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Accident Detection and Reporting System Using GSM and GPS Technology and Traffic Clearance for Ambulance

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ABSTARCT

The purpose of this project work is to detect the position of the vehicle met with an accident automatically. The vehicle's geographical position and status is transmitted in the form of latitude & longitude values through GSM and GPS to the concern authorized mobile. Two parameters i.e., latitude and longitude will describe the location anywhere on the Earth. The co-ordinates data will be acquired by the GPS receiver which will be fed to the microcontroller to display in the LCD. Whenever the vehicle is crashed, location information will be transmitted to the concern mobile automatically. The collision sensing is done with bumping sensor. Based on this signal, the controller collects the longitude & latitude data from GPS receiver and is transmitted to the concern mobile through GSM module.

The location of the vehicle is indicated using GPS (Global Positioning System) technology. Communication link between the vehicle and mobile is made possible through a GSM modem. GPS will give the information of parameters like longitude & latitude, based on this information; the crashed vehicle position can be identified very easily. The advantage of using GSM (Global System for Mobile) technique is that it doesn't have any range restriction; the data can be acquired from anywhere from the world. The vehicle details and mobile number are stored in the microcontroller. Whenever the vehicle is crashed, the Microcontroller gets the location of vehicle by the GPS modem and sends the message to the mobile using GSM modem.

In addition to clear the traffic for the ambulance at the signal post a communication system installed in the ambulance can clutch the traffic at signals until it crosses the crowded area. The system is designed for junction/cross-roads, where often ambulance has to wait until the normal traffic is cleared. This is quite inconvenience for the patient who needs immediate treatment. There by this system is designed which can by-pass the existing signaling system temporarily.

The demo module is constructed with four side signaling system for normal operation, means one junction is simulated for the demo purpose. Here in addition to the existing signal posts, separate signals must be installed to clear the way to the ambulance. Junctions are known as circles where flow of traffic is restricted from all four sides. In addition to the normal signaling system, four additional red indicators must be installed at all four corners of the junction. As the driver know from which way he is approaching, the corresponding key has to be activated from the data transmitting module. Based on this signal, the control circuit installed at junction switches off the normal signaling system through a relay and energizes the red indicators automatically. As the embedded system can identify the approaching way, except this way signal for the remaining three ways will be red, there by traffic will be clutched and way for the ambulance will be cleared. During normal time these indicators remains in off condition, whenever the ambulance is approaching from a specific way, the driver has to activate the corresponding key from the transmitter. Likewise all four sides' traffic can be controlled according to the

approaching way of ambulance. After crossing the circle, simply by pressing reset key from the ambulance, the signals are restored automatically. The same system can be implemented in VVIP vehicles also.

INTRODUCTION

The main concept of the proposed project work is identify the crashed vehicle position and that vehicle details can be transmitted to authorized mobile or the emergency services and at the same time its geographical position is transmitted. The main heart of the project work is microcontroller, is used for interfacing to various hardware peripherals. The system is to be placed inside the vehicle with all the peripherals like GPS, GSM, LCD and bumping circuit interfaced to the controller. The GPS module provides information about the geographical position of the module and therefore position of the vehicle and GSM modem is used to send SMS message in case of vehicle accident by providing the geographical position (Latitude and Longitude) of the vehicle from a remote place. The bumping circuit is used to improve the system with capability of recognize an accident by triggering emergency situation automatically. In case of emergency, wireless information is transmitted via the GSM module. The GPS modem gives many parameters as the output, but only the NMEA data coming out is read and displayed on to the LCD. The same data is sent to the mobile at the other end when the vehicle is met with an accident. In order to interface GSM modem and GPS Receiver to the controller, switching transistors used. The design uses RS-232 protocol for serial communication between the modems and the microcontroller. A serial driver IC is used for converting TTL voltage levels to RS-232 voltage levels. A Program has been developed which is used to locate the exact position of the vehicle and also to navigated track of the moving vehicle on Google Map.

Customers can also use Google Earth to create list of place marks in the city like office, store, suppliers and customer locations where the vehicle normally travels. If these locations are marked in Google earth and place marks provided to our system, then in reports you can see, when did your vehicle reached these locations and how much time they were parked at these locations.

GLOBAL POSITIONING SYSTEM : GPS (Global Positioning System) is the only system today able to show you where you're exactly position on the earth at anytime and any weather condition. 24 satellites are all orbit around the earth at 11,000 nautical miles or approximately 20,200 kms above the earth.

GPS ELEMENTS :

We can divide GPS system into three segments.

- SPACE SEGMENT
- USER SEGMENT
- CONTROL SEGMENT

SPACE SEGMENT:

The space segment comprises a network of satellites. The complete GPS space system includes 24 satellites, 11,000 nautical miles above the earth; take 12 hours each to go around the earth once or one orbit. They are orbit in six different planes and 55 degrees inclination. These positions of satellites, we can receive signals from six of them nearly of the time at any point on earth. Satellites are equipped with very precise clocks that keep accurate time to within three nanoseconds (0.000000003 of a second or 3e-9)

This precision timing is important because the receiver must determine exactly how long it takes for signals to travel from each GPS satellite to receiver. Each satellite contains a supply of fuel and small servo engines so that it can be moved in orbit to correct for positioning errors. Each satellite contains four atomic clocks. These clocks are accurate to a nanosecond. Each satellite emits two separate signals, one for military purposes and one for civilian use.

SOME SPECIFICATIONS OF SATELLITE:

- Weight : 930 kg.(in orbit)
- Size : 5.1 m.
- Travel Velocity : 4 km/sec
- Transmit Signals: 1575.42 MHz and 1227.60 MHz
- Receive at : 1783.74 MHz
- Clocks : 2 Cesium and 2 Rubidium
- Design life : 7.5 year (later model BlockIIR 10 years)

USER SEGMENT:

As the pilot fly, the GPS receiver continuously calculates the current position and display the correct position / heading. The GPS unit listens to the satellite's signal and measure the time between the satellites transmission and receipt of the signal. By the process of triangulation among the several satellites being received, the unit computes the location of the GPS receiver. GPS receiver has to see at least four satellites to compute a three dimensional position (it can compute position with only three satellites if know altitude). Not only latitude and longitude, but altitude as well. There are numerous forms of display among the various manufacturers. No frequency tuning is required, as the frequency of the satellite the receiver already knows transmissions.

CONTROL SEGMENT:

The control Segment of GPS consists of:

- Master Control Station (one station): The master control station is responsible for overall management of the remote monitoring and transmission sites. As the center for support operations, it calculates any position or clock errors for each individual satellite from monitor stations and then orders the appropriate corrective information back to that satellite.
- Monitor Stations (four stations): Each of monitor stations checks the exact altitude, position, speed, and overall of the orbiting of satellites. A station can track up to 11 satellites at a time.
  Each station performs this check-up twice a day as the satellites go around the earth.

OPERATION:

The principle of GPS is the measurement of distance between the receiver and the satellites. The satellites also tell us exactly where they are in their orbit above the earth. The receiver knows our exact distance from satellite, knows the distance between satellites. GPS receivers have mathematical method by computer to compute exactly where the GPS receiver could be located.

In our day to day life how many times have we come across a situation where in an emergency service say an Ambulance gets stuck in the traffic, the patient inside the ambulance may need immediate treatment, in this critical situation the only intention is to make some room for the Ambulance.

But it might not be possible because of traffic signals; if the junction is too crowded then the ambulance may have to wait for another term. For these reasons, the vehicle may have to wait for few minutes, which could mean 'Life and Death' for the patient. To solve this problem, here we present our practical solution.

In this project work, the goal is to see to it that the ambulance has its way cleared, till it reaches its destination, without any intermediate delays. This can be successfully achieved, if the ambulance interacts with the forthcoming traffic signal much before it arrives at that respective traffic junction. Digital communication can be used for this purpose. The Ambulance transmits a "Digital Code" to the Traffic signal. On receiving this code, the Controller at the traffic junction, which would be performing its usual operation will be held up for few seconds/minutes, and clears the way for ambulance. After the ambulance passes, the controller reloads the previously saved scenario.The above-presented idea can be implemented easily; for which the existing technology implemented at traffic junctions may have to be modified accordingly.

The project "RF network used to clear the way for ambulance" is aimed to clear the way for ambulance by holding the traffic at junctions where traffic signals are installed. By implementing this kind of system in each and every ambulance patients are transported to the hospitals in time during emergencies. The main concept involved in the system is to bypass the existing signaling system from the ambulance itself through a wireless control system, and energize red signals to the all sides approaching traffic except the way from where ambulance is approaching. As RF network is used to communicate with the junction signaling system from the ambulance, existing signals can be clutched little away from the junction, there by the time the ambulance reaches to the junction it can find a clear way for it.

Remote controlled signaling system can be defined as an operation control circuit for a remote control keypad having a key operating section interfaced with microcontroller in remote unit, this remote unit can be fixed over the dash board of ambulance there by it is accessible to the driver. As microcontrollers are called as microcomputers they can be used for dedicated tasks, here the task is very simple, the remote control unit designed with 89C2051 controller can generate different command codes by activating the corresponding keys interfaced with controller. This digital information produced by the controller is transmitted through RF transmitter generates 433MHz as carrier wave. The command signals generated and transmitted are intended to control the traffic signals at remote end junctions. In this regard, the data transmitting module is designed with 5 keys, as the junction or cross roads contains four ways and to identify the vehicle from which way it is approaching the junction, four different keys are used to generate four different codes. As the driver knows from which way he is approaching the junction, he has to activate the corresponding key. Based on this data, signal lights will be controlled at remote end. The function of fifth key is to restore the normal signaling system, means after crossing the junction, the driver has to activate this fifth key by which signals are restored. The microcontroller used in the project work is playing dominant roll. Microcontrollers are increasingly being used to implement control systems. It is therefore important to understand Microcontroller-controlled system well. Today, microcontrollers have become an integral part of all control systems. Dedicated controllers that use microcontrollers, have certainly improved the functional, operational and performance based specifications. The architectural changes in instrumentation and control systems where and are due to the computing and communication capability of the Micro controller devices. Micro controller must be treated as a tool for computing and communication.

Any Micro-controller, that functions according to the program written in it. Here the program is prepared in such a way, so that the system performs the function of a remote control unit. The program is nothing but an instruction set, & according to the instructions received from the remote, the controller unit carries out the specified task. The instruction set often prepared in binary code, & are referred as machine code, there by this software is called as machine language. Writing a program in such a code is a skilled and very tedious process. It is prone to errors because the program is just a series of 0's and 1's and the instructions are not easily comprehended from just looking at the pattern. An alternative is to use an easily comprehended form of shorthand code for the patterns 0's and 1's. Micro controller can read and it can store the information received from the remote control unit. Micro-controllers are dedicated to one task and run one specific program. The program is stored in ROM (read-only memory) and generally does not change. If there are any modifications in the function, or errors in the software, the existing program must be erased from the chip & again modified program must be loaded in the chip through chip burner.

HARDWARE DETAILS

The IC's and other important components used in this project work, procured from the Hyderabad Electronics Market. The details or data sheets of the IC's are down loaded from the Internet. The following are the web sites that can be browsed for collecting the data sheets.

1. www. Texas Instruments.com
2. www. National semiconductors.com
3. www. Fairchild semiconductors.com

The following are the components used in the project work:

(1) 89C2051 controller

(2) 89C51 controller

(3) L293D H – Bridge IC

(4) Z44 MOSFET

(5) 7805, 7808 Voltage Regulators

(6) BC547 NPN Transistors

The required PCB'S (Printed Circuit boards) for the project work fabricated by SUN RISE CIRCUITS, Kushaiguda Industrial Estate, Hyderabad. Kushaiguda Industrial Estate is very famous for fabricating the Industrial grade PCB's.

CONCLUSION & REFERENCES

The Project work to find the accident vehicle location is a model for Vehicle Tracking unit with the help of Google maps and also with the help of GPS receiver and GSM modem. The positioning is done in the form of latitude and longitude along with the exact location of the place, by making use of Google maps. The system tracks the location of particular vehicle and sends to users mobile in the form of SMS. The arrived data, which is in the form of latitude and longitude co-ordinates is used to locate the Vehicle on the Google maps and also we can see the output on the LCD as well as it sends the same data to the concerned mobile number.

One more task performed in the project work is RF network used to clear the way for ambulance that is aimed to clear the way for ambulance at junctions. The position of the ambulance from which way it is approaching to the junction, this is the information that is supposed to be transmitted from the ambulance to the remote end embedded system from where the traffic lights are controlled. Based on this information, the corresponding signal lights will be controlled automatically. The wireless communication network designed with RF modules is aimed to communicate with the control circuit. The main advantage of using this technology is to carry the patient to the hospital in less time. The system is designed and developed successfully, for the demonstration purpose prototype module is constructed & results are found to be satisfactory.. During the trail run we have tested the range and found that the transmitter is able control the signals from a distance of 60 feet in open air. The demo module constructed with small signal post that is aimed to control the four side's traffic, for this purpose cross roads are simulated over wooden plank. The signal post is constructed with 16 indicators, out of 8 indicators are used for normal signaling system, they contains 4 red indicators and 4 green indicators. With the help of these 8 indicators normal function of traffic signaling system will be performed based on the timings data programmed through controller. In addition 8 more signals are provided for the ambulance, these signals clutch the traffic in emergencies. Depending up on the data transmitted from the ambulance, all three sides' traffic will be held up except the way from where the ambulance is approaching.

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