Automatic Accident Rescue System Using IoT

Karanam Niranjan Kumar, C. H. Rama Narasimha Dattu, S. Vishnu and S. R. Jino Ramson

Abstract Nowadays, the road accidents in modern urban areas are increased to uncertain level. In highly populated countries like India, more than 410 people get swooped up every day. A leading cause of the global burden of public health and fatalities is road accidents. The loss of human life due to accident is to be avoided. There is no technology in current times for detection of accident. Reaching of ambulance to the accident location is mostly delayed due to the conjested traffic that increases the chance of victim death. To reduce loss of life or save life of person due to accidents and reduce the time taken by ambulance to reach the hospital, there is a need of system which needs to come into force in our daily lives. To bar loss of human life due to accidents, we introduce a scheme called automatic accident rescue system (AARS). There is an automatic detection of accident by crash sensors in the vehicle. A GPS module in the vehicle will send the location coordinates of the accident using IoT platform to central unit which will notify and send an ambulance from the nearest hospital in the vicinity to the accident spot. This scheme is fully automated; thus, it finds the accident spot, helping to reach the hospital in time. This system can help in reducing the loss of lives of human which happen by the accident.

Keywords IoT · GPS · Accident · AARS

1 Introduction

Promptly, as the population is increasing rapidly the usage of vehicles is also increased and this has raised the inclusive accident rate. In most cases, the loss

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of victim's life is due to the hindrance in reaching of the ambulance to the area where the accident has occurred. This in turn has an adverse effect on the economy of the country as well as the loss of lives. So problem given above will become worst in the future.

The main objective behind this AARS is to diminish the time gap between the occurrence of accident and time required for the ambulance to reach the location of the accident for treating the victim. When an accident takes place, a lot of time is wasted to search the location of accident; such a time our system work faster and avoid the loss of life due to the time delay.

In the previously proposed system, an accident of the vehicle is detected automatically with the help of vibration and fire sensors. The location coordinates of accident vehicle are detected using Global Positioning System (GPS) and then transfer the message to the central unit using GSM [1]. A GSM module is used for transfer of the message to the central unit which indeed causes delay and interference.

In our proposing system, we are replacing GSM module with the IoT platform due to delay in its working [2]. The victim vehicle coordinates are sent to the nearby ambulance, thereby reaching the location of the accident without delay. As this system can be manually turned off, it is not used in the minor accident cases, but for emergencies where an ambulance is needed by the victim. Such a system is helpful for providing very fast medical treatment to a victim of vehicle.

2 Related Works

This idea of automatic ambulance rescue system (AARS) is all about procuring the life of mishap individual. In previously proposed system if a vehicle has met with an accident, vibration sensor or fire sensor gives the electric signal to the microcontroller through signal conditioner. The location coordinates are identified using GPS and sent to the control centre using GSM modem. In control section, the GSM modem receives a message about the accident and sends it to PC. PC identifies the nearest ambulance and instructs to pick up the patient [3] (Fig. 1).

In this system, communication gets delayed due to the usage of GSM modem which is a slow process of transfer of a message and communication using GSM modem causes interference.

3 Proposed System

To overcome the existing problem we will implement a new system in which there is automatic detection of the accident. A crash sensor is fitted in every vehicle and when an accident occurs, signals from the crash sensor are sent to the microcontroller [4]. The signal is transferred from microcontroller to the central unit using IoT platform. The GPS module provides the latitude and longitude coordinates of victim vehicle

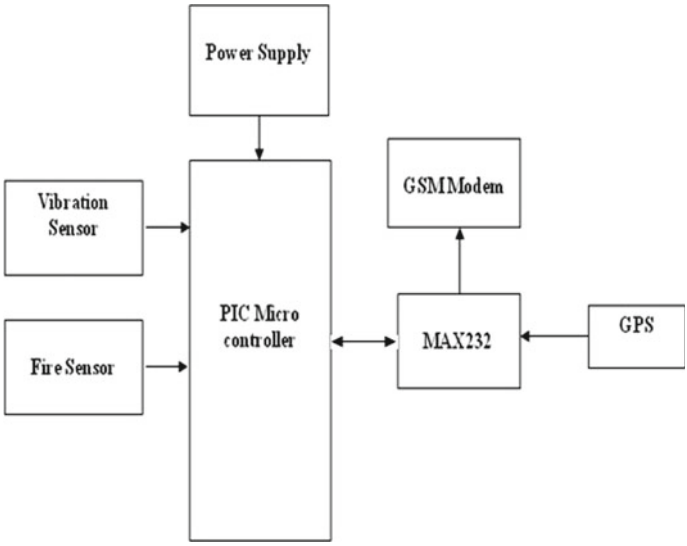

Fig. 1 Block diagram of vehicle unit

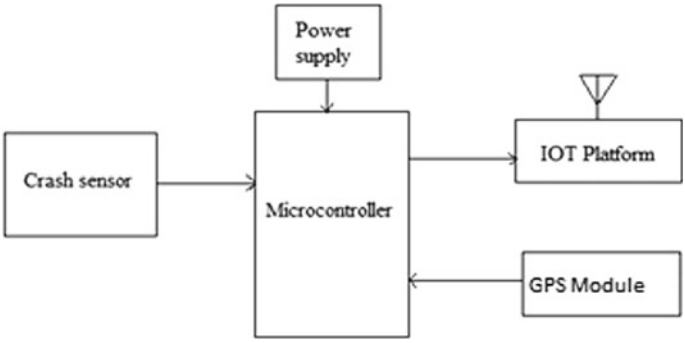

Fig. 2 Block diagram of vehicle unit

which are sent to the control using IoT platform. The central unit sends the location coordinates to the nearest ambulance and is instructed to pick up the victim. The central unit will be placed in a police station or a hospital that receives the signals from vehicle unit. It sends an alert message to the ambulance that is nearer to the location of the accident. The ambulance is also equipped with a GPS receiver for tracking of the accident location. This helps ambulance to reach the location in time and save the victim (Fig. 2).

3.1 Crash Sensor

The sensor employed in this vehicle unit is M510 Crash sensor. It is responsible for detecting sudden deceleration in a collision and converts it into corresponding signals within a matter of milliseconds. The vehicle unit is installed with the crash sensor. It turns mechanical quantity into electricity. When this sensor collided with an object, it will cause circuit switch close. As a result signals from the crash sensor are sent to the microcontroller, thereby indicating that an accident has occurred.

3.2 Microcontroller

The signals from the crash sensor and GPS module is sent to the microcontroller, for further processing. The microcontroller used in this system is Arduino Uno R3. As Arduino can be connected using USB, it is most preferred. The Clock speed of the Arduino is 16 MHz so it can perform a particular task faster than the other processor or controller.

3.3 GPS Module

GPS stands for Global Positioning System by which anyone can unchangingly obtain the position information. Initially, the time signal is sent from a GPS satellite at a given point to the vehicle equipped with GPS receiver [5, 6]. Subsequently, the time difference between GPS time and the point of time clock which GPS receiver receives the time signal will be calculated to generate the loftiness from the receiver to the satellite. The same process will be washed-up with three other satellites. When a wrecking occurs, the location coordinates of victim vehicle are identified using this receiver with an accuracy of 20 m and sent to the microcontroller.

3.4 IoT Platform

The IoT platform is used in this system to diminish the gap between the device sensors and data networks. The location coordinates of the victim vehicle are sent to the central unit using IoT platform. This IoT platform can be 4G/LTE networks. As the communication in 4G is 10 times faster than 3G or GSM, there would not be any delay in transfer of the message to the central unit [7].

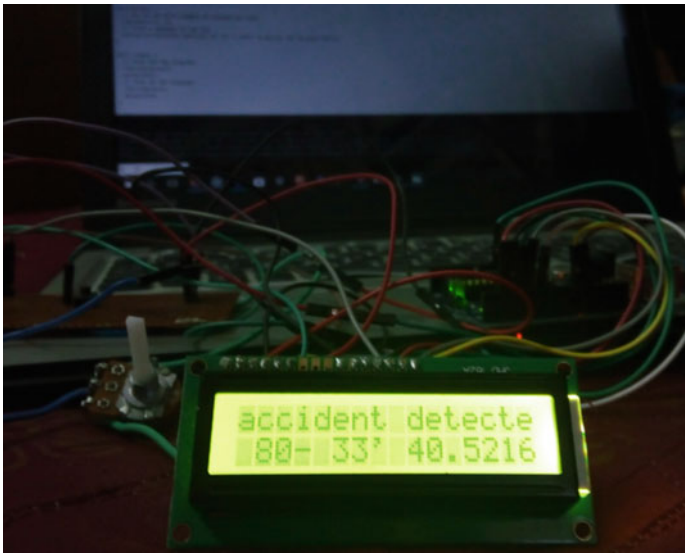

Fig. 3 Practical model of vehicle unit

4 Results

We have implemented the hardware section of vehicle unit. The circuit is made that if an accident occurs to the vehicle, the crash sensor in the vehicle unit sends the signal to the Arduino, and location coordinates from GPS module are collected. The location is sent to the central unit using Wi-Fi module ESP8266. The central unit can be a cloud storage in a hospital or a police station. The location coordinates of the vehicle unit are displayed on the above LED screen (Fig. 3).

5 Advantages

1. A totally advanced version of ambulance system [6].
2. With the help of GPS, we get the latitude and longitude of the detected position more precisely.
3. When we get the exact location of the vehicle, the ambulance will reach there in a few minutes.
4. This scheme is fully automated; thus, it finds the accident spot, helping to reach the hospital in time.

6 Applications

1. Biomedical applications.
2. Crash recorders.
3. Dead reckoning.

7 Future Improvements

In the proposing system, we are further extending to replace GPS with NAVIC chip as it has standard positioning service with an accuracy of 5 m which is much better than GPS. It is Indian Regional Navigation Satellite System (IRNSS) with its operational name as NAVIC [8]. The system was developed partly because access to foreign government-controlled global navigation satellite systems is not guaranteed in hostile situations. This system can be further extended for ambulance control system with intelligent traffic light system. This system can also be extended in facilitating connectivity to the nearest hospital and provide medical assistance through live streaming from the ambulance and also through video conferencing.

8 Conclusion

In this paper, a novel idea is proposed to save the lives of victims in an accident. This system can detect the location of accident spot automatically and accurately, and realize the automation of information transmission. Thus, AARS if implemented in countries with a large population like INDIA can produce better results. The AARS is more accurate with no loss of time. Such functions can be useful for 'help' and 'safety' of humans and society.

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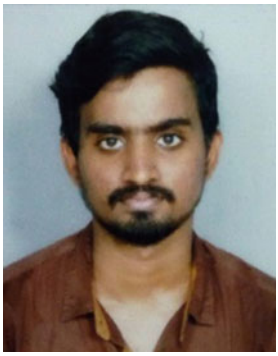

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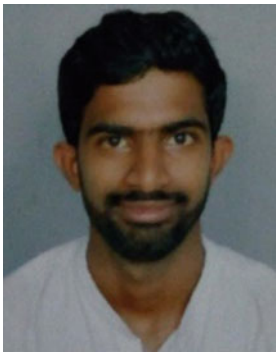

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