

# Survey on 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), Accidents, Streetlights, GPS, GSM, LDR .

## 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 patient's 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 is 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 than in a car. This system uses GSM, GPS and Arduino microcontroller. The methodology is in four stages:

- *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 than other vehicle users.

- *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.
- *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.
- *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:

- *LDR:* This sensor is used to sense light in the surrounding of system. It works as light detector.
- *Arduino Controller:* It is used as microcontroller in the system.
- *Relay:* It is used as switches to perform ON/OFF action on lights when commanded by microcontroller.
- *Wi-Fi module:* It is used for communicating microcontroller with the central server for data exchange and storage.
- *Humidity Sensor:* It is used to detect and observe humidity surrounding the device.
- *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 can be 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 as required.

### 4. 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.

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