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TELESAVE MULTITRACK SYSTEM FOR MEDICAL EMERGENCY WITH KNN ALGORITHM

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ABSTRACT

Many times we have seen accident on roads and highways and people don't turn up easily to help victims of the accidents and even if after some time police or some responsible citizens call ambulance service it takes significant time to reach to the spot of accident. Not only in this case but in case of medical emergency like heart attack, paralyses attack, delivery of baby etc. on road or highway we face problem to get ambulance in time. In existing solution to this problem is provided with the help of GPS technology to get the location and GSM technology to send alert regarding accident or medical emergency to the hospital, we have gone a level up and we maintain a central server which keep location track of all the ambulances in the city, as each ambulance is equipped with GPS/GSM based tracking system and vehicles too have similar system with accident detection and emergency trigger.

I. INTRODUCTION

Many times, we have seen accident on roads and highways and people don't turn up easily to help victims of the accidents and even if after some time police or some responsible citizens call ambulance service it takes significant time to reach to the spot of accident. Not only in this case but also in case of medical emergency like heart attack, paralyses attack, delivery of baby etc. on road or highway we face problem to get ambulance in time. Some vehicle owner keeps a list of ambulances of various hospitals but again one cannot be sure which hospital is nearest and call that number. In existing solution to this problem is provided with the help of GPS technology to get the location and GSM technology to send alert regarding accident or medical emergency to the hospital, But our project we have gone a level up and we maintain a central server which keep location track of all the ambulances in the city, as each ambulance is equipped with GPS/GSM based tracking system and vehicles too have similar system with accident detection and emergency trigger. We have added one more smart feature in the system it first find out nearest hospital and send SMS to that hospital also for immediate logistic support and making doctors available. System has two triggers one is activated with the help of key/switch this can be used in medical emergencies and other is triggered automatically with the help of various sensors whenever accident occurs.

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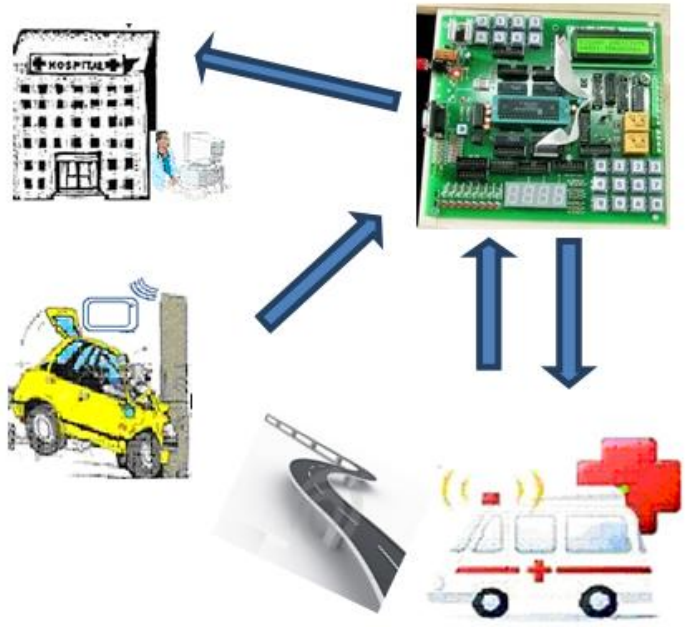

Figure 1: System Level diagram

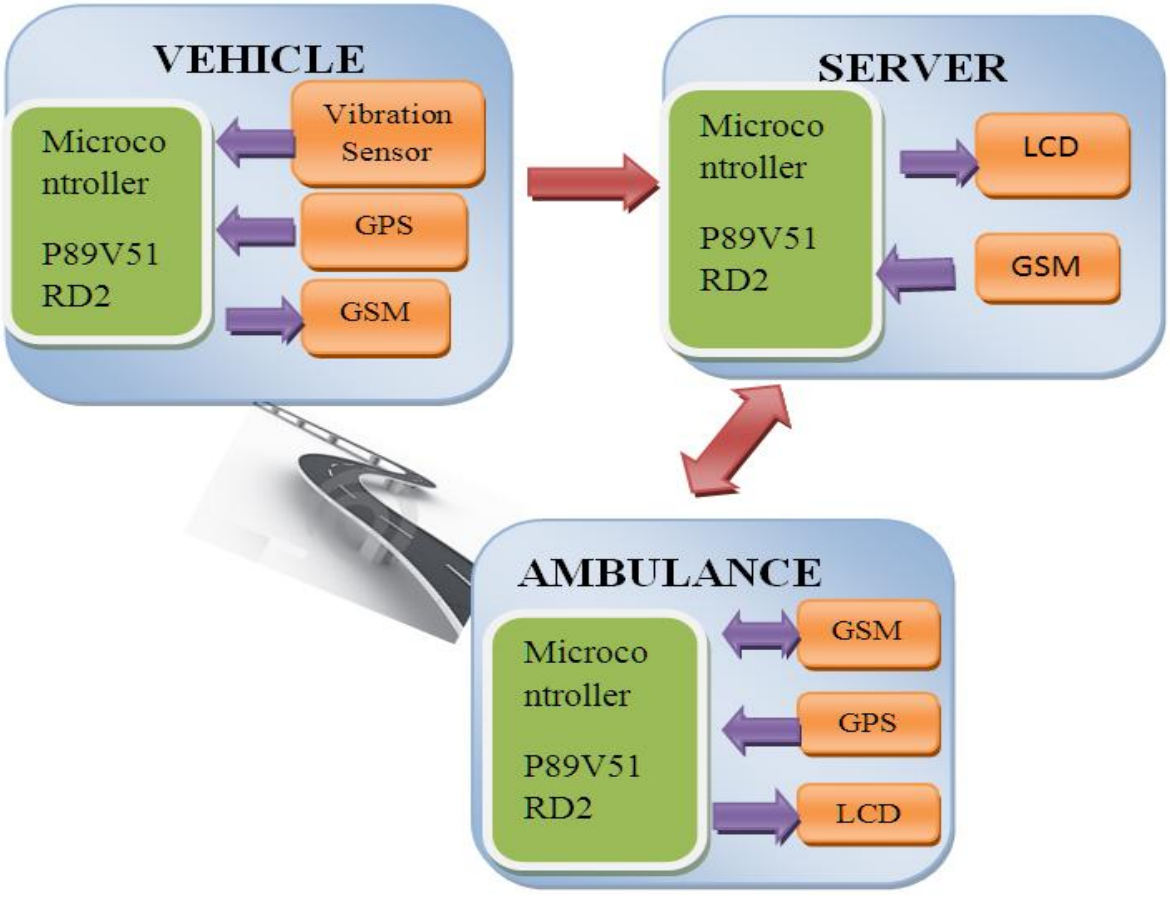

Figure 2: Block diagram of the complete system

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II.TELESAVE MULTITRACK SYSTEM

Microcontroller P89V51RD2

Computer in its simplest form needs at least three basic blocks: CPU, I/O and the RAM/ROM. The integrated form of CPU is the microprocessor. As the use of microprocessors in control applications increased, development of microcontroller unit or MCU took shape, wherein CPU, I/O and some limited memory on a single chip was fabricated. Intention was to reduce the chip count as much as possible. We decided to use P89V51RXX series of Microcontroller [1-3].

The following are the features of the microcontroller P89V51RD2.

- 80C51 CPU Core
- 5 V operating voltage from 0 MHz to 40 MHz
- 16/32/64 KB of on-chip flash user code memory with ISP and IAP
- Supports 12-clock (default) or 6-clock mode selection via software
- Four 8-bit I/O ports with three high-current port 1 pins (16 mA each)
- Three 16-bit timers/counters
- Programmable watchdog timer
- Eight interrupt sources with four priority levels
- Low EMI mode (ALE inhibit)
- TTL and CMOS-compatible logic levels

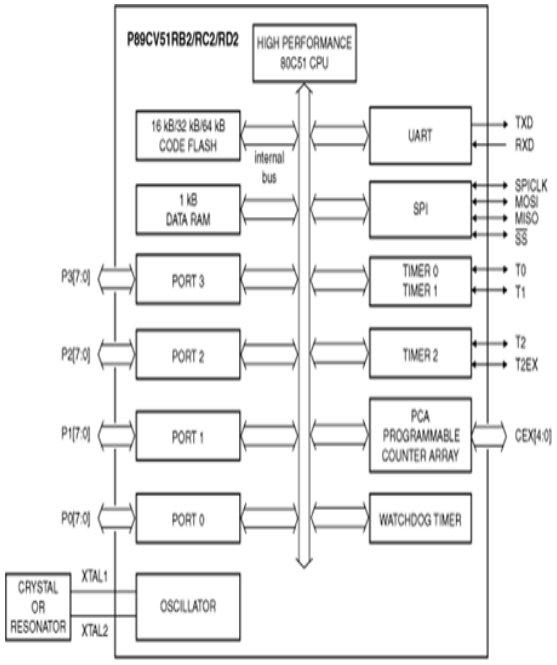

Figure 3: Block diagram of Microcontroller P89V51RD2

GSM

The GSM system is the most widely used cellular technology in use in the world today. It has been a particularly successful cellular phone technology for a variety of reasons including the

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ability to roam worldwide with the certainty of being able to be able to operate on GSM networks in exactly the same way - provided billing agreements are in place.

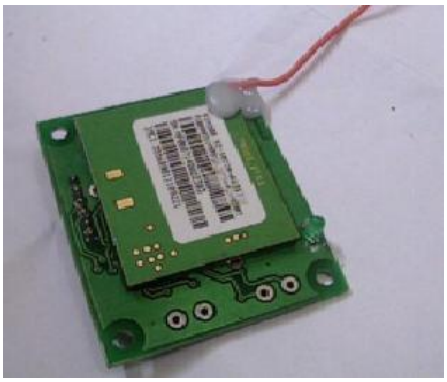

Figure 4: GSM Modem

GPS

The Global Positioning System (GPS) is a space-based satellite_navigation system that provides location and time information in all weather, anywhere on or near the Earth, where there is an unobstructed line of sight to four or more GPS satellites. It is maintained by the States government and is freely accessible by anyone with a GPS_receiver.

Figure 5: GPS Modem

Using GPS receiver we are going to find out the Latitude, Longitude of current position, time and status .

The following format we are using in our GPS system

GLL - Latitude and Longitude, with time of position fix and status

Latitude and longitude of current position, time and status.

Structure:

$GPGLL,ddmm.mmmm,a,dddmm.mmma, hhmmss.sss, A, a*hh<CR><LF>

Example:

$GPGLL, 4250.5589, S, 14718.5084, E, 092204.999, A, A*2D<CR><LF>

LCD

LCD (Liquid Crystal Display) is made of nematic liquid crystals sandwiched between layers of filter glass, electrodes and polarizing film kept in front of mirror.

Normally this crystal are in twisted state and allow light to pass through them so when there is no current, light entering through the front of the LCD will simply hit the mirror and bounce right back out.

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But when the circuit supplies current to the electrodes, the liquid crystals between the common-plane electrode and the electrode shaped like a rectangle untwist and block the light in that region from passing through. That makes the LCD show the rectangle as a black area.16 X 2 lines LCD are Common-plane-based LCD which is simplest LCD in market and most of them are backlit by LED. To control the functioning of LCD there is a onboard controller.

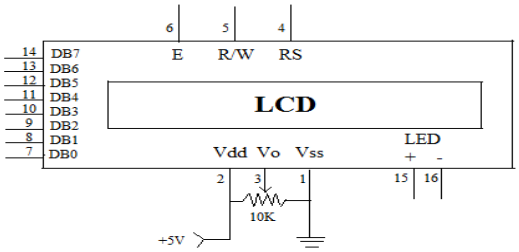

Figure 6: Pin description of LCD

Piezoelectric Vibration Sensor

A wide range of functions are accomplished by microelectronics, and one important measurement made by them is vibration. Vibration sensors measure what is known as oscillatory motion, a movement that continuously goes back and forth. The direction can be indicated using a coordinate system with axes, and the force in relation to gravity can be measured as well. Vibration analysis is done by measuring displacement and velocity as well as acceleration, which is primarily analyzed by vibration-monitoring sensors. The different types include piezoelectric, integral electronics piezoelectric, piezoresistive, variable capacitance, and servo sensors [4-5].

Figure 7: Various types of piezoelectric sensors

III. IMPLEMENTATION

GPS gives multitude of information every one sec via NMEA (National Marine Electronics Association) protocol, embedded system continuously reads this output and filters out RMC messages which contains location of the system, this location is updated in the system memory, Piezoelectric sensor is used to detect shocks and impact but output is amplified and to detect threshold point equivalent to accident and disaster a comparator is used whose output is fed to MCU interrupt pin [6] , hence whenever accident occurs a interrupt is generated in the system and then system gets the current location of the vehicle and send the accident or emergency alert to server. Server gets location updates from all ambulances every few minutes, now server starts to search nearest ambulance /hospital from the database. Server system sends location, vehicle number to the nearest ambulance and hospital hence in this manner the ambulance reaching time is highly increased. A manual trigger is also provided to do the same task but this is used when there is a medical emergency like heart attack, paralysis attack, delivery of baby etc. GPS is connected to embedded board using UART and GSM also uses UART interface to MCU. AT commands are used to communicate with GSM modem via UART interface.

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Here we use P89V51RD2 microcontroller compare to 8051 it has 8X more program memory,4X more data memory, 2X speed, inbuilt SPI, watch dog timer, 3 timers, enhanced UART, brownout detection, ISP and IAP for programming any other lower cost embedded board also can be used we can do survey on that also [7-12].

Once Hospital gets the SMS it will keep all instruments and doctors ready. The ambulance will be equipped with certain medical instruments and the GPRS enabled system to send all this data to hospital. This can be added in project as future enhancement. Along with KNN algorithm to search for the nearest ambulance/hospital we can also add one more future enhancement feature, i.e. high speed detection and notification. Some parents or close person to driver does not want that he/she should drive at high speeds so our system is using one more algorithm to derive speed information from the GPS position data and if speed crosses the set threshold it will notified the required person.

Applications

- Telesave is accident assistance application system.
- It can be also used in medical emergency.
- It is used where very fast medical response time is required.
- It is also used for helping others too who don't have Telesave system installed.

Advantages

- This system does immediate action in calling the ambulance hence its a life saver system.
- Accuracy of GPS is in meters hence location accuracy of the accident spot or medical emergency spot is good.
- Nearest Neighbourhood algorithm searches nearest ambulance or hospital which again cut off some time of travel of ambulance to reach the spot.
- Its a low cost, low power and compact system which can be fit easily in cars and bikes.
- Its a maintenance free system.

Disadvantages

- If GSM network is not there then alert couldn't be sent.
- GPS satellites sometimes do not lock at start up this can lead to problem called cold start and hence for first few minutes of system start up location cannot be determined by GPS.

IV. CONCLUSION

In this work, we have developed a system that helps to save the life of accident victim. The workings of various modems of the wireless communication are used in achieving this purpose. Using the concepts of microcontroller interfacing we interface the GSM, GPS and LCD. The GSM is used to send the messages to the server and ambulance. The GPS system provides the location coordinate of the accident spot.

Hence, the combined work of both the hardware and software design gives us the product that can save a person's life. This system is very useful in the isolated areas, where there is nobody to help if a person meets with an accident.

- We can add medical test facility in each ambulance so patient data will reach hospital before patient and doctors can plan course of action.

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- Instead of piezoelectric sensor, MEMS accelerometer and smart algorithms can be used to detect accident to reduce false alert in the system.
- Instead of using SMS services, we can use 2g or 3g or 4g for location tracking and communication with server.
- By adding High speed detection and notification enhances safety.

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