AUTOMATIC ACCIDENT DETECTION AND AMBULANCE RESCUE WITH INTELLIGENT TRAFFIC LIGHT SYSTEM

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ABSTRACT: **Nowadays the road accidents in modern urban areas are increased to uncertain level. The loss of human life due to accident is to be avoided. Traffic congestion and tidal flow are major facts that cause delay to ambulance. To bar loss of human life due to accidents we introduce a scheme called ITLS (Intelligent Traffic Light system). The main theme behind this scheme is to provide a smooth flow for the emergency vehicles like ambulance to reach the hospitals in time and thus minimizing the delay caused by traffic congestion. The idea behind this scheme is to implement ITLS which would control mechanically the traffic lights in the path of the ambulance. The ambulance is controlled by the control unit which furnishes adequate route to the ambulance and also controls the traffic light according to the ambulance location and thus reaching the hospital safely. The controller identifies the location of the accident spot through the sensor systems in the vehicle which determined the accident and thus the controller walks through the ambulance to the spot. This scheme is fully automated, thus it finds the accident spot, controls the traffic lights, helping to reach the hospital in time.**

Keywords: **ITLS, Traffic, Congestion, Sensor system**

I. INTRODUCTION

Nowadays Wireless Sensor Networks (WSN) has been applied in various domains like weather monitoring, military, home automation, health care monitoring, security and safety etc. or in a nut shell one can say wireless sensor network can be applied in most of the domains [1], [7]. Traffic Signal System or traffic monitoring is a vast domain where WSN can be applied to gather information about the incoming flow of traffic, traffic load on a particular road, traffic load at particular period of time (peak hours) and in vehicle prioritization. WSN installed along a road can be utilized to control the traffic load on roads and at traffic intersections [5], [9].

The sensor nodes that are to be deployed along the road are small in size and have low energy consumption [2], [3]. These sensors run on both battery power as well as solar energy. They have the capability to draw solar energy so that they can use sunlight for functioning in bright and sunny condition and the battery power for functioning at night or in cloudy or foggy condition. Sensors used in the Wireless Sensor Network for traffic signal systems are mainly of two types: i) Intrusive type and ii) Non-Intrusive type [4], [8]. i) Intrusive types of sensor are kept under the road and sense the traffic waiting at the signal. This type of sensor has the same working principle as that of a metal detector. ii) Non-Intrusive types of sensor is fitted on the road. The installation of this type of sensor is easy as no cutting of road is needed to be done. Non-intrusive sensor includes acoustic sensors or video image processors to detect the presence of vehicles waiting at the traffic intersection. Although Intrusive sensors are very effective still Non-intrusive sensors are preferred over Intrusive sensors as they are cost-effective, easy to install, immune to natural corrosion and degradation [6],[10].

II. PROPOSED SYSTEM

In proposed system if a vehicle has met accidents, immediately an alert message with the location coordinates is sent to the Control center. From the control center, a message is sent to the nearby ambulance. Also signal is transmitted to all the signals in between ambulance and vehicle location to provide RF communication between ambulance and traffic section. The vehicle accident observed using vibration sensor and in the control section it is received by the microcontroller and then the nearby ambulance is received from the PC and controller sends the message to the ambulance. The signal to Traffic signal section is transmitted through RF communication. Also if any fire occurs, it is detected using fire sensor and an alarm message is directly sent to the fire station.

III. BLOCK DIAGRAMS
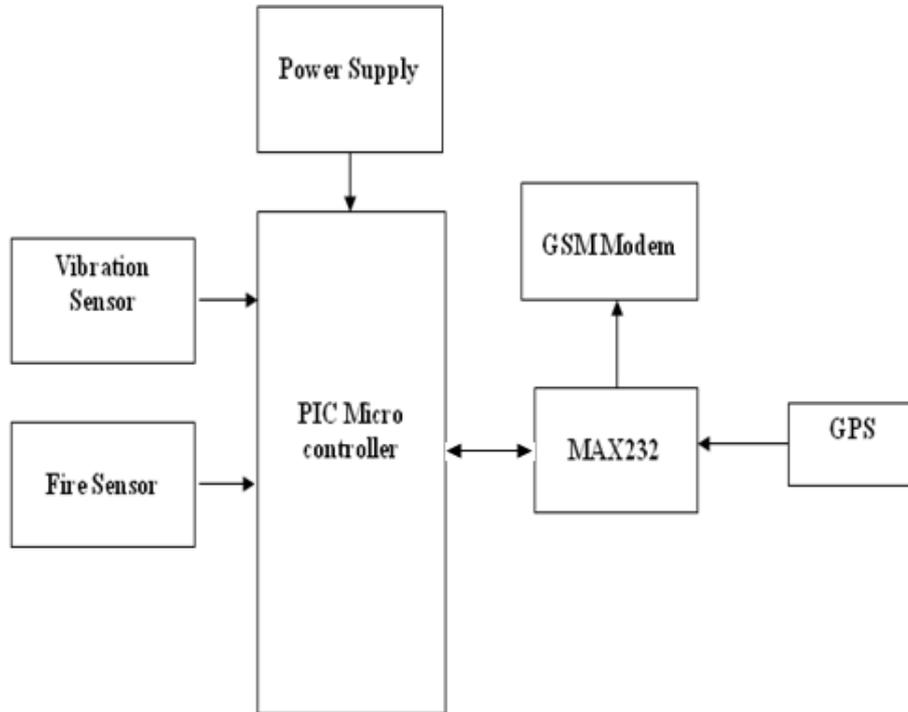
A. Block Diagram Of Vehicle Unit

Fig.1 Block diagram of vehicle unit

If a vehicle has met accident, vibration sensor or fire sensor gives the electric signal to microcontroller through signal conditioner. Then GPS provides latitude and longitude information about vehicle location to control section through GSM.

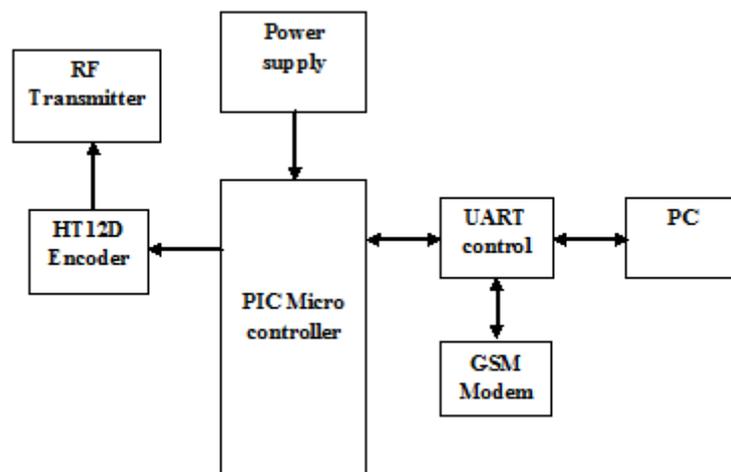*B. Block Diagram Of Ambulance/Control Unit*

Fig.2 Block Diagram of Ambulance/Control Unit

In control section GSM modem receives message about accident and send it to PC. PC identifies the nearest ambulance and ambulance is instructed to pick up the patient. Control section transmits the control signal to all the signals in between ambulance and vehicle by RF transmission.
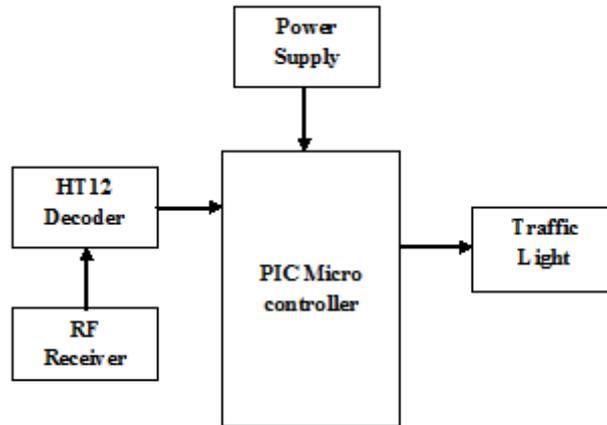
C. Block Diagram Of Traffic Unit

Fig.3 Block Diagram Of traffic unit

Whenever the ambulance reaches near to the traffic signal(approximately 100m), the traffic signal will be made to green through RF communication. Thereby the ambulance is recommended to reach the hospital in time.

IV. SYSTEM IMPLEMENTATION

Our system consists of three main units, which coordinates with each other and makes sure that ambulance reaches the hospital without any time lag. Thus our system is divided into following three units,

- The Vehicle Unit
- The Ambulance/control Unit
- Traffic unit

A. Vehicle unit

The vehicle unit installed in the vehicle senses the accident and sends the location of the accident to the controller.   According to our system, every vehicle should have a vehicle unit. The vehicle unit consists of a vibration sensor, controller, siren, a user interface, GPS system and a GSM module. The vibration sensor used in the vehicle will continuously sense for any large scale vibration in the vehicle [1]. The sensed data is given to the controller GPS SYSTEM inside the vehicle. The GPS SYSTEM finds out the current position of the vehicle (latitude and the longitude) which is the location of the accident spot and gives that data to the GSM MODULE. The GSM MODULE sends this data to the control unit whose GSM number is already there in the module as an emergency number

B. Ambulance unit

The controller finds the nearest ambulance to the accident spot and also the shortest path between the ambulance, accident spot and the nearest hospital. The controller then sends this path to the ambulance. Also using this information the controller controls all the traffic signals in the path of ambulance and makes it ready to provide free path to ambulance, which ensures that the ambulance reaches the hospital without delay. At the same time, the ambulance unit turns ON the RF transmitter. This will lead to communicate with the traffic section.

C. *Traffic unit*

Whenever traffic signal section receives the information about accident, the RF receiver in this section is turned ON to search for ambulance nearing the traffic signal. Whenever the ambulance reaches near to the traffic signal(approximately 100m), the traffic signal will be made to green through RF communication. Thereby the ambulance is recommended to reach the hospital in time

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V.   SIMULATION RESULTS

Automatic Accident Detection and Ambulance Rescue with Intelligent Traffic Light System is simulated using PROTEUS SOFTWARE and their results are presented here. The circuit model of the above system is shown and sensors are connected to measure output result.

A. *Normal Condition*

In normal condition the vibration sensor and fire sensor value will be less than the preset value.

Fig.4 Normal Condition

B.   Accident condition

If a vehicle has met accident, vibration sensor gives the electric signal to microcontroller through signal conditioner. Then GPS provides latitude and longitude information about vehicle location to control section through GSM.
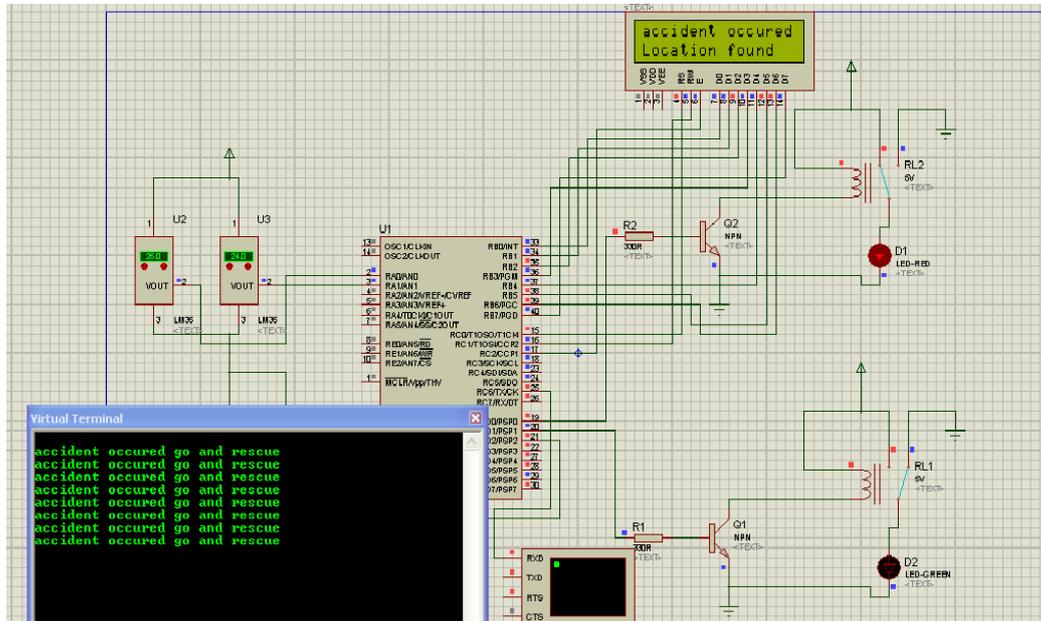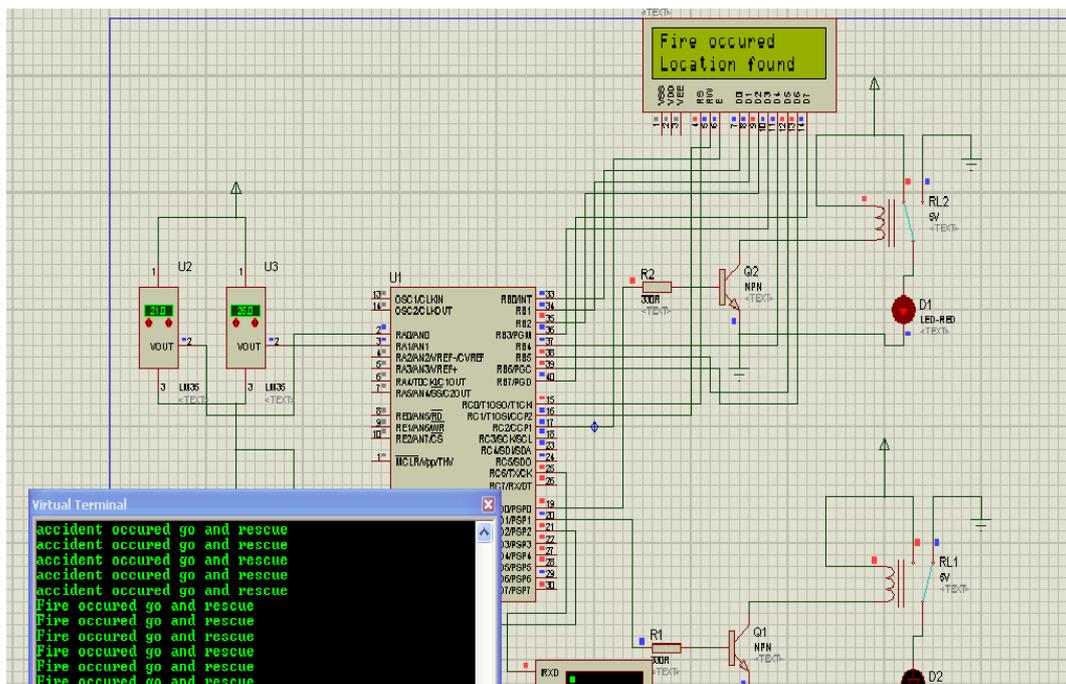

Fig.5 Accident Condition

C.   Fired condition

If a vehicle has met accident, fire sensor gives the electric signal to microcontroller through signal conditioner. Then GPS provides latitude and longitude information about vehicle location to control section through GSM

Fig.6 Fired Condition

D.   Before amulance reaching traffic signal

Before ambulance reaching the traffic signal junction, the signal will be red. Control section transmits the control signal to all the signals in between ambulance and vehicle by RF transmission.
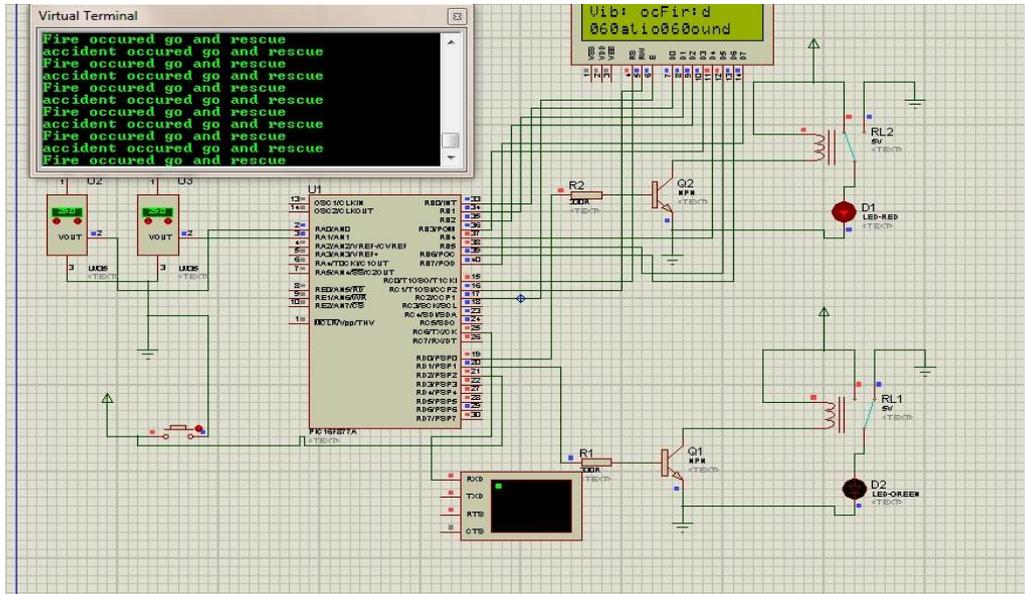

Fig.7 Before Amulance Reaching Traffic Signal

E.   After amulance reaching traffic signal

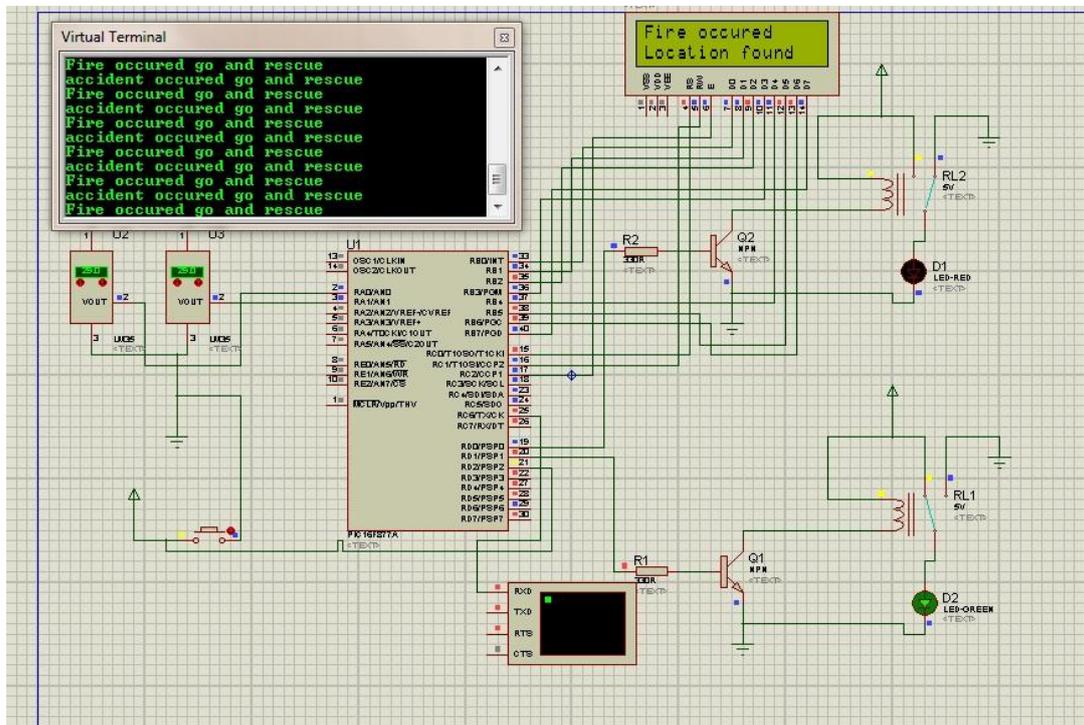After ambulance reaching the traffic signal junction the signal will turn into green with the help of the RF signal.

Fig.8 After Amulance Reaching Traffic Signal

VI.   CONCLUSION

In this paper, a novel idea is proposed for controlling the traffic signals in favor of ambulances during the accidents. With this system the ambulance can be maneuvered from the ITLS can be proved to be effectual to control not only ambulance but also authoritative vehicles. Thus ITLS if implemented in countries with large population like INDIA can produce better results. The ITLS is more accurate with no loss of time. But there may be a delay caused because of GSM messages since it is a queue based technique, which can be reduced by giving more priority to the messages communicated through the controller.

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BIOGRAPHY

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