The major idea of developing this project has been inculcated with the idea of promoting good things in society [1, 2]. In the recent days we are observing a lot of two-wheel vehicle accidents which evidently leads to high rate of death. In India nearly about 11% of total accidents happens in the world happens in India. In India at an average 6 persons met with an accident every hour [3]. Major of the accidents that take place which leads to death is due to the lack of proper medication. This can be overcome by timely informing the concerned medical authority and the family members to take actions [4]. The tracing of the location of accident can be done by GPS module using microcontroller. The helmet is basically a smart IoT device which has various features, or we can say that various systems that it possesses. Features such as alcohol detection, vehicle alert and accident alert. It consists of various sensors such as, MQ-3 Sensor, Ultrasonic Distance Sensor and Eye Blink Sensor [5].

1. The risk of brain injuries and traumatic disorders can be reduced using helmet during riding of a two-wheel vehicle.
2. The risk of death is reduced by a huge 37 percent and the risk of any kind of injury is reduced to 69 percent in case of an accident of a two-wheel vehicle if the rider wears a helmet during riding the vehicle.
3. It has been observed that head injuries are the major cause of disability after birth which is reduced by wearing a helmet during riding of a two-wheel vehicle as it reduces the risk of head injuries.
4. By wearing a helmet, the risk of neck injury is reduced, as neck injury leads to serious back problems or it may also lead to some kind of disability.
5. Adding an external layer of protection to skull and brain removes the risk of damaging the head.

From the above points we can clearly conclude that the use of helmet is very essential for every two-wheel vehicle both for rider and pillion.

2. Proposed model
By the development of smart helmet with the help of IOT we can reduce the risk of accidents for two-wheel vehicle by following means-

1. The engine will not turn on if the driver has consumed alcohol.
2. It also has an anti-sleep system which helps in the reduction of accident.
3. The Ultrasonic Sensor helps to alert the driver about the vehicle approaching nearby.

With the help of new IOT technology we ensure the safety of drivers. Various sensors are used to alert the driver and keep him safe. As we know drink and drive is common across the country which increases the risk of fatalities. By using smart helmet, we can overcome this problem [11].

Table 1: depicts the components required to develop the helmet.

S. No	Components	Name
1.	Microcontroller	Arduino UNO
2.	Alcoholic Sensor	MQ-3
3.	Ultrasonic Distance Sensor	
4.	Eye Blink Sensor	
5.	DC Motor	
6.	LED	
7.	Buzzer	

Fig.3.1. depicts various functions such as when alcohol will be detected the relay module will shut down motor and led will glow. Another sensor which is eye blink sensor which acts as an anti-sleep system for drivers and motor will be turned off when sensor is activated and led will glow. Our third sensor is the ultrasonic distance sensor that is used for the detection of the distance of the rear vehicle.

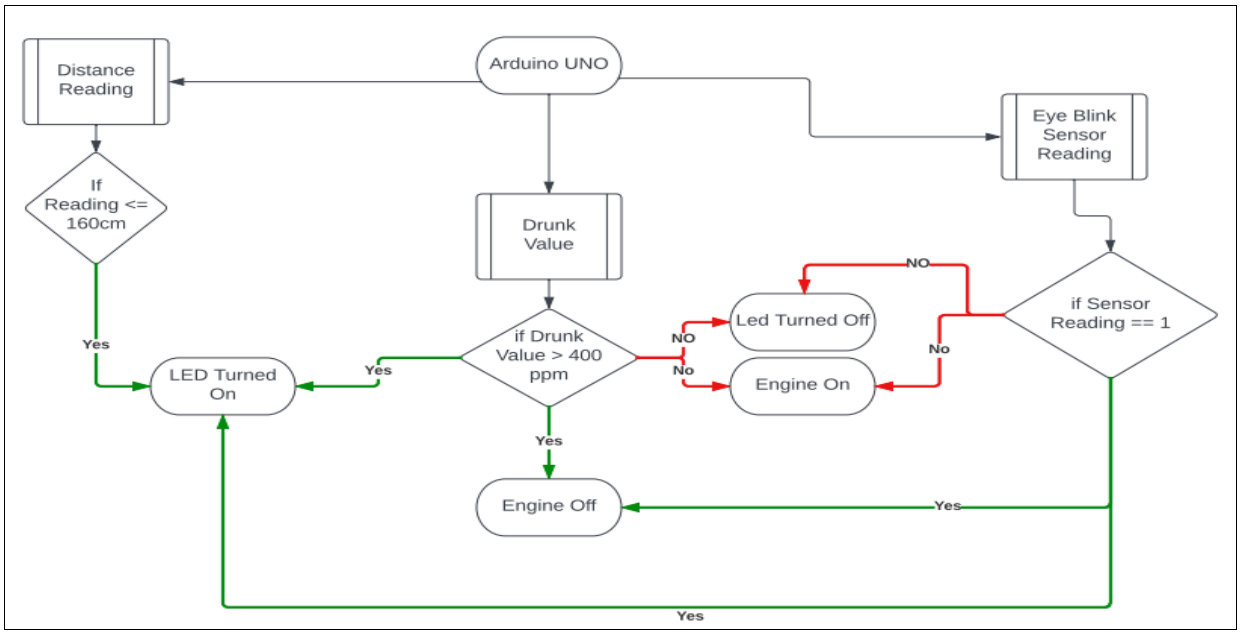

Fig 3.1: Flowchart

3. Experimental Work

1. The helmet consists of different sensors mounted on it. A microcontroller such as Arduino UNO or raspberry pi will act as an interface between the environmental variables and sensor output.
2. The helmet consists of MQ-3 Sensor (Alcoholic Sensor) which detects whether the driver has consumed alcohol or not. If driver has taken alcohol greater than the permissible limit, then the relay module attached will turn off the engine with the help of Bluetooth module and led will glow which indicate the detection of alcohol so that the drunken person reaches safely to the destination [9, 10].
3. It also contains Ultrasonic Distance Sensor which detects the presence of nearby vehicle approaching in its range. Driver will get the idea about the vehicle by seeing patterns of led glow. All led's will glow if the vehicle is very close to the driver's vehicle.
4. Third sensor is Eye Blink Sensor which acts as an anti-sleep system for drivers. In case driver is in sleep state then the relay module will turn off the engine immediately with the help of Bluetooth module and buzzer will be activated to wake up driver, thus reducing loss of lives.

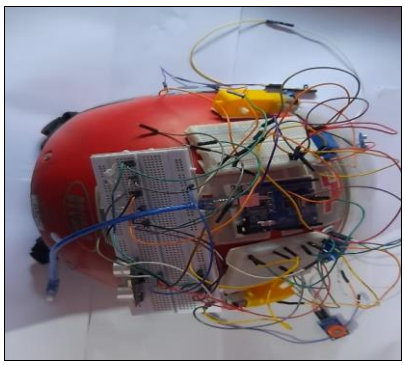

Fig 4.1: shows the interfacing of the microcontroller with various sensors mounted on the helmet.

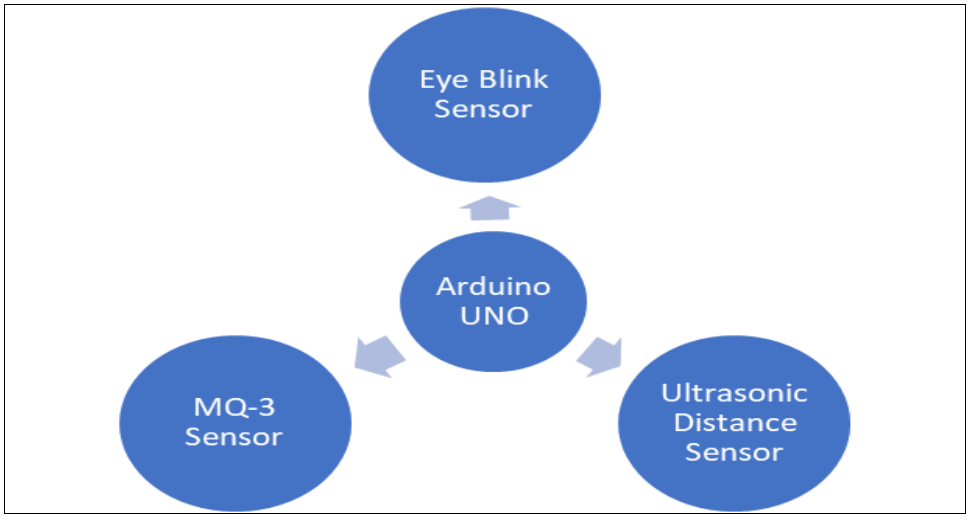

Fig 4.2: Block Diagram of Accident detection and reporting system

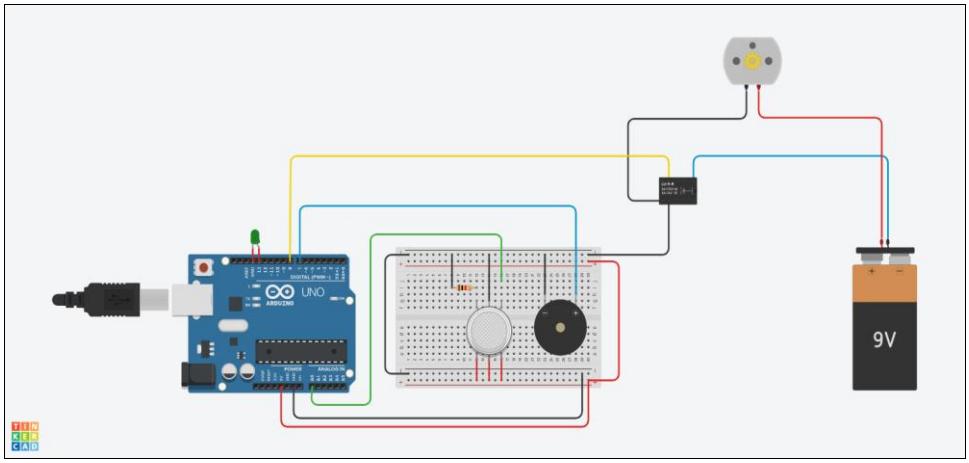

Fig 4.3: Simulated Circuit of MQ-3 Sensor

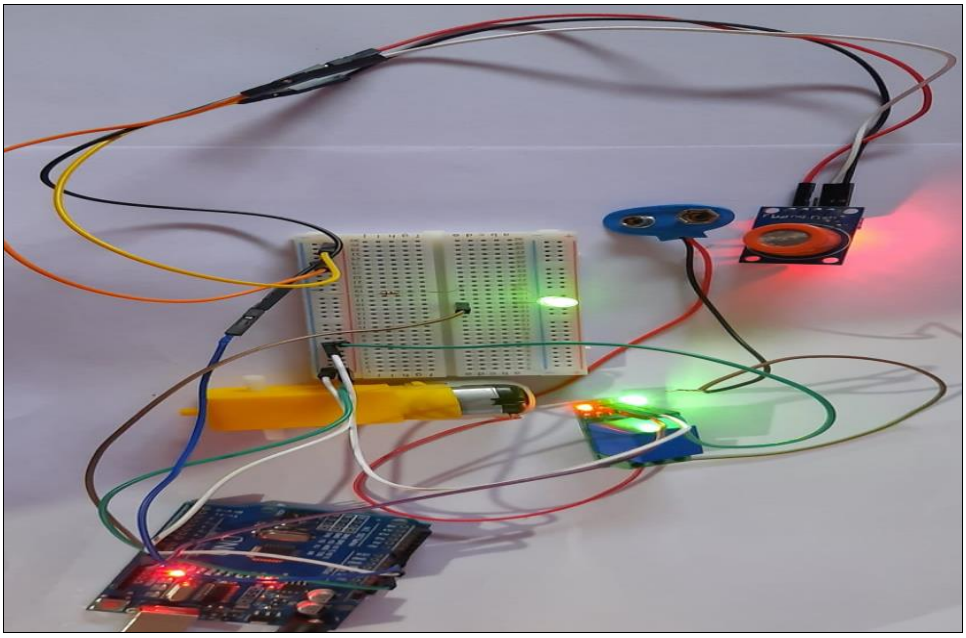

Fig 4.4: Hardware Implementation of MQ-3 Sensor

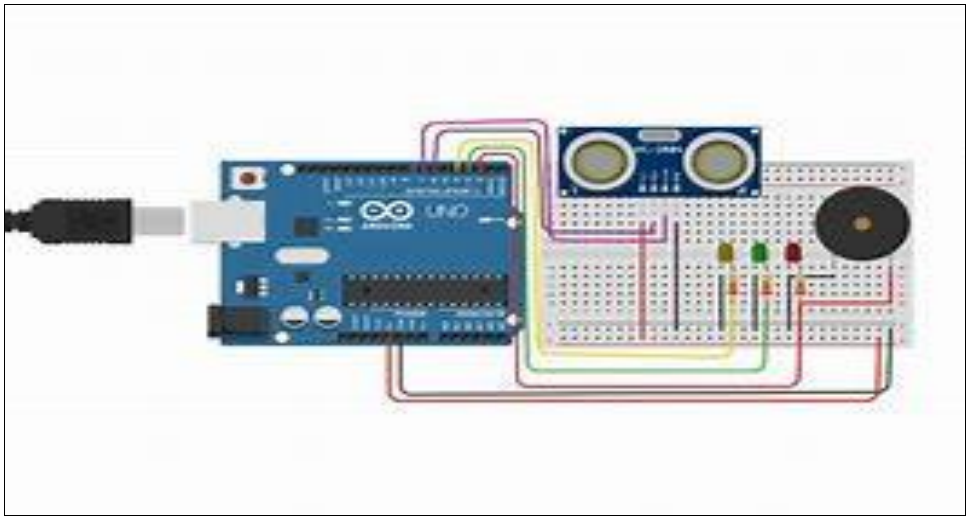

Fig 4.5: Simulated Circuit of Ultrasonic Distance Sensor

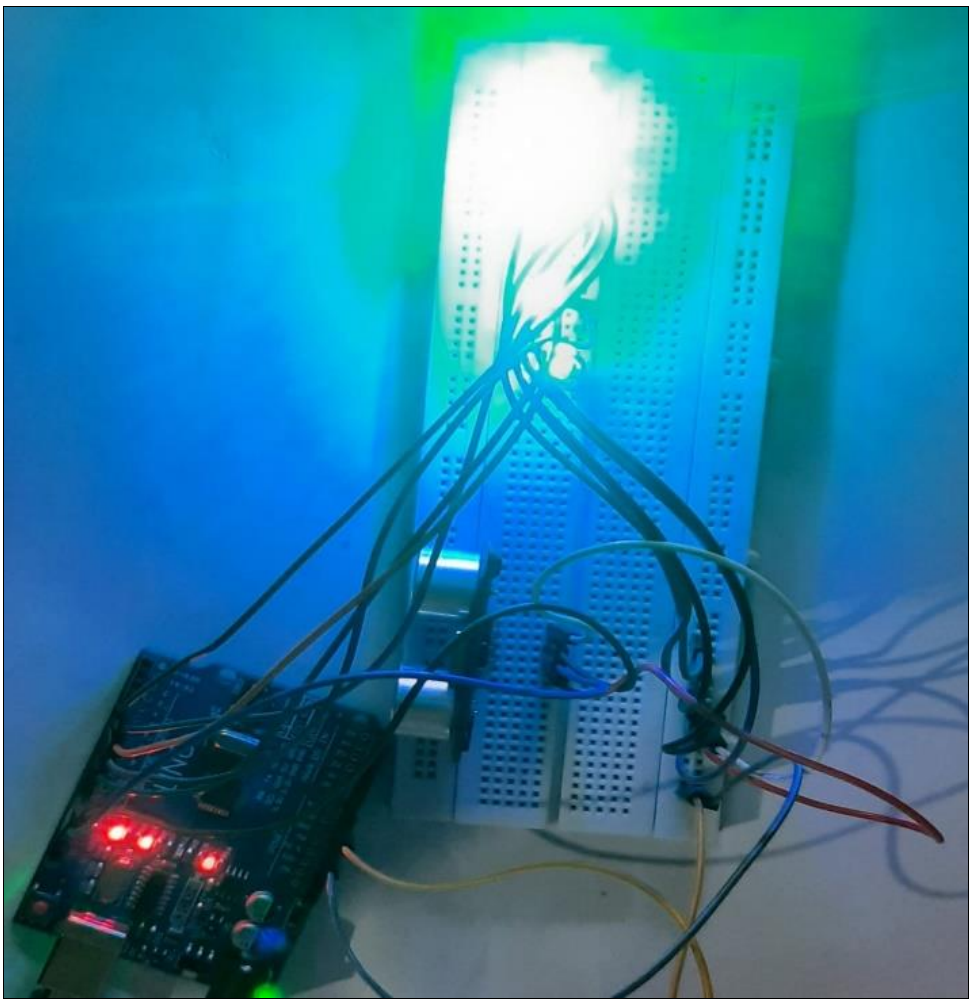

Fig 4.6: Hardware Implementation of Ultrasonic Distance Sensor

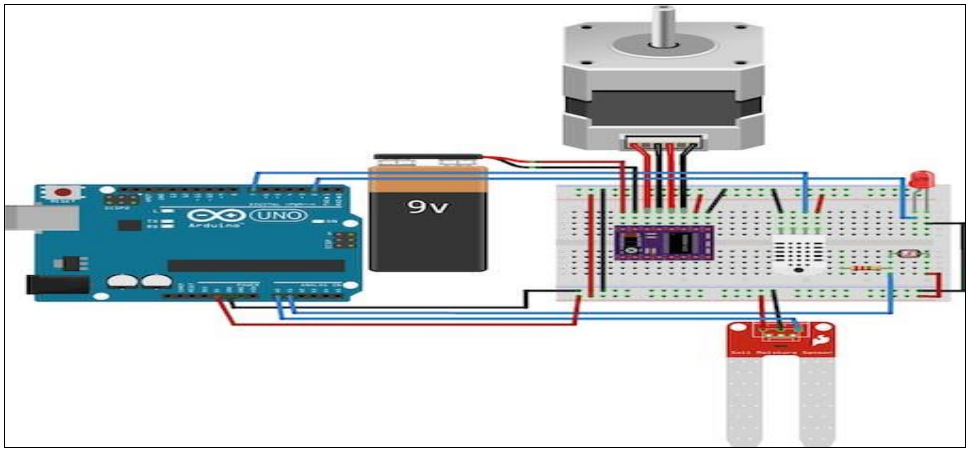

Fig 4.7: Simulated Circuit of Eye Blink Sensor

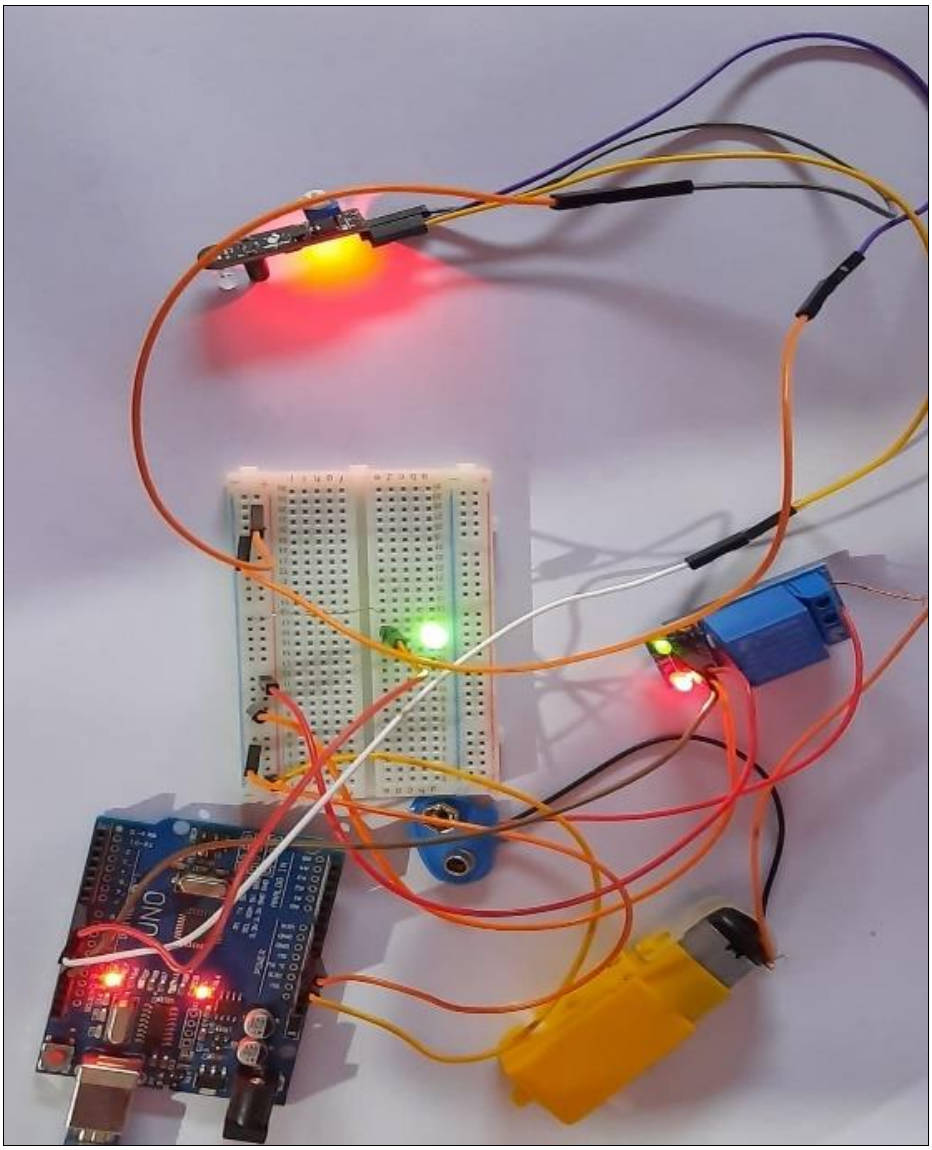

Fig 4.8: Hardware Implementation of Eye Blink Sensor

4. Conclusion

The conclusion of the project is the use of smart helmet should be made compulsory to all riders [15, 16]. Also new bikes should be added with the features so that there will be a clear communication between the rider helmet and bike it will help to reduce risk of accident and safety of people on the road as well as for riders [17, 18].

4.1 Advantages

1. With the help of smart helmet reduces the risk of fatalities
2. It helps in reducing the cases of drink and drive accidents
3. It ensures safety of the driver by providing an anti-sleep system

4.2 Disadvantages

1. In case the battery becomes dead the helmet will not be able to perform
2. It needs constant supply source
3. The weight of the helmet becomes heavy due to installation of various kits

The helmet is designed to ensure the safety of the driver by making it necessary to wear the helmet while driving or the motor will get turned off in case alcohol is detected and rider will be safe [19, 20].

References

1. Al Saadi F, Al Jabri M, Al Hasani S. Integrated Accident Detection & Reporting System. Glob Sci J. 2019;7(5).
2. Amin M, Reaz MB, Nasir S, Bhuiyan M. Low-Cost GPS/IMU Integrated Accident Detection and Location System. Indian J Sci Technol. 2016;9. doi:10.17485/ijst/2016/v9i10/80221
3. Amin MS, Jalil J, Reaz M. Accident detection and reporting system using GPS, GPRS and GSM technology. In: 2012 International Conference on Informatics, Electronics & Vision (ICIEV). 2012. doi:10.1109/iciev.2012.6317382
4. Amin M, Reaz MBI, Nasir SS. Integrated Vehicle Accident Detection and Location System. TELKOMNIKA Telecommun Comput Electron Control. 2014;12(1):73. doi:10.12928/telkomnika.v12i1.1787
5. Goud V, Padmaja. Vehicle accident automatic detection and remote alarm device. Int J Reconfigurable Embedded Syst. 2012;1(2):49. doi:10.11591/ijres.v1i2.493
6. Nesakumar D, Suresh T, Aarthi M, Gomathi K, Aarthi G, Mugilan P. Accident Detection, Alert and Tracking System Based on IoT. Eur J Transl Clin Med. 2020;7:1370-1374.
7. Meena A, Iyer S, Nimje M, JogJekar S. Automatic Accident Detecting and Reporting Framework for Two Wheelers. In: 2014 International Conference on Advanced Communication Control and Computing Technologies. 2014.
8. Ambedkar S, Ghosh M, Jain P, Kudalkar Y, Mali J. Intelligent Accident Identification System using GSM and GPS Modem. Int J Eng Res Technol (IJERT). 2017;5(ICIATE).
9. Routh J, Das A, Kundu P, Thakur M. Automatic Vehicle Accident Detection and Messaging System Using GPS and GSM Module. Int J Eng Trends Technol. 2019;67:69-72. doi:10.14445/22315381/IJETTV67I8P211
10. Chaturvedi N, Srivastava P. Automatic Vehicle Accident Detecting and Messaging System Using GSM and GPS Modem. Int J Eng Res Technol. 2018;5(3).
11. Wakure AR, Patkar AR. Vehicle Accident Detection and Reporting System Using GPS and GSM. Int J Eng Res Gen Sci. 2015;2(5).
12. Lot R, Cossalter V, Massaro M. Real-Time Roll Angle Estimation for Two-Wheeled Vehicles. In: ASME 2012 11th Biennial Conference on Engineering Systems Design and Analysis; Nantes, France. 2012:687-693. doi:10.1115/ESDA2012-82182
    William J, Padwal K, Samuel N, Bawkar A. Intelligent helmet. Int J Sci Eng Res. 2016;7(3):591-594.
13. Chitte P, Salunke AS, Bhosale NT. Smart helmet and intelligent bike system. Int Res J Eng Technol. 2016;5(5):483-487.
14. Chitte PP, Salunke AS, Thorat A, Bhosale N. Smart Helmet & Intelligent Bike System. Int Res J Eng Technol. 2016;3(5):483-485.
15. Vijay J, Saritha B, Priyadharshini, Laxmi R. Drunken Drive Protection System. Int J Sci Eng Res. 2011;2(12):1-4.
16. Mohanta HC, Mahapatra RK, Muduli J. Anti-Theft Mechanism System with Accidental Avoidance and Cabin Safety System for Automobiles. Int Ref J Eng Sci. 2014;3(4):56-62.
17. Raj RP, Kanth CS, Bhargav A, Bharath K. Smart-tec helmet. Adv Electron Electr Eng. 2014;4(5):493-498.
18. Vijay A, Singh A, Singh BV, Yadav A, Varghese B, Vijay A. Hi-tech Helmet and Accidental Free Transportation System. Int J Adv Technol Eng Explor. 2015;2(6):67-70.
19. Manjesh N, Raj S. Smart Helmet Using GSM & GPS Technology for Accident Detection and Reporting System. Int J Electr Electron Res. 2014;2(4):122-127.