



Design and Implementation of an Intelligent Rescue System

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ABSTRACT: In the recent years the road accidents and traffic hazards has increased which causes tremendous loss to life and property of the people. Another serious problem which arises relevant to road accident is the delay in rescue operation. Intelligent rescue system deals with solution to both the problems. This system uses accelerometer which senses the impact during any collision and is installed inside the vehicle. Whenever an accident occurs it detects the impact and gives an equivalent output voltage to the ARM controller. If the voltage is above a certain level then the coordinates of that place is tracked by GPS module and that coordinates are send to the a control unit using GSM module, which find the exact location of that place using the coordinates and sends this information to ambulance. All the traffic signal in path of ambulance are made green automatically whenever the ambulance reaches near the traffic signal this is done using RF communication. Hence the delay in reaching the ambulance to hospital is minimized using this system.

KEYWORDS: Accelerometer, GPS, GSM, RF module & ARM controller.

I.INTRODUCTION

The total number of vehicle around the world is increasing at a very rapid rate. The major effect of this increase in the number of vehicle is increased traffic hazards. Number of accident and their severity has increased which is a major problem in most part of the world.

The rapid growth in the technology has raised the standard of living of people. Traffic safety is one of the fields which have improved in recent years with the advancement of technology. Many in-vehicle safety equipments like, airbag technology in which accelerometer is used, which detect the impact during collision and air bag get open immediately has been designed to avoid the loss of life and property which take place during a road accident and the research is still continue in this field. But still road accidents constitute the major part of accident death in the world. No one can prevent the road accident but the loss of life which occurs can be prevented if rescue is provided on time. Delay in the rescue operation is the major cause of death in road accidents. There are two major problems which causes delay in rescue operation in road accident they are:

1. Delay in Conveying the message to the ambulance and to victim`s family about accident spot
2. Delay in reaching the ambulance to the accident spot and to the hospital which is caused due to traffic conjunction and waiting at the traffic signals.

The system discussed in this paper deals with solution to both the problems.

System automatically detects the location of accident spot using GPS module and sends the position of that spot to the ambulance using GSM module. It also determines the shortest route from the accident spot to the hospital. The time delay in reaching the ambulance from accident spot to the hospital is reduced by clearing all the traffic signals in path of the ambulance using RF communication. In this way the ambulance reaches the hospital in minimum possible time thus preventing the life of the victims in the accident. Accelerometer is used in the system to detect the accident automatically. The ARM controller (LPC2148) is used in this system which is interfaced with the GSM and GPS module.

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II.SYSTEM MODEL

The system is divided into four main sections which communicate with each other and helps to locate the position of accident spot and also to minimize the time delay in rescue operation. These three main sections are

- Vehicle section

This section consists of ARM controller interfaced with GSM module, GPS module and accelerometer and this is installed inside the vehicle. Accelerometer detects the tilt of the vehicle and converts it into an equivalent analog voltage signal

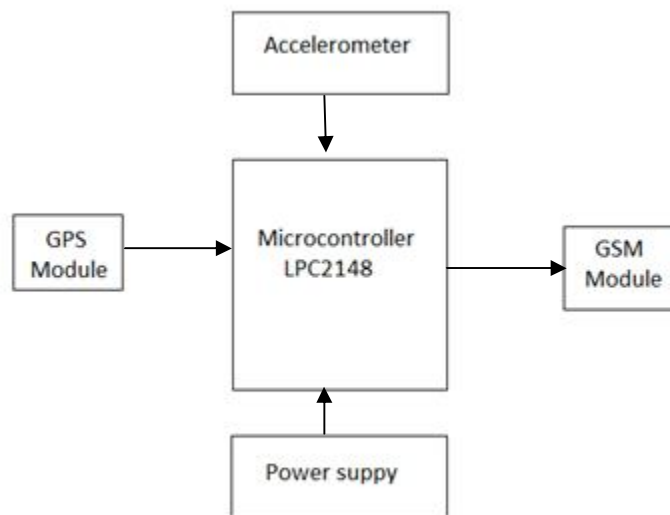


Figure 1 Block diagram of vehicle section

. Whenever the voltage level is more than the threshold voltage the ARM controller interpreted it as an accident. The GPS module detects the location of that place and the coordinates of that place is send to the control section using GSM module.

- Control section

This section consists of a system installed with a software program which receives the coordinates of the accident spot send by the vehicle unit and determines the exact position of the spot using the coordinates. It also determines the nearest hospital to that spot and the shortest path to reach the hospital from the spot. It sends all this information to the ambulance section and also to the nearby hospital using GSM module.

- Ambulance section

Ambulance consists of RF transmitter which transmits the RF signal to the traffic section. The traffic signals in the path of the ambulance are cleared as soon as the vehicle reaches with in a specific distance from the traffic light. This is done through the RF communication between the traffic signal and the ambulance.

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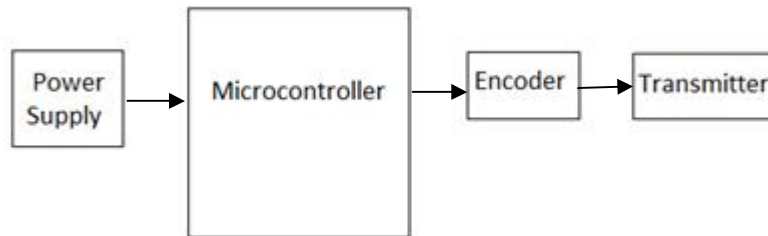


Figure 2 Block diagram of ambulance section

- Traffic Section

Each traffic signal in the path of the ambulance consists of RF receiver. Whenever the ambulance reaches the specific distance from the signal it is made green automatically through RF communication between the traffic section and the ambulance section. Thus the delay in reaching the ambulance to the hospital from accident spot is minimized.

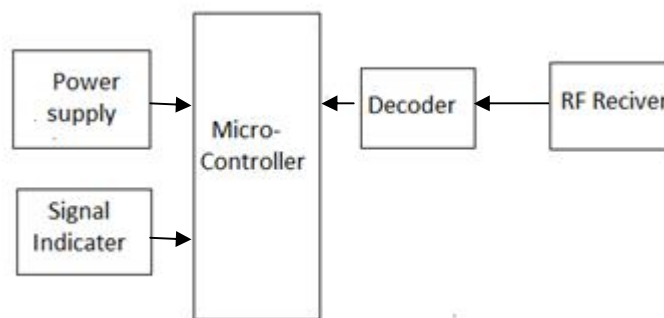


Figure 3 Block diagram of traffic section

III. PREVIOUS WORK

In recent year many systems have been developed to detect accident and to rescue injured persons in the accident as the number of road accident have increased. System have developed which uses GPS and GSM module to locate the accident spot and to sent the location of accident spot to the already saved number in the memory of microcontroller [2][3].

Automatic traffic accident detection and notification with smart phone: this paper specify the use of smart phone to automatically detect the accident and notify a control unit and also provide the situational details like GPS coordinates and photographs of the accident spot [1]. Another paper Automatic vehicle accident detection system uses GPS and GSM module to locate the accident spot and send the details of the victim to the medical help centre and to the nearby police station [2]. Automatic accident detection and ambulance rescue with intelligent traffic light system focuses on controlling the traffic light in the path of the ambulance so that time delay in reaching the hospital can be minimized [5].

Road accidents cannot completely avoid but it is possible to provide assistance after the accident to the victim as soon as possible thereby improving the chance of survival of the people [4]. Road accidents can be minimized if the driver fatigue symptoms can be detected. Sensor like gas, alcohol, eye blinking can be used for this propose [6].

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IV. SYSTEM DISCRIPTION

The vehicle unit placed inside the vehicle consists of accelerometer [7] which senses the tilt of the vehicle and sends the analog signal corresponding to the tilt to microcontroller LPC2148 which converts the analog signal into digital using inbuilt 10 bit analog to digital converter. Controller is programmed in such a way that whenever the output from the sensor is above the threshold value, the location of the spot as determined by the GPS module interfaced with the controller is send automatically to the control section using GSM module. The figure 4 given below shows the hardware unit of the system.

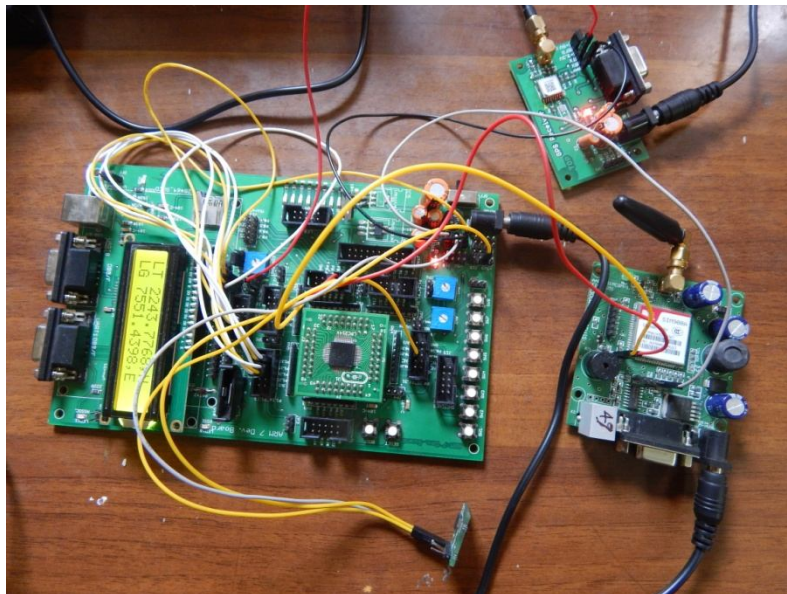


Figure 4 Hardware unit of system

The control section determines the exact location of the spot using the received coordinates and finds the nearest hospital from the spot. It also sends this information to the ambulance section and to the hospital.

Ambulance is equipped with the RF receiver and the traffic system consists of Microcontroller, whenever the ambulance is within a specific distance from the traffic signal the traffic light automatically get green. This is accomplished through RF communication between the traffic signal and the ambulance. Hence the delay caused due to waiting for signal to become green is minimized.

V. EXPERIMENTAL RESULTS

- **Normal working condition:**

Figure 5 shows the result of the system during its normal operation that is when the accelerometer is at its normal condition without any tilt.

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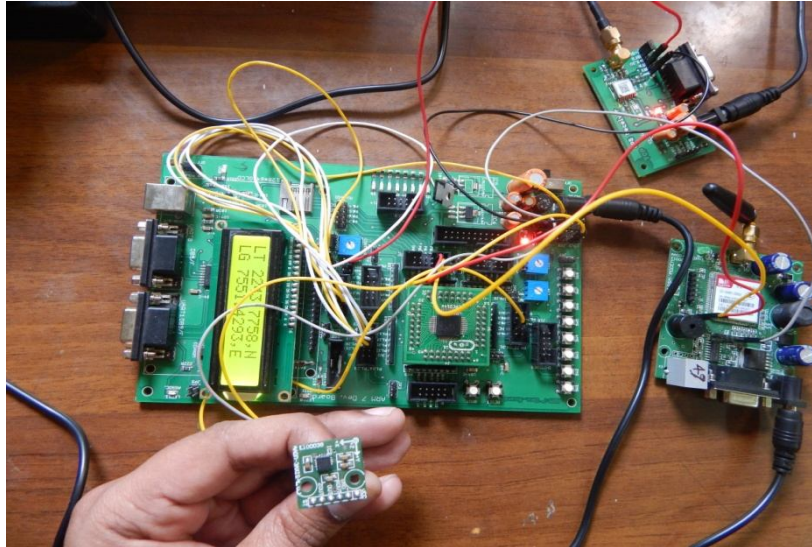


Figure 5 Normal condition

This can be seen from the figure that LCD is showing the latitude and longitude coordinates of the place. This is assumed that the vehicle has not suffered an accident.

- **Accident Condition:**

As shown in the figure given below, when the tilt of the accelerometer is greater than some threshold level the system is programmed in such a way that the location of the place as determined by the GPS module is send to the control unit through the GSM module.

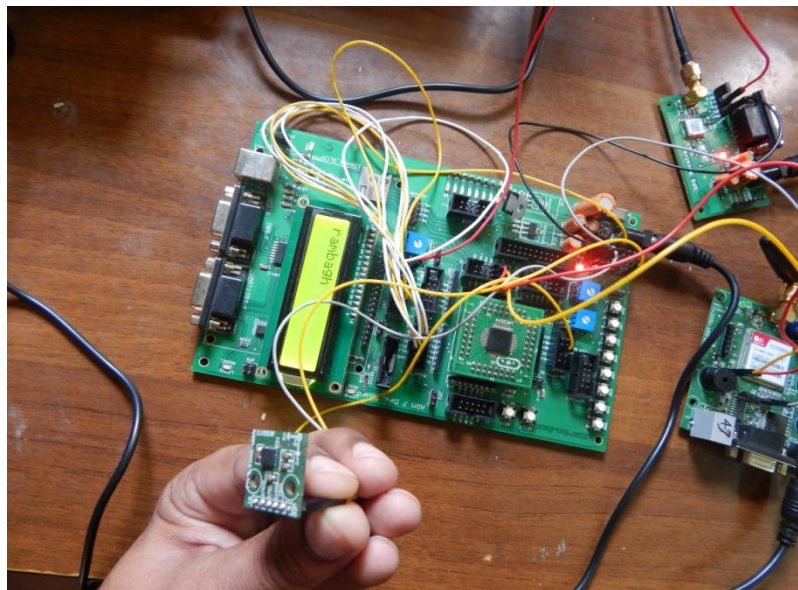


Figure 6 Accident condition

This is assumed that an accident has occurred in this condition. Programming is done in such a way that LCD shows the name of the place where accident had occurred.



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VI.CONCLUSION

The system described in this paper explain how the life of people can be saved if the recue is provided to the victim as soon as possible. The intelligent recue system not only automatically detects the accident but also convey the information about the accident spot to the ambulance and to the nearest hospital. It also minimizes the time delay in reaching the ambulance to the hospital by clearing all the signals in the path of the ambulance. This insure reduced time lag between the accident spot and the hospital thus making the world a much safer place to live.

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