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Emergency Rescue System for Accidents by Traffic-Light Control

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***Abstract*— In developing countries like India, Traffic congestion is recognized as a severe problem in modern urban areas since most of the people prefer self transportation rather than public transport. The rapid rise of the automobile industry over time has directly affected all aspects of people in terms of obesity, other health issues and polluting the mother earth by enhancing global warming. In most urban areas, people should forecast the risks of vehicles travelling at high speed because most of the accident results in serious injuries and can be fatal. Moreover, the traffic blockages have caused much waiting for the emergency vehicle to reach the accidental spot on time. Hence, the life of a victim is put at risk. To avert this hazardous situation we have introduced a new technique called Emergency Rescue System. The intention of this method is to provide an emergency vehicle on the accidental spot on time by implementing an ITS that control the traffic light. Thus, it finds the accident location accurately and assists the victim within their golden hour by expediting the emergency vehicle using traffic light control.**

Keywords*— *Vibration sensor, Short Message Service, Global System for Mobile Communications (GSM), Arduino Global Positioning System (GPS), RF transmitter, RF receiver, (SMS), Encoder and Decoder.

I. INTRODUCTION

Road transport plays a major role in our daily life as it offers mobility at low cost. However, it also leads to the risk of accidents, injuries and loss of an individual life. In India, modernization and growing urbanization causes exposure to severe traffic.

During the calendar year 2018, road deaths in India increased to nearly 1.49 lakhs and caused injuries to 4, 70,975 persons. On an average, there occur 405 deaths every day or 53 accidents and 17 deaths every hour in the country. The State of Tamil Nadu has recorded the highest number of road accident, but Uttar Pradesh has registered the maximum spike in fatalities [2].According to a survey conducted with Trauma care staffs, “If the casualty is displaced within the golden hour, the chance of survival would be increased. In India most of the bystanders are hesitating to assist the accidental victim due to the fear of legal complications including police enquiries and court appearances.

The primary step to correct this is to implement a system which would send the emergency vehicle to assist the victim within the time frame since every second is valuable. In [11] PN Petri nets are used for intersection road areas to avoid traffic congestion. The shortest path is determined by using algorithm for emergency vehicle to reach the hospital [4].

COUNTRY	NO.OF ROAD DEATHS
INDIA	1,49,725
US	40,000
CHINA	2,60,000
RUSSIA	18,214
UK	26,610
IRAN	32,575

Table 1.1: NO. Of road accident death in each country

The primary goal of this proposal is to identify the accident spot accurately, send the message to the emergency assistance team as well as the guardians as it offers an uninterrupted transition of the emergency vehicle to reach the medical center within the time. The RF component helps in controlling the traffic lights accordingly.

II. SYSTEM DESCRIPTION - EMERGENCY RESCUE SYSTEM

The system consists of three sections namely vehicle section, emergency assistance vehicle section and traffic network section

A. Vehicle Module

A vehicle module which includes a Vibration sensor and MEMS sensors, Arduino UNO, GPS, and GSM Modem should be installed in every automobile.

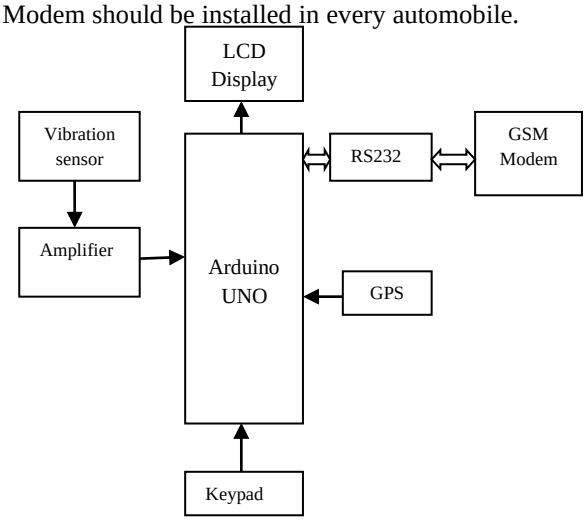

Fig.1: Schematic diagram of vehicle module

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When an accident occurs, immediately the vibration sensor embedded in the vehicle module will identify the signal and sends it to the Arduino UNO. The sensor is made up of piezoelectric material. After that, this signal is given to the amplifier unit for amplification purpose. This amplified signal is given to the ATmega controller. Here we use flash type programmable controller. This ATmega controller is already programmed for our process.

From the GPS ATmega gets the location information of the vehicle. On accident detection, ATmega transmit the message to the stored number it may be a Police control room and the EMA team with the help of GSM modem. The RS 232 is a serial communication cable. It is used to interface the ATmega with GSM. Mobile number can be entered by using the keypad. After receiving the information, the Police and EMA team can immediately discover the accident spot by GPS MODEM. Then after double-checking the details, appropriate action will be taken.

In case of minor accident, the operation will be terminated by the vehicle driver in order to save the EMA's team valuable time.

B. Emergency Vehicle Module

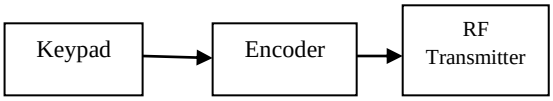

Fig.2: Schematic diagram of Emergency vehicle module

This module holds a keypad which is connected remotely to control that. For each key pressed, the respective road only gets cleared while others are obstructed. When the key is pressing this information is given to the encoder. Then this encoded signal is transmitted via RF transmitter. Once the emergency vehicle crossed the signal, then it will be switched on to its ordinary routine.

C. Traffic Network Module

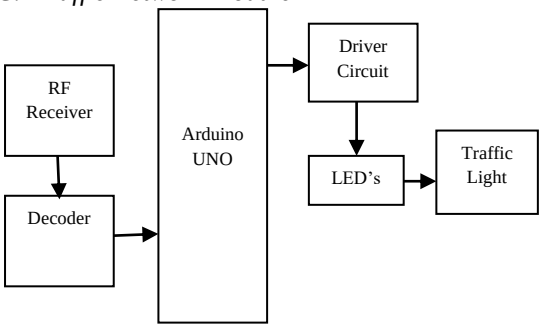

Fig.3: Schematic diagram of Traffic Network module

RF receiver receives the signal and sends it to the decoder. Decoded signal is given to the Arduino Uno which in turns controls the traffic light. Driver circuit is used to control the LED's and traffic lights since it cannot be controlled directly by the controller.

III. HARDWARE RESULTS

A. Vehicle Module

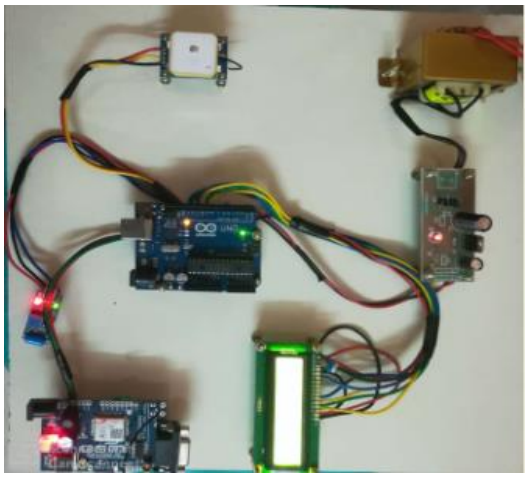

Fig.4: Vehicle module Hardware result

This section holds a vibration/MEMS sensor to identify the accident, GPS and GSM modem to determine the accident location accurately and send the message to the concerned team for necessary action to be taken post accident. All the devices are connected to the Arduino controller which acts as a heart of the section.

B. Emergency Vehicle Module

The emergency vehicle section consists of a keypad, an encoder and RF transmitter. On pressing each key the signal is encoded and sent to the RF transmitter.

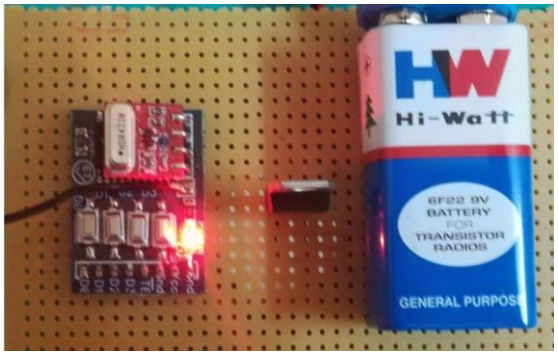

Fig.5: Emergency vehicle module Hardware result

C. Traffic Network Module

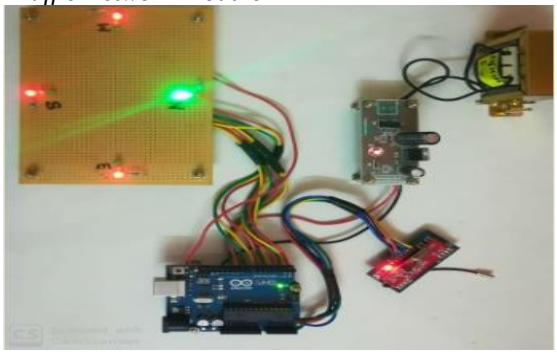

Fig.6: Traffic network module Hardware result

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This section consists of RF receiver, a decoder, Arduino and traffic light. The encoded signal is received by the RF receiver then it is decoded and the traffic light for the respective road alone is made as GREEN while the other roads are change to RED so that they are blocked. Once the emergency vehicle crossed the road, the lights are switched to work in a regular manner.

IV CONCLUSION

This work saves the human life by providing medical assistance within their golden hour. It reduces the time lag, since much time is wasted in waiting for the emergency vehicle and during the displacement of the victims between accident spot to hospital.

The Major advantage of this system is decision making is much simpler as the accidental vehicle is identified accurately with its geographical location without any delay and the victim is assisted immediately. By using a cell phone signal booster, we can get network coverage in rural areas as well. Thus, by implementing this system in highly populated areas like our nation, fatality rate can be reduced maximum.

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