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# Streetlight Automation and Accident Detection Systems

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***Abstract*: Road accidents are faced all over the world. In spite of rapid industrial developments we face frequent road accidents. Human life is threatened if there is delay in reporting of such incidents to the rescue teams and authorities. Improper traffic control and management and rapid rise in our population has also given rise to accidents at cross points and crowded streets. Such accidents can be detected traced and predicted in various ways. This survey paper discusses various approaches to detect the occurrences of accidents on road using various sensors with street light automations.**

***Keywords*: Internet of Things (IoT), Cloud, Smart Poles.**

## 1. Introduction

Roads play an important role in our transportation system. Global status report of 2015 [1] says that the total numbers of deaths caused due to road accidents are 1.25 million a year. India faces the highest number of accidents and accident fatalities in the world. India is a country which has a large number of land variance like hilly areas, plateaus and many more. Due to improper land variance and road facilities the accident rate and deaths caused by it are also more [2]. The highest number of accidents and accident fatalities are reported in transport sector, that is, road as well as railways. Some reports claim that India encountered 105,000 accidental fatalities in 2010 which is really huge. The accidental death rate is increasing day by day; it has increased 50 percent in 2000-2015, when Planning Commission of India calculated the total loss caused by it was 2.5% of India's GDP. According to the "WHO Report 2015: Data Tables" [3] the total number of accidents in India in 2015 is 238,562 and reported number of deaths is 137,572 which is really huge.

## 2. Literature review

The proposed system in [4] detects accident and its location. This system includes GSM, GPS, Buzzer and Panic button in it. The proposed system is placed in the vehicle. It works in three parts – Accelerometer, GSM and GPS module, Buzzer and panic button. Accelerometer detects whether the vehicle is on road as expected or is deviated away. GPS module is used to track the location of vehicle and GSM module is used to communicate to emergency stations by SMS. After detection of accident, buzzer placed in automobile emits sound to detect condition of the rider. This buzzer is connected to Panic button. If the Panic Button is not pressed even after certain time constraint, the panic button will be activated sending emergency alert to server with GPS and rider details. If accident is minor, alert is sent to server after Panic Button is pressed.

This system presents accident detection and alert system using SMS to specified numbers. It also tracks location of incident. The Rescue team can be dispatched immediately if major accident is detected.

The proposed system in [5] detects an accident and notifies nearest hospital, (2) It identifies route to be taken by ambulance thereby commanding traffic signals to give direct passage [6] [7] and (3) examines patients condition and reports to doctors of nearest hospital. The system is divided according to modules:

The vehicle unit: It includes microcontroller and sensors. The GPS is used for tracking location and GSM module for communication. Main server is notified when accident is detected with all details. The accelerometer acts as assistance to the driver in case the vehicle is deviated from actual path.

The control unit: It acts as a central unit of the system. It is mainly responsible for communicating with all modules and keeping records of locations of accident. It also decides which hospital to be notified about accident and its details.

The ambulance unit: The patient's condition is under supervision in this unit and its updates are given to hospital.

The traffic unit: This unit makes direct passage for ambulance by turning all signals in the route green when the ambulance is within 10 metre distance. Thus, this system saves time for ambulance to reach nearest hospital and can be helpful in saving lives at the time of crisis. The proposed system in [8], detects accidents caused by motorcycles. Chances of survival of person on motorcycle are much less then in a car. This system uses GSM, GPS and Arduino microcontroller. The methodology is in four stages:

1) *Vehicle Identification:* Identification of bikes and other vehicles is done by accessing MAC address of mobiles of users. If user is on bike, then custom beacon is sent to probes by Android application changing MAC address length of the user on bike by making it shorter in length then other vehicle users.
2) *Vehicle Registration:* After identification of vehicle, it is registered in the system. The data of the user like GPS location, MAC address is send from probe to master node.
3) *Vehicle Tracking:* Vehicle when comes near the next probe

from previous probe, its details are compared to identify the vehicle in database and if match is found, connection with the next probe is maintained and details of vehicles is shared with respective probes.

4) *Vehicle Alerting:* The master node has data related to vehicle like past and present location, moving direction and speed. If master node detects motorcycle and other vehicles within 20 meters radius, it sends alert to the driver through probe and notifies the driver by android application which conveys the message through speaker.

This system clearly focuses on prevention of accident among vehicles and motorcycles. GSM technology is used for communication and IoT as cloud storage.

The proposed system in [9] saves energy by optimized automation of Street Light. Better control and automation is possible by this system. This system can control 4 to 8 street lights. This system includes Arduino microcontroller, Wi-Fi module, relays, LDR, temperature and humidity sensor. The conventional lamps are replaced with smart LED lights which provide better illumination. This system controls the light switch with the help of light in its surrounding. All the lights are connected to relays which when commanded performs ON/OFF action on lights. When surrounding light is present, no lights are ON. This action is decided with the help of LDR sensor. The system is divided in following units:

1) *LDR:* This sensor is used to sense light in the surrounding of system. It works as light detector.
2) *Arduino Controller:* It is used as microcontroller in the system.
3) *Relay:* It is used as switches to perform ON/OFF action on lights when commanded by microcontroller.
4) *Wi-Fi module:* It is used for communicating microcontroller with the central server for data exchange and storage.
5) *Humidity Sensor:* It is used to detect and observe humidity surrounding the device.
6) *Central Server:* It acts as the main central device of the system which communicates with others and collects results and status on the microcontrollers. It is also used to display results and status to end users by web application or mobile apps.

This system provides a cost efficient solution for street light automation. It also uses LED lights reducing CO2 emissions. By this system, humidity and temperature of certain area can be monitored. The initial cost and maintenance are disadvantages of this system.

The proposed system in [10] used solar panels for efficient utilization of solar energy. It used 8052 series microcontroller. Sensors are positioned on either side of the roads to detect movements of vehicle and pass commands to microcontroller to switch ON/OFF the lights accordingly. Lights are turned ON only if motion of vehicle is detected. Else, all the lights are turned OFF in absence of vehicle motion even it is night time or dark weather conditions.

This system saves energy by being self-sustained as it uses solar energy. It also uses only when vehicle's motion is detected thereby avoiding wastage of energy.

The proposed system in [11] used GSM technology for communication and many other sensors. The system included a server microcontroller, and various sensors like smoke sensor, noise sensor, light sensor etc… to calculate various parameters. This system is able to detect surrounding temperatures, noise intensities and alert the system if something goes wrong. The disadvantage of this system was that the GSM modem has to be implemented in each streetlight raising the implementation cost. As this model used lots of different sensors for detection and monitoring of its surrounding, it is more costly to maintain too.

## 3. Proposed system

Our proposed system would be integration of street light automation and accident detection system. This will facilitate easy detection and management of accident crisis on streets with energy conservation. The model will detect the accidents by analyzing variation in sound signatures surrounding the device on the road. All the nodes of the system will be controlled by central server. Alert buzzers placed on poles notifying people in surrounding about accident occurred in direction they are heading. The access of the cloud will be given to respective Authority for monitoring incident's spot and managing traffic accordingly. The System will be controlling the intensity of streetlights by using LDR sensors.

### *A. Advantages and disadvantages*

Advantages

- Fast accident detection.
- User friendly GUI.
- Quick Reporting to Authorities.
- Detection of abnormal sound surrounding device.

Disadvantages

- Need constant power and Internet access.
- Periodic maintenance is required.

## 4. Methodology

The accident detection sensors in the proposed system are sound sensors, LDR sensor and Temperature sensor. The system is continuously monitoring the surrounding sound signatures with the help of different sound sensor. When a sound signature which is more than the threshold set on the devices which are mounted on street poles, an message of Accident Detected is passed to the central server by the IOT device via Internet. Server immediately shows status of Accident Detected on the respected pole and alert message to surrounding poles is sent by server. Meanwhile, buzzer is triggered at accident spot and red lights are activated notifying other vehicles about accident ahead. A manual switch is given at each pole to switch off the buzzer. The Street lights are controlled by the LDR sensor for its intensity as and when required. Alerts received by the server are shown on the

dashboard of User/Authorities for swift actions.

### A. IoT Device

The sound sensing at streets will be done by the IoT device mounted on street poles. If any sound signature is recorded which is greater than the threshold, an alert will be sent to the server and at the same time the buzzer will be activated. The device will also control street light with the help of LDR sensor. The device must be having internet connectivity for working and communicating to server.

### B. Server Middleware

Cloud captures the data and processes it and displays if accident is detected or not and at which pole detection of abnormal sound has occurred. It's a remote computer which can be accessed by the authorities anywhere. If accident is detected, it's displayed on dashboard of server. In proposed system, Adafruit io is used as server providing all required functionalities.

### C. Authorities

The authorities provided with the access of the server dashboard can monitor the street poles and send rescue teams as and when required.

## 5. Result

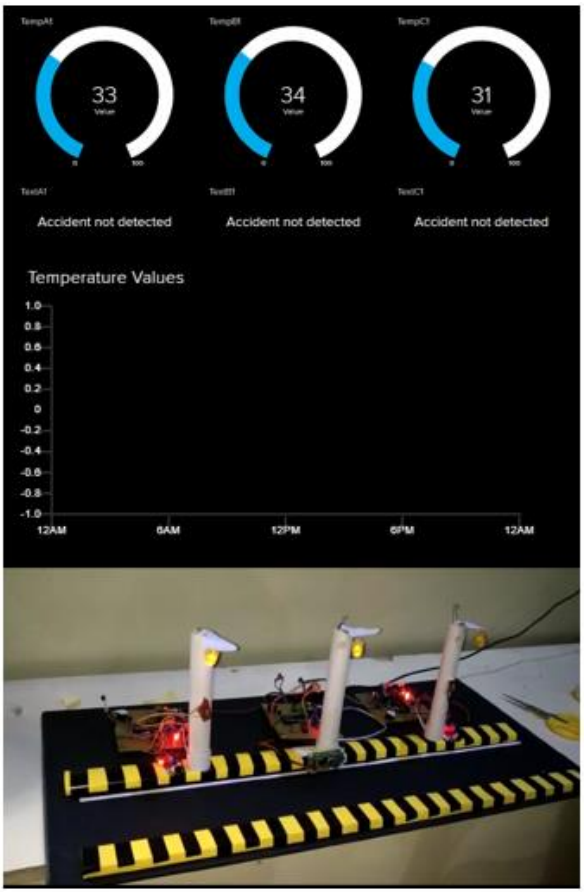


Fig. 1. Hardware setup

## 6. Future scope

This system if extended with further researches and funding can efficiently provide a platform for monitoring and safeguarding our national highways and streets in cities.

## 7. Conclusion

The papers provide various methods for automation of street lights and accident detection systems depending on hardware and software. For better energy conservation and to provide extra functionality other than illuminating surrounding, streetlights must be transformed into devices capable of detecting accidents in its surroundings. Most of the methods discussed provide alerts to users when accident is detected or as a preventive measure. As devices used for detection of accidents are in vehicle or with the users, there is a risk for hardware being destroyed in accident. Hence, an approach that does not depend on hardware or sensor associated with vehicle under damage is needed and achieved by the proposed system.

## References

[1] "Global status report on road safety 2015", World Health Organization, 2016, http://www.who.int/violence_injury_prevention/ road_safety_status/ 2015/en/.
[2] Ramya Keerthi, G.Shanmukh, Dr. R. Sivaram, Various Accident Detection Technologies and Recovery Systems with Victim Analysis, International Journal of Advanced Trends in Computer Science and Engineering (IJATCSE), Vol.2 , No. pp: 07-12, Special Issue of ICCSIE 2013
[3] "Data", World Health Organization, 2016. http://www.who.int/violence_injury_prevention/road_safety_status/2015 /GSRRS2015_data/en/.
[4] Sharath Kumar K, Kavitha Juliet, "Accident Detection for Automobiles Switch and Buzzer", International Journal of Engineering and Computer Science, Volume 7, Issue 3, March 2018.
[5] 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.
[6] S. Iyyappan and V.Nandagopal , "Accident Detection and Ambulance Rescue with Intelligent Traffic Light System?", International Journal of Advanced Technology and Engineering Research, 2013.
[7] Amnesh Goel, Sukanya Ray, Nidhi Chandra, "Intelligent Traffic Light System to Prioritized Emergency Purpose Vehicles based on Wireless Sensor Network", International Journal of Computer Applications, Volume 40– No.12, February 2012.
[8] R. Keerthika, S. Atchaya, M. Bharathi, K. Hamsaleka, C. Monika, "Road Vehicle Alerting and Accident Detection System Using IoT", International Journal of Pure and Applied Mathematics, Volume 118, 2018.
[9] Fathima Dheena P.P, Greema S Raj, Gopika Dutt, Vinila Jinny S, "IoT Based Smart Street Light Management System", Proceedings of 2017 IEEE International Conference on Circuits and Systems, 2017.
[10] M. Abhishek, Syed Ajram Shah, K. Chetan, K. Arun Kumar, "Design and implementation of Traffic Flow based Street Light Control System with effective utilization of solar energy," International Journal of Science Engineering and Advance Technology, IJSEAT, Vol. 3, Issue 9, September 2015.
[11] K. Y. Rajput, Gargeyee Khatav, Monica Pujari, Priyanka, "Intelligent Street Lighting System Using GSM" International Journal of Engineering Science, Volume 2, Issue 3, March. 2013.