

Automated Detection and Rescue System for Road Accidents

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Abstract

Modern vehicles integrated with new communication technologies provide an excellent assistant to the vehicle driver to avoid road accidents. A fast and accurate tracing of accident spot is a key feature to help the victim life during emergency. The road accidents are greatly avoided by knowing the psychological state of the vehicle driver. This paper leads to monitor the drowsiness and drunken state of the driver as well as obstacles located in the roads. The alarming circuit is designed to alert the driver from major accidents. This paper also proposes a precautionary system to avoid further accidents. The probable locations are intimated to the nearest police station and help to initiate the medical services.

Keywords: Driver state, Accident, precaution system, alert system, medical service

1. Introduction

The Indian government reported that over 1.5 lakhs of road accidents due to over speeding of vehicles in the country during 2018 [1]. In past decades, there are no sensor networks available to detect and rescue the accident and cannot track the vehicle in real time. After getting the information from the telephone or news, the rescue team will arrive and save the person who gets into the accident. It will take time to save the person from the accident. The drawbacks of the past decades are;

- It takes More time consumption
- Automatic alert is not possible
- Possibilities for traffic collision.

The government is also focusing on improving the Intelligent Transportation Systems (ITS) to avoid the large number of road fatalities. The ITS application involves the data exchange between the vehicle to vehicle (V2V) or roadside to infrastructure (V2I) for road safety and secure navigation management. The automatic alert system based on the specific characteristics of accident will replaces the manual decision during the inaccurate or critical emergencies. Hence, this paper focuses on improving the post collision assistance as well as reducing the critical road accidents.

1.1. Literature review

In developing countries the access of emergency medical services are quite long time. The authors in the reference [2] proposed an accident detection system based on crash sensor and MEMS sensor. The two sensors are utilized to sense the collision. Further, the traffic lights in the accident area are controlled by the RF transmitter / receiver. The location of accident and accident information send through mobile SMS for their relatives. The end to end emergency solution based on web technology is proposed for a study location in Pakistan [3]. A fuzzy logic based optimal control of traffic signal based on the accidents is described in the reference [4]. Real time accidents detection based on the historical data represented in the

literature [5, 6]. The shortest path identification and navigation system using GPS for the access of emergency services is proposed in the reference [7]. Similar work is applied in the IoT application given in the literature [8].

1.2. Proposed solution

This project is mainly designed to save the people who get into the accident. Due to the time consumption, there are chances for the person to die during the rescue process. To overcome this process we proposed automation based safety system. If the person get in to the accident, the crash sensor detects and automatically the GSM will send the message to the contacts were saved. The proposed system proves following advantages;

- The location at which the accident took place can be exactly identified with the help of GSM.
- Time taken for rescue person is reduced.
- Easy to rescue advanced collision avoidance is possible.
- Fast response

2. Methodology

In recent years the occurrence of accident is very frequent and the consequences getting worse day by day. Hence it creates the chance for a person get in to the accident. In order to detect the accidents which take place can be detected by using a crash sensor and GSM is used to send the message to the contacts with the exact location using GPS. In order to communicate V2V zigbee has been used. So we can easily transfer the information if the accident has been take place. A DC motor is connected to the break system. A PIC microcontroller is used to control the motor thereby it reduce the speed of the automobile.

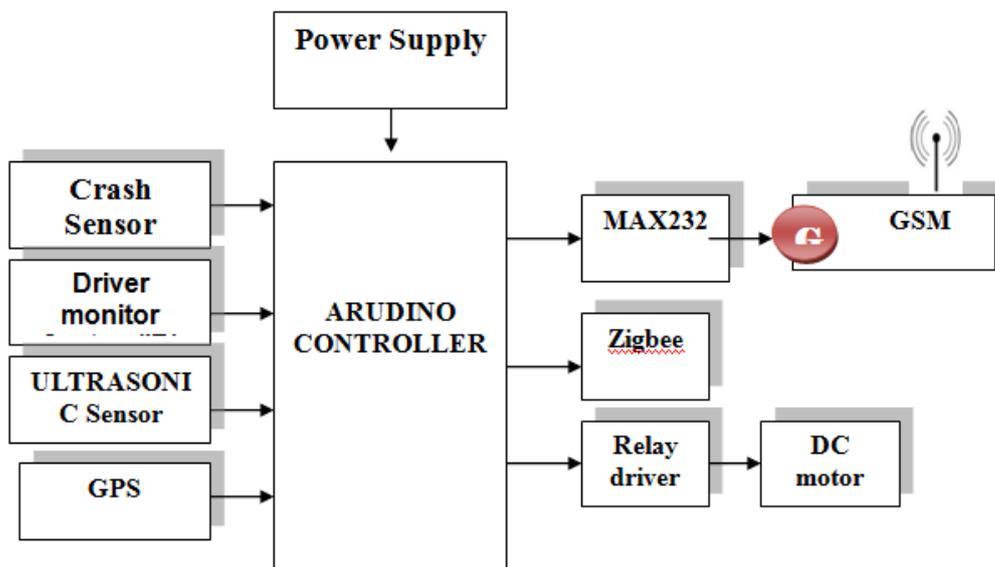


Figure 1. Block diagram of the system

2.1. Vehicle system

This project is mainly designed to save the people who get in to the accident. Due to time consumption, there are chances for the person to die during the rescue process. To overcome this process we proposed automation based safety system.

- **Power supply:** A set of battery pack is utilized to power the external devices in the connected system.
- **Crash sensor:** It is used to measure the onset of a rollover crash or frontal crash on the side of the vehicle.
- **Driver monitor system:** Driver monitor system is a electronic device which is used to monitor the eyes of the driver.
- **Ultrasonic sensor:** It measures the distance between two objects using sound waves.
- **GPS:** GPS is a navigation device, it is used to locate where the accident take place.
- **GSM:** GSM (Global System for Mobile Communication) it is mainly used to give a information to local station if any accident has been occurred.
- **PIC controller:** It is to interface the hardware and software (PIC16F877A)
- **Zigbee:** Zigbee is module to transmit and receive the information between the vehicles.
- **LCD:** LCD (Liquid Crystal Display) it is used to display the information if the accident takes place or not.
- **DC motor:** The purpose of DC motor is to run the system by DC supply. It helps to reduce the speed of the vehicle by reverse action..

3. Simulation circuit

In this project, LABVIEW software is used. In this, already we have some input files in file path. The components required for simulation are already available in the Simulink library. The PIC(16F877A) is essential for a simulation to be carried out. The required components are placed in the model and are arranged according to the given circuit. Input string value is fed to the match path, after that, it is passed into the string to numerical value block for converting string to numerical value of detected value. The simulations are carried and result is viewed in display. The simulation is compared with the before crashed and after crashed so the output is verified.

The complete simulation of our project is shown in Fig.5.1and Fig.5.2. Simulation output block diagram. The simulation circuit is designed in such a way. If any sensor is detected means, whole case structure is going to perform. Otherwise it expressed a output as a false function. Here crash sensor, IR sensor, ultrasonic sensor loops are considered as three loops. The detected numerical value is got from the sensors. If the vibration is more from the crash it has been detected by the crash sensor it indicates when the vibration is more than the limited value. Similarly both the ultrasonic sensor and IR sensor are performed. The project consists of Arduino UNO, crash sensor, IR sensor, ultrasonic sensor, GPS, MAX232, zigbee, relay driver, DC motor, GSM, power supply, APR, LCD. The PIC play a vital role in controlling the wheel shaft of the motor. The processor consists of 40 pins and port are port A, port B, port C, port D, port E. The port A of the processor are connected to the crash sensor, ultrasonic sensor and IR sensor. The port B of the processor are connected to the relay driver and DC motor. The port C of the processor are connected to the MAX232. The port D of the processor are connected to the LCD

display.

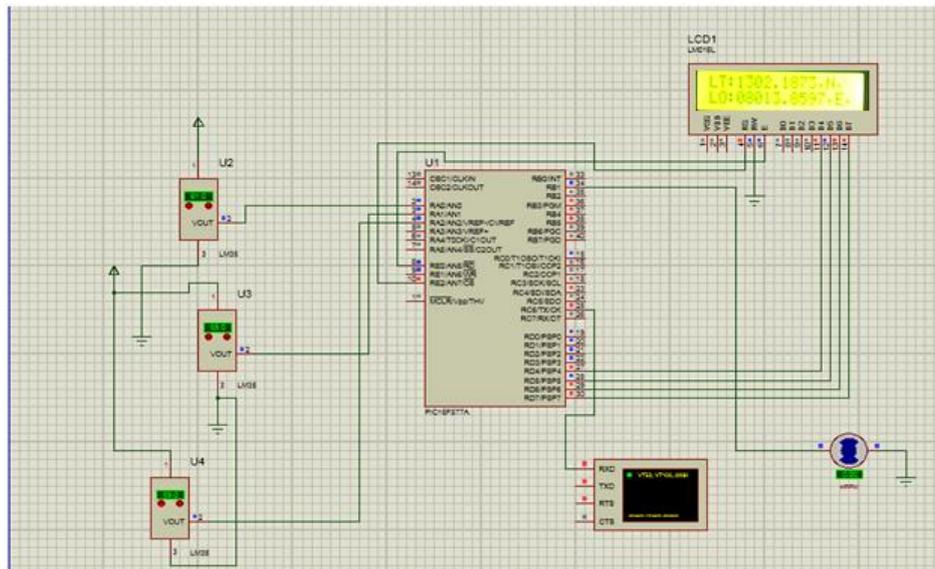


Figure 2. Simulation

The Arduino processor is made on and if the crash sensor detects any crash it gives the information to the arduino, then GPS detects the location and send the message to the contact has been saved through the GSM with the exact location. The Ultrasonic sensor is has been used to detect the distance between the vehicle. In the meanwhile a LCD module is placed on the LCD processor which displays a distance between the vehicles. In order to prevent the accident Ultrasonic sensor is placed if the distance between the vehicle reduced minimum 20 meters it gives a information to the arduino. The Arduino processor Capture is 16-bit max, resolution is 12.5 ns Compare is 16-bit max, resolution is 200 ns so the relay driver trip the motor to start and the motor used to reduce the speed of the vehicle by connecting the motor shaft to the brake controller of the vehicle. Hence the accident has been reduced. It also reduces the complications created for the rescue team by providing exact location through GSM. A consequent service should be done in order to avoid the damage caused to the electronic equipments.

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Ultrasonic sensor used to sense the other vehicle by sending the ultrasonic wave it reflect back when it touches the other object or vehicle by these we can prevent the accident has going to take place.

LCD module is present in the hardware to indicate the message of detection in simulation, the message is a collection of detected value. APR is a voice modulator it used to alert us whether the accident has been taken place. Zigbee is device used to connect the two vehicle by these we can share the information about whether the accident has taken place or not.

4. Conclusion

Automotive sector integrated with new technologies offers better assistance to the public in emergency situations. In this work, the response time of the emergency services is reduced. The system will provide to access the emergency services in shortest distance during the emergency situations. The GPS supports the both navigation of the nearest hospital and sending the accident path to the nearest police station as well as registered relatives mobile number. However, the effectiveness can be improved with characteristics of the accidents. This estimation can be done with the incorporation of artificial intelligence technique.

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