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DESIGN OF INTELLIGENT ROAD TRAFFIC CONTROL SYSTEM FOR AMBULANCE USING RF AND GSM TECHNOLOGY

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Abstract: Recently development of technology and population, the usage of vehicles are rapidly increasing and at the same time the occurrence accident is also increased. Hence, the value of human life is ignored. No one can prevent the accident, but can save their life by expediting the ambulance to the hospital in time. The objective of this scheme is to minimize the delay caused by traffic congestion and to provide the smooth flow of emergency vehicles. The concept of this scheme is to green the traffic signal in the path of ambulance automatically with the help of RF module and RFID based system. So that the ambulance can reach the spot in time and human life can be saved and the accident location is identified sends the accident location immediately to the main server. The main server finds the nearest ambulance to the accident zone and sends the exact accident location to the emergency vehicle. The control unit monitors the ambulance and provides the shortest path to the ambulance at the same time it controls the traffic light according to the ambulance location and thus arriving at the hospital safely. This scheme is fully automated, thus it locates the accident spot accurately, controls the traffic lights, provide the shortest path to reach the location and to the hospital in time.

Keywords: GPS, GSM, RF module and RFID.

INTRODUCTION

Automatic accident detection system is used to recognize the location of the accident and easily to reach the location. Every second is valuable for the ambulance vehicle. There is loss of life due to the delay in the arrival of the ambulance to the hospital in the golden hours. This delay is mainly caused by the waiting of ambulance in the traffic signals. So time places an important role in this task. The traffic signals are also controlled automatically by using a Radio Frequency module (RF module) and it is also necessary to control the traffic jams near the junction when ambulance is near to traffic junction, this is done by using RFID system. With this system, we can consider the priority of different type of vehicles and also consider the density of traffic on the roads by installing RF reader on the road intersections. Radio frequency identification is a technique that uses the radio waves to identify the object uniquely. An ambulance will reach the nearest hospital at the exact time to save the human life. This paper is fully automated and thus it locates the accident spot exactly.

RELATED WORK

The intelligent traffic light controller that was introduced saves the waiting time and avoids the traffic load. With an embedded sensor network technology, the congestion road is detected and managed accordingly with controllers. Alarm device predict the accident vehicle using the algorithm developed. The acceleration sensors and angle sensors module provide the necessary data to the controller. The area of accident is detected using detection algorithm built in the controller. Nowadays Wireless Sensor Networks (WSN) has been applied in various domains like weather monitoring, military, home automation, health care monitoring, security and safety etc. The vehicle system is placed inside the vehicle which detects the accident location by means of sending a message. With the help of GPS and GSM module anywhere in the vehicle is traced. GSM modem used to send an exact location of the vehicle.

INTRODUCTION TO GPS

Satellite based navigation uses Global Positioning System (GPS) to send and receive the radio signals that serves the user with the required information. GPS posse's twenty four satellites that revolve orbit of earth in twelve hours, the ground stations and the receivers. The GPS receiver in the ground station determines the location and distance accurately in all sough's weather without distortions are made easy with the satellite in orbit as a reference. GPS is used in laptop, mobile, airplane etc.

The receiver uses the messages it receives to determine the transit time of each message and computes the distance to each satellite using the speed of light. Each of these distances and satellites' locations defines a sphere. The receiver is on the surface of each of these spheres when the distances and the satellites' locations are correct. These distances and satellites' locations are used to compute the location of the receiver using the navigation equations. This location is then displayed, perhaps with a moving map display or latitude and longitude.

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This paper states that the traffic management is the critical issue of the road. Traffic lights play an important role in the traffic management. The existing traffic lights follow the predetermined sequence. So these lights are called static traffic lights. These traffic lights are not capable to count the number of vehicles and the priority of the vehicles on intersection point. As a result some vehicles have to wait even there is no traffic on the other side. The vehicles like Ambulance and Fire Brigade are also stuck in traffic and waste their valuable time. The proposed system provides quality of service to Emergency vehicles and improves the accuracy of Automatic Traffic Light Violation Detection system as well as helps to trace out the stolen vehicles using RFID.

Dynamic Traffic Light Sequence Using RFID

It avoids problems that usually arise with standard traffic control systems, especially those related to image processing and beam interruption techniques. This RFID technique deals with a multi-vehicle, multilane, multi road junction area**.** It provides an efficient time management scheme, in which a dynamic time schedule is worked out in real time for the passage of each traffic column. The real time operation of the system emulates the judgment of a traffic policeman on duty. The number of vehicles in each column and the routing are proprieties, upon which the calculations and the judgments are based.

PROPOSED SYSTEM

Our system consists of five main units which coordinates with each other and makes sure that ambulance reaches the hospital without any delay. This system is divided into following units,

- Vehicle unit
- Main server
- Ambulance unit
- Traffic unit

In the proposed system, vehicle unit installed in the vehicle that sense the accident. If vehicle met an accident, immediately send the location of the accident to the main server. From the control unit, a message is sent to the nearby ambulance. Control unit finds the shortest route to the accident spot, ambulance, hospital. Also send this to the ambulance and it transmitted the information to the traffic unit through RF communication. Also, using this information the control unit controls all the nodes in the path of the ambulance and make it ON, which ensures that the ambulance reaches the hospital in time.

BLOCK DIAGRAM

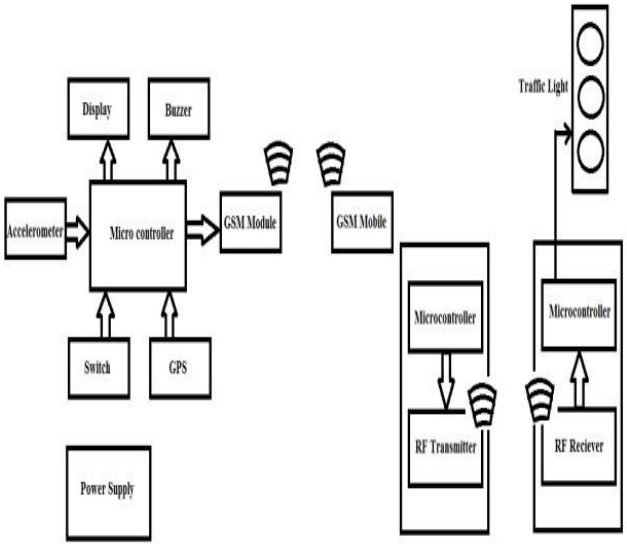

Fig.1. Intelligent Traffic Lights Based on RFID

As shown in the diagram the main components of the system are a microcontroller, an accelerometer, a GPS module, Microcontroller, RF transmitter, RF receiver, power supply and a GSM. Accelerometer is meant for the detection of change in acceleration, GPS module is for finding the co-ordinates of the location, GSM for sending message, microcontroller controls all these operations. Accelerometer detects the change in acceleration of the moving mass. The output of the accelerometer will be an analog quantity which is proportional to the change in acceleration. The output of the accelerometer is given to the microcontroller as input. The microcontroller compares the value of input with the programmed value. A value more than the programmed value indicates that an accident is detected. At the time when the accident is detected, the alarm circuit will start working by a beep sound. The sound lasts for about 20 seconds. If the accident is not severe the driver himself can stop the further action by simply pressing a switch attached to the controller.

In the case of a severe accident the driver may not be able to control the further action. During this situation, the controller extracts the output of the GPS. The output of the GPS will be a large string consisting of a wide range of data about the position. From this data controller select the required data (latitude and longitude) for the purpose of the position detection. Using a GSM module the extracted data is send to an emergency call centre as an sms. The GSM module in the receiver station receives the message which in turn is connected to a personal computer where the message is decoded and exact location is found out with the help of the Google map. Now the RF transmitter is meant for

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transmitting continuously.

RF receiver captures RF signals transmitted by the transmitter placed on the ambulance. Two microcontrollers has been used here, one of them has been placed in the ambulance interfaced with the transmitter and the other one is placed interfaced with the receiver. The later one controls the traffic light at the junction. Once the ambulance approaches the junction, the receiver captures the signal transmitted by the transmitter as it comes into the suitable range of operation. Upon receiving signals the controller controls the traffic lights in convenience of the ambulance. After the ambulance closes the junction, the traffic comes back to normal flow.

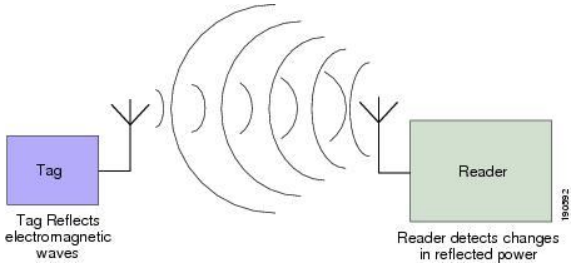

Fig.1.1. RFID Module

GSM MODEM

As known by all the GSM represents the Global System for Mobile communication. It is provided with special slots for accepting SIM card through which the message is send. The receiver section consists of a quad band GSM receiver which is controlled by AT commands. Depending up on the transmitting power GSM can be classified into 2 classes that is class 1 and class 4. Class 1 requires 2W power for transmission. We can use SIM 1900 GSM module. A GSM network is composed of several functional entities, whose functions and interfaces are specified.

The GSM network can be divided into three broad parts, the Mobile Station is carried by the subscriber. The Base Station Substation controls the radio link with Mobile Station. The Network Subsystem, the main part of which is the Mobile service Switching Centre (MSC), performs the switching of calls between the mobile users, and between mobile and fixed network users. The MSC also handles the mobility management operations. Not shown is the Operations and Maintenance Centre, which oversees the proper operation and setup of the network. The Mobile Station and the Base Station Subsystem communicate across the Um interface, also known as the air interface or radio link. The Base Station Subsystem communicates with the Mobile services Switching Centre across the A interface. The mobile equipment is uniquely identified by the International Mobile Equipment Identity (IMEI). The SIM card contains the International Mobile Subscriber Identity (IMSI) used to identify the subscriber to the system, a secret key for authentication, and other information. The IMEI and the IMSI are independent, thereby allowing personal mobility. The SIM card may be protected against unauthorized use by a password or personal identity number. The Base Station Subsystem is composed of two parts, the Base Transceiver Station (BTS) and the Base Station Controller (BSC). These communicate across the standardised Abis interface, allowing (as in the rest of the system) operation between components made by the different suppliers.

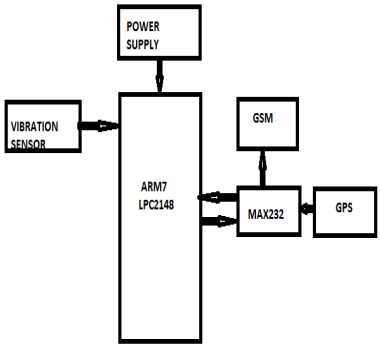

Fig.1.2 Vehicle Unit

Every vehicle should have vehicle unit. The vehicle unit consists of a vibration, controller, MEMS sensor, GPS system, GSM module. The vehicle unit installed in the vehicle every vehicle should have a vehicle unit. The vehicle unit consists of a vibration sensor, controller, MEMS sensor, GPS system and a GSM module. The vehicle unit installed in the vehicle senses the accident and sends the location of the accident the main server. The vibration sensor used in the vehicle will continuously sense for any large scale vibration in the vehicle. The sensed data is given to the controller. GPS module finds out the current position of the vehicle which is the location of the accident 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.

a) Ambulance Unit

The main server discovers the nearest ambulance to the accident place and also the shortest route between the accident spot, ambulance and the nearby hospital. Then the server sends this path to the emergency vehicle. Ambulance unit also using this information the controller controls all the traffic signals in the path of emergency vehicles and makes it ready to provide a free path to the ambulance, which ensures that the ambulance reaches the hospital without delay.

At the same time, the ambulance section turns ON the RF transmitter. This is used to communicate with the traffic department.

b) Traffic unit

Whenever a traffic signal section receives the information about the accident, the RF receiver in this section is turned ON to search for ambulance nearing the traffic signal. Control the traffic signal automatically with the help of RF module. Whenever the emergency vehicle reaches near to the traffic signal (approximately 100m), the traffic signal will be made of green via RF communication. Thereby the ambulance is recommended to attain the hospital without delay.

ADVANTAGES

- Efficient monitoring of accident.
- Fast response between victim and the control station.
- Fast tracking of vehicle position and distance calculation.
- Accuracy in finding vehicle location.
- Ease of movement of vehicle in traffic.

CONCLUSION

This system will definitely help to traffic police to give the way to the ambulance when there is heavy traffic on the road. Also the condition of patient is monitored and this information is send to the respective doctor so that doctor can prepare for the next process before the patient reach to the hospital.

The design and implementation of this technique is directly targeted for traffic management so that emergency vehicle on road get clear way to reach there destination in less time and without any human interruption. The main feature of this operation is the ability to communicate with purpose using GSM and GPS. It is very smart to find the location of emergency of VIP vehicle and get clear path to pass on.

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