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Automatic and Effective Tracking Of Hit & Run Misbehavior Driver with Emergency Ambulance Support

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ABSTRACT

The Instantaneous growth of technology has made our lives easier. The combination of communication technologies and vehicles provide assistance to people injured in traffic accidents and at the same time, the person who caused such mishaps will also be adjudged. The rapid growth in the production of vehicles and also swift increase in human population have also increased the number of traffic hazards and the road accidents. This causes a huge loss of property and in most of the cases, the vehicle that caused the accident may escape and it becomes tedious to keep track of these vehicles, especially during night time. If an accident has occurred at a particular location and it is assumed that two vehicles are involved, then the vibration sensor placed in front of these vehicles senses the vibration and gives the alert to the traffic police control server through the zigbee communication. Even if someone who caused the accident happens to escape without stopping, then the vibration sensors in vehicle send the corresponding GPS location to the Traffic Cops server via zigbee.

Keywords: Arm Controller, Vibration sensor, GPS, Zigbee.

1.INTRODUCTION

Vehicle crashes result in enormous economic and social cost leading to loss of life and property, as well as injuries and fatalities to road users. During the last few decades, the total number of vehicles around the world has experienced a rapid growth. This results in making the traffic density higher. An estimate done at 2011 says that the total number of vehicles in India will be 400-450 million in the next 20 years or so. Now we have nearly 60-70 million vehicles. Most of these vehicles will come to the cities, thereby making the road accidents more frequent. The immediate effect is the dramatic increase in traffic accidents on the road, representing a serious problem in most countries. India's fatality rate was reported to be 13 fatalities per 10,000 vehicles and 64 injuries per 10,000 vehicles and 2.9 two wheelers per 10,000 two wheelers and 1.1 pedestrians per 10,000 vehicles in the year of 2004. The conviction rate in accident cases has witnessed a decline in the past five years – from 17% in 2010 to 4.6 % in 2014. These include the hit and run cases, which are usually untraced. To aid solving these problems, several cameras were installed all over the cities where roads are filled with traffic. Thus the exciting system depends only on the camera/video footage for tracking the vehicle which caused an accident. But this system is not efficient to trace out the vehicle at night time. To add on to this problem, the cameras are placed in limited areas only. There is no existing system in India that is available to track the vehicles that made the accident along with the regular monitoring system.

In this paper, we proposed the design model which deploys GPS (Global Positioning System) based Vehicle Tracking and Alert System along with emergency medical support which allows traffic police control station to track vehicles which caused the accident, along with real-time monitoring and emergency alert system. Nowadays all the new vehicles consist of the vibration sensor and GPS system. We modify this system with Zigbee. Using our tracking system we can keep track of the vehicles and also find exact location and route traveled by the vehicle, which can be observed from any other remote location. When a collision has occurred, then the vibration sensor is turned ON and it will activate the GPS system. Simultaneously the zigbee module will send a message to the nearby traffic control station. The message includes the location, vehicle owner details, vehicle details such as registration number, colour, model id etc. Using this information the police can trace the vehicle and identify the vehicle which caused the mishap and along with the current location of each vehicle. This system also provides emergency medical support without any delay to the injured victim. The current location and status of each vehicle can be viewed using Google Earth Application. This system is of low cost and serves as an effective tracking system. The proposed system requires vehicle on-board unit (VOBU) and external server in traffic control station. The vehicle onboard unit is responsible for detecting and reporting accident location along with the vehicle details to the traffic police server i.e., Control Unit (CU).

II. RELATED WORK

There are several efforts made in order to avoid accidents i.e., there has been many accident avoidance system and mobile applications are available to track the lost vehicle. One of the approaches to identify the vehicles involved in a collision, allowed to exchange details between the two vehicles at the time of collision [1]. This system had a major disadvantage because the details are interchanged via RFID between the vehicles only, the storage of vehicle details in the database of Cops server or any other external unit wasn't incorporated. The approach [2] involved the usage of Global Positioning System and Zigbee in sending the accident location to the predefined mobile number as an act of providing information about the accident. This system approach wasn't effective since it lacks effective tracking of vehicle and storage of path taken by vehicle etc., which is the basic need to catch the hit and run driver. The system [3] employs PIC microcontroller along with GPS- GSM module to provide the alert message along with the location to the Control center, from which a message is sent to the nearby ambulance to provide medical support. This system [3] overcame the limitations of [1] and [2]. But it suffers due to delay at the time of execution, communication, and response because PIC does not provide best compiler and application support and also has a slow speed of operation taking 4 clocks /instruction cycle. Since most of the traffic accidents are due to the human mistakes, [4] provides an analytical approach to study the behaviour of the driver under all the potential threats. Driver behaviour profiling system [5] uses a fussy logic to calculate the score for different drivers by providing route topology, weather conditions and detects the risky driving events and also the potential threats. In order to detect the collision in road scenes, an algorithm was developed to compute crash probabilities [6]. This is effective in terms of collision warning, crash avoidance and also mitigation. But it doesn't provide the support during its aftermath of the accident.

The system [7] employs microcontroller, GPS, and GSM to send a message about the vehicle crash to the preprogrammed numbers like ambulance, police station, etc. The system [8] renders a holistic solution to provide assistances for traffic accident by analysing the rescue problems by using V2V and V2I communications. It also estimates the severity of the accident so as to mitigate the wastage of resources which are required to provide the medical support. This system provides medical support but lacks the tracking of the hit and run cases. There are several crash prevention, mitigation and also warning systems along with the provision of medical support. But there hasn't been a system to track the hit and run vehicles with the regular monitoring along with the storage of vehicle details and GPS location in the database of the Traffic Police Control Server

III. SYSTEM DESIGN OF VOBU

The vehicle onboard unit is embedded as a part of a complete device which includes hardware and mechanical parts. Since the embedded small in size and is of less cost. These units can be mass-produced, benefiting from economies of scale. It is controlled by one or more main processing cores such as a microcontroller. The vehicle on-board unit (VOBU) employs arm controller as the main processing core because of its relative simplicity which makes them suitable for low power applications. Its simplicity results in a high instruction throughput and impressive real-time interrupt response. It is small and cost effective processor core. The ARM controller stores all the vehicle details such as owner name, contact number, the registration number of the vehicle, model number and other details. A piezoelectric vibration sensor is utilized in a number of applications to measure acceleration and vibration activity. Vibration sensors are generally used for monitoring the condition of rotating machinery, where overheating or excessive vibration could indicate excessive loading, inadequate lubrication, or bearing wear. This sensor buffers a piezoelectric transducer. As the transducer is displaced from the mechanical neutral axis, this displacement creates strain within piezoelectric element and generates voltages. MAX232 is used to convert TTL i.e., Transistor- Transistor Logic into RS232 logic level converter used between the microcontroller and the other interfacing devices. The Global Positioning System (GPS) is a satellite-based navigation system that sends and receives radio signals. A GPS receiver acquires these signals and provides us the information such as location, velocity, and time, anytime time and anywhere in the world. A GPS device calculates geographical location by receiving information from GPS satellites. The GPS provides the accident location in terms of latitude and longitude. Zigbee device transmits data over long distances by passing data through a mesh of intermediate devices to reach the traffic cops control server unit.

IV. SYSTEM DESIGN OF CU

The control server unit consists of the server connected to the zigbee transceiver which receives the data from a vehicle onboard unit (VOBU) and stores them in the database. With the help of Google Earth Application, the current location and status of each vehicle can be found. If the button to cancel medical support embedded in VOBU is not triggered immediately due to the injuries, then the emergency support for the injured person in the vehicle shall be provided without any further delay. This is triggered when the GPS location is sent to the nearest hospital. This facility is meant to prevent wastage of medical and rescue resources in the cases of unwounded drivers. The special software in the server allows it to find the exact location of an accident when the vehicle number is known and also to find the vehicle number if the GPS location where the accident occurred is known. This function enables to identify the vehicle exactly among a large number of vehicles in the roadways.

V. EFFECTIVE COMMUNICATION

This is done with the help of zigbee transceiver module. Zigbee eliminates the use of physical data buses such as USB and Ethernet cables. The protocol stack size of Zigbee is 32KB i.e., about one-third of the stack size necessary in other wireless technologies where the stack size is as low as 4KB. Zigbee is used because of its specifications such as low data rates, consume very low power and has long battery life. Its low power consumption limits transmission distances to 10–100 meters line-of-sight, depending on power output and environmental characteristics. Zigbee devices can transmit data over long distances by passing data through a mesh network of intermediate devices to reach more distant ones. Zigbee is typically used in low data rate applications that require long battery life and secure networking (zigbee networks are secured by 128-bit symmetric encryption keys.) Zigbee has a defined rate of 250 kbit/s, best suited for intermittent data transmissions from a sensor or input device.

VI. RESULT AND DISCUSSION

This section includes the real-time analysis of the proposed system.



Fig1. Shows the snapshot of the (VOBU) Vehicle On Board Unit

The snapshot contains the arm controller attached to the Zigbee, Vibration sensor and also the GPS module. The GPS module is connected to the antenna. The arm controller is also connected to the LCD to indicate the event occurrence. The voltage regulating circuit is incorporated to reduce the power supply voltage into suitable voltage required by the arm microcontroller.

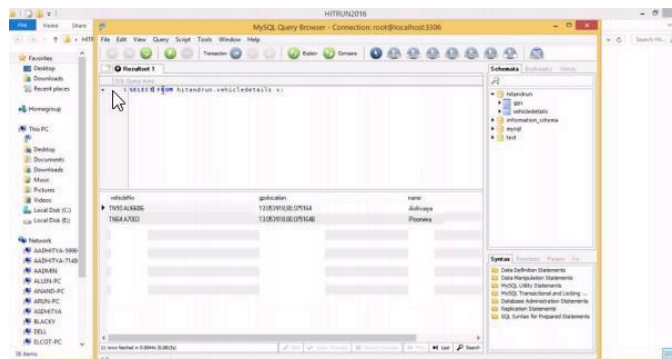


Fig2. Shows the storage of data in the query database of the Traffic Police Control Server.

When the Traffic police cops server database is checked, then the query table containing vehicle number, GPS location, and the owner's name are displayed. Using this data, either the vehicle number using GPS location or GPS location using vehicle number can be detected. The GPS location is given in the form of latitude and longitude.

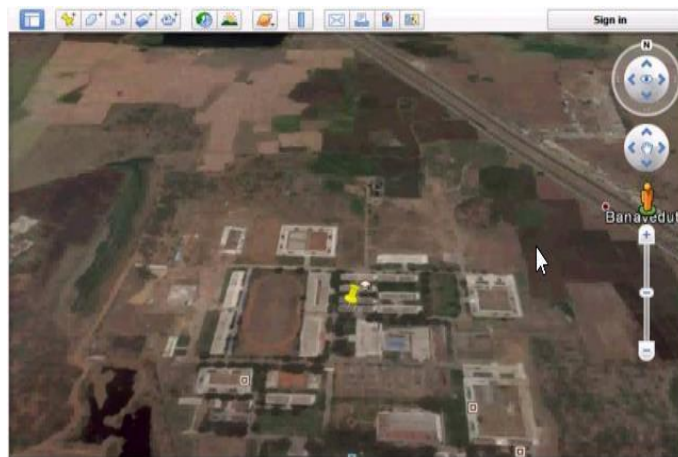


Fig3. Shows the GPS location in the Traffic Cops Control Server

Fig3. Shows the GPS location in the Traffic Cops Control Server which is provided when the vibration sensor is triggered by the high vibrations. The vehicle location is mapped using Google Earth Application installed in the cops Server. With the help of the internet, the exact location can be easily tracked.

CONCLUSION

This paper has proposed the effective system which would help to track vehicle that caused a hit and run accident and also provides emergency medical support in order to mitigate the fatalities in road accidents. This provides a key role to reduce accidents by decreasing the number of hits and run misbehavior driver and also ensures safety to people by providing all the details which are required to file an action against the hit and run driver. Thus the driver who caused accident leading to injury or death and left the scene of an accident would be subjected to serious criminal charges. The constant and periodic monitoring of the vehicles will reduce the number of accidents on the roads.

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