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EMERGENCY DETECTION AND RESCUE SYSTEM USING MOBILE COMMUNICATION TECHNOLOGY

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Abstract:

In recent days the road accidents in India is increased to a considerable number. Many of them result in fatal too. One way that helps us to reduce the death rate due to accidents is by reaching medical assistance in time. Time plays an important role when people are taken to hospitals. If accidents occur in places where people move around rarely it makes the situation even more worse. Taking this as the mile stone the system has been developed which is completely automated by using an hardware components ans software application**.** This work aims in providing an automatic rescue process for the people who are inside the vehicle and expects immediate medical assistance. It involves a combination of software and hardware component. The circuit is developed which detects the occurrence of an accident acts as the hardware component of the auto rescue process. An Android application acts as the software component which helps in retrieving the location of the accident and communicating with the ambulance. Hence, development of the Product is under development by integrating all components in the single device

Keywords: Peripheral interface controller(PIC),Global Positioning System (GPS).

Introduction

The demand for emergency rescue during road accidents has increased highly in numbers in our country. Even after the increase of many devices for rescuing purpose there has been very sustainable reduction in fatal. Hence a novel method has been proposed toalert the ambulance service during the emergency purpose. It is necessary to know the exact location where the accident exactly took place so that the rescue process will be done on time. Depending upon this an automation system rescue process has been designed and explained in detail. The system is designed in such a way that the rescue will be done at the exact location on time. This rescue process is entirely an automation system integrating the

hardware and software. In this automation process the vibrating sensor and the server plays a vital role throughout the entire process. The overview description about the safe rescue process is given in Introduction Section. The brief explanation of the relevant prior works are given in Related Works Section. The proposed work is explained in detail in Experimental Setup Section. Finally the conclusion described in the last section.

Related Works

[1]Proposed a novel approach of parallelizing the ambulance dispatching. Nowadays there has been a rising demand for Emergency Medical Service (EMS); There is an essential for efficient nevertheless effective techniques for handling ambulance logistics. The response time is minimized due to the assignment of EMS Ambulance dispatching decisions. The concept of parallelism is developed for ambulance dispatching. The decision is taken by considering both the idle and busy ambulances in parallel apart from the concern of just the idle ones. Depending upon the literature survey the centrality policy is considered and incorporated with the parallelism concept for completing and improving the centrality policy. It is experimentally proved that the Response Time (RT) considerably eases up to 3.4% when parallelism is applied over the existing approaches by considering only the idle ambulances.[2]In April 2004 explained that the tests conducted using the GPS receiver and RTK(Real Time Kinematics) GPS(Global Positioning System) receiver at different speeds. Dynamically, GPS receivers were tested on a 0.8 km length using a small rail cart on railroad track by April 2002. A survey is taken by tracking the RTK(Real Time Kinematics) GPS receiver with GPS receiver with reference to a NGS standard. An improvement has been traced on GPS- based control system in agriculture. To estimate the receivers here is no availability dynamic test standards which are evaluated over the 24hrs. John Deere StarFire receiver throws 2 types of errors namely Cross−track and pass−to−pass errors. By using the typical statistical analysis Cross−track errors are correlated sequentially. Fourier analysis is used in the process indicating the cross tract errors that is evaluated in a periodic structure that is 6 cycles/day. Incorporating with the Fourier Analysis a Voronoi step interpolation method is also used to produce equally portioned data. It is to be noted that the cross-track correctness must be conducted minimum of 12h durations. Hence the result has proved through Fourier analysis that when compared with cross-track bugs the pass−to−pass bugs were more random with no exact attentions of frequency content

[3]A1 titled “System for Communicating A Vehicle Position and Speed During Accident” is an accident detection and prevention system which sends message to related people when a certain speed has been detected and when an accident

has been identified with speed less than a preset limit, this system includes a microcontroller, a modem, nock sensor and speed selection box which are used to send messages when a certain speed has been exceeded and when an accident occurs with speed less than the predetermined limit, a GSM modem is used to send the text message.[4] Made a comparative study regarding the drivers using safety belt in automobile with an interlock service when we start up the vehicle. A study is also done on a buzzer- light reminder system used by the drivers. It is a comparative study by collecting the data by observing visually the usage or non-usage of safety belts by drivers. Hence the result is analyzed by comparing the efficiency between the starter-interlock reminder systems and buzzer-light in automobiles.

[5]US 20130069802 A1 "Car accident automatic emergency service alerting system" is a system for detecting a car accident and alerting the emergency services using a smart mobile device fitted with an accelerometer, a GPS unit and a processor. The real time values received from the accelerometer and the GPS are sent to the processor which then runs an application to check for car accident within a period of time. In case of an accident the processor generates an alert signal. The measurement values received from the accelerometer, the GPS unit and the processor are stored in the memory for a certain time. A transmitter is connected between the processor and memory to send the alert signal and the corresponding values and information are stored within the memory. The base station of this system includes a receiver and a unit for alerting emerging services

[6]US 7348895 B2 titled "Advanced automobile accident detection, data recordation and reporting system" puts forward a system for monitoring a location to detect and report a vehicular accident. It consists of a transducer for detecting acoustic waves at the accidental location. It also describes an audio output based upon which the processor determines a probable occurrence or impending occurrence of a vehicular incident. The images of the accident area are captured using an imaging system. A buffer selectively stores some of the images captured and passes it on to the communication link which uses the selected images for identifying the location. The information in the buffer is stored until a positive response is heard from the communication link indicating the successful transmission of the accidental location.

[7]A1 titled "Vehicle security with accident notification and embedded driver analytics" proposes a telemetric device with one or more cameras embedded for recording the audio-video of the surrounding. It automatically performs accident detection and notifies the emergency services. It does facial processing for drowsiness and is embedded with multiple profiles of driver analytics. Each profile of driver analytics has many advanced driver analytics parameters and for any

given driver multiple profiles can be active. It uses mobile internet connectivity to directly contact the emergency services without procrastination. In case of request for help during an emergency, the accident video is uploaded to a cloud drop box and the respective link with the necessary index, location, nearest address number of passengers etc becomes available. [8]A Vision based Fall Detection System for Elderly People"With a growing population of elderly people, health systems are needed to meet the necessities of elderly people. A Microsoft Kinect sensor monitors the usual activities of people and the acquired image frames are processed in Raspberry pi. The context aware feature extraction technique identify the shape of a person and a mean based classification distinguish the fall from usual activities, if it encounters the unusual activity then the alert is sent to the particular person's caregivers through SIM800 GSM modem.

Proposed Work

After various comparative studies in the literature survey it is clearly understood that there is a need for an automation system for a person who is left unconscious after they met with an accident. Hence, a novel method has been proposed that mainly focuses on rescuing the person by using the automation rescue process. The Emergency Detection and Rescue System using mobile communication technologyuses both Hardware devices and Software programs. The Hardware components are: Peripheral Interface Controller (PIC), Vibrating Sensor, Bluetooth, Buzzer and Stop Button.

A. Hardware Component

A brief explanation about each peripheral device is explained under this Hardware Components subsection.

- Peripheral interface controller(PIC): This is a MicrochipTechnology which comes under the microcontrollerfamily. The components are maily used for the program storage. TheFlash memory within PIC allows it to re-program by itself.

Figure 1.Microcontroller.

The Figure 1 shows a pictorial representation of the Peripheral interface controller(PIC). This component is feeded with Embedded C program which is responsible for controlling the entire hardware system.

- The Figure 2 shows a Vibrating Sensor:The mechanism primarily depends upon this vibration sensor. The sensor device will help in alerting the system when an accident occurs.

Figure 2. Vibrating Sensor.

When the vibration is sensed and if the person fails to respond to its alert, a signal is passed to PIC as an input which in turn automatically responds to the program that is feed in PIC.

- Buzzer: In response to the vibration sensor the buzzer creates an alert or signal in the vehicle. The sound produced from the buzzer is the confirmation of the accident. The Figure 3 shows the buzzer that is used in the System. This Buzzer is an electromechanical device which provides a rasping noise that alerts the neighborhood if accident occurs.

Figure 3. Buzzer.

- Stop Button:In response to that alarm produced by the Buzzer during any accident, if the victim who mets with accident doesnot need any help the person is allowed to press the STOP Button. If the STOP Button is not pressed a signal will be passed to the Software Component by means of Bluetooth.

Figure 4. Stop Button.

Figure 4 shows the switch used to end the process in the middle if necessary.

- The Figure 5 shows a Bluetooth:The Bluetooth is used for transferring data to and fro between the devices over short distance. The Bluetooth plays the vital role in this System by acting as an interface between the hardware component and the software. The Bluetooth is kept activated in the mobile device whenever the person drives the vehicle.

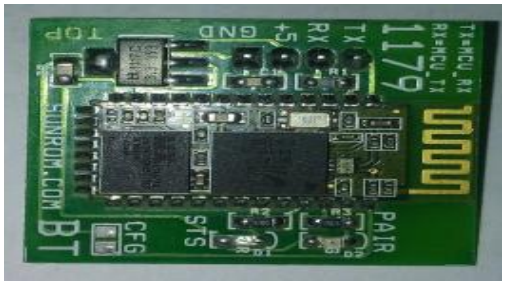

Figure 5. Bluetooth device.

If the person fails to press the STOP Button within that limited time, the response will be diverted to the Bluetooth device which in turn will activate the Software device to continue its process.

Hence from the above brief descriptions about the Hardware components it is clearly explained that the hardware components mainly focuses on providing alert to the Software in response to the vibration sensor and Buzzer. As described earlier once the accident occurs and a confirmation signal will be sent to Bluetooth which will alert the Software to continue its process.

B. Software

In response to the signal received through Bluetooth the software starts processing its tasks. The software that are used in this System are: An Android Application (Installed in smart phone), GPS and Centralized Server (108 Server).

Andriod Application and its Uses: An Android application is developed and depolyed in the Smart Phone. The Applicationcreated is named as Rescue App. This app will start responding once an alert is received from the Bluetooth.

RescueAndroid App

The input to this Rescue App is the signal we receive from the Bluetooth device once the confirmation about the accident is made.

- The Figure 6 shows a Global Positioning System (GPS): The Global Positioning System is mainly used for identifying the location and time information by using the satellite navigation system in space. GPS transmits the data exactly that contains the time and position information uisng the Latitude and Longtitude values.The major role is played by this GPS system by sharing/sending the location of the accident area to the Centralized Server (108 Server)

Figure 6. GPS, a Car Tracking Device

The GPS is used as a tracking device which helps the ambulance service to reach the accident area on time to rescue the person from fatal.

- Centralized Server(108 Server): After gathering the details about the location and confirmation of the accident.
- The server in response will send an ambulance service to the accident prone area with the help of the location shared by the GPS.

Hence the principle work of the proposed system is to provide an ambulance service using the shared location of GPS through satellite and other hardware components that are explained in earlier in previous sub sections.

Experimental Setup

The detailed design of the proposed work is completely explained in this architectural design. The experimental setup is done on the basis of the combination of Hardware devices and Software. The combined execution of this design is explained precisely with their corresponding snapshots.

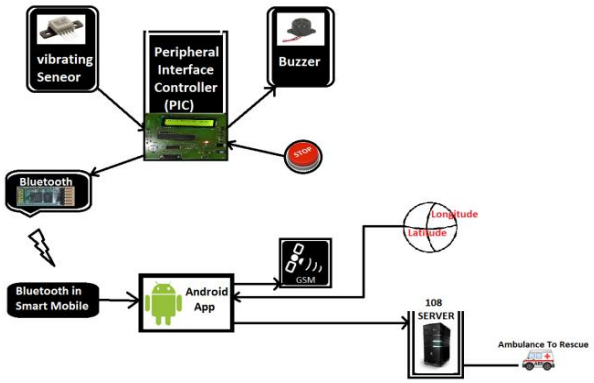

Figure 7. Overall ArchitecturalDiagram.

The Figure 7 shows the Overall Architectural Design of Emergency Detection and Rescue System using mobile communication technology.The overall architecture design demonstrates the combination layout of Hardware components namely, PIC, Vibrating Sensor, Buzzer, Stop Button and Bluetooth with the Software devices like Android App (Rescue App), GPS and 108 Server.The overall architecture of System is explained in working principles of PIC,

Describes about the Hardware Setup, Describes about the Working methodology of Software. Brief description of each is given here.

A. WORKING PRINCIPLES OF PERIPHERAL INTERFACE CONTROLLER (PIC).

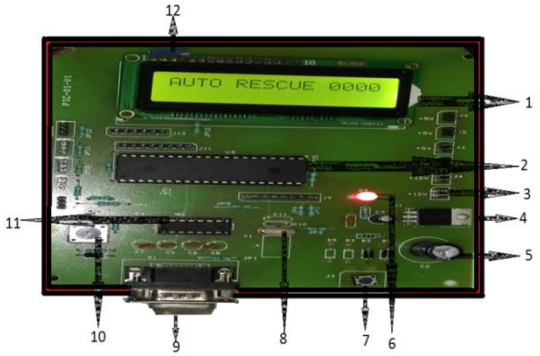

Figure 8. Components of Peripheral Interface Controller (PIC).

The various componentsof Peripheral interface controller(PIC)shown in Figure 8 are explained below:

The PIC device is integrated with 12 functional components which are listed and explained below:

1. LED Display: It is used for displaying the latter performance of the PIC.
2. Embedded C program is loaded in this section that is supportive for the PIC to perform its tasks according to the encoded program.
3. Power Supply Socket: PIC needs 12 Voltage Power Supply to activate and run the component.
4. Converter:PIC Controller needs 5volt, but the input power is 12volt. So this converter is used to convert 12volt to 5volt
5. Capacitor: Capacitor avoids the system from high and low voltage power supply and maintains constant throughout the process.
6. LED Indicator: Alerts the system once it is ready for processing its task.
7. Stop Button: If the person is conscious after the after occurs he will press this STOP button interrupting the sensor to alert the Bluetooth.
8. Crystal Oscillator: Program execution is done at this crystal oscillator.
9. Serial Port: Bluetooth Connecting Port.
10. Restart Button: Restarts the complete process if necessary.

11. Level Converter: PIC Controller gives an 5volt output to the Level Converter, and Level Converter convert and send 5volt to 12volt to the Bluetooth device

12. Potentiometer: Useful for adjusting the brightness of the LED Display.

B. Hardware Setup

The Figure 9 describes about the Hardware Setup that to be equipped in the vechicle.

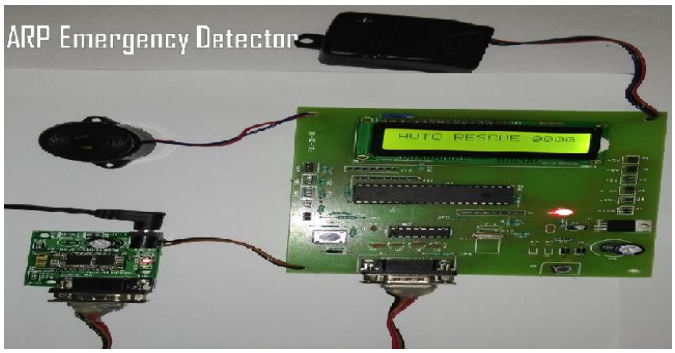

Figure 9. Emergency Detector.

Essentially the Hardware components must be secured inside the vehicle. Initially, Pairing has to be done between the Device and the Smart phone so that if accident occurs the vibration sensor produces some vibration which is triggers the Buzzer to alarm to alert the neighborhood for help. If the person who met with the accident does not need any medical assistance can press the STOP button so that the alert that has to be given to the GPS will be avoided. The Buzzer will be alarmed for a limited time of 60 Seconds. After limited time PIC will Activate the Bluetooth and send the alert information to Android Application. The Bluetooth in Smart Phone will receive the data by Bluetooth.

C. Working Methodology Of Software

Once the signal from the Bluetooth is received the Android App or theRescue App initiates its responsible task by identifying the location of the accident area with the help of GPS. The process carried out by Rescue App is described elaborately here.

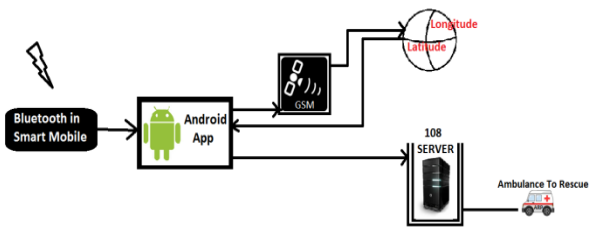

Figure 10. Activity of the Software Component.

The Figure 10 illustrates the overall software working process. The working process of each and every component is explained elaborately in the forthcoming points.The sequential working process of this device is described here.

- The Bluetooth device senses the alarm from the buzzer.
- The Bluetooth activates the Rescue App in the Smart phone in response to the alarm signal received as an input from hardware component.
- Rescue App gets activated.
- The Rescue App sends the signal to the GPS.
- GPS collects the required data and starts to track the location.
- The location is tracked using the latitude and longitude values received by theRescue App.
- Location is traced and is sent to the 108 Server which results in providing the ambulance service to the accident area as soon as possible.

Hence the hardware components that consists of embedded C program and other peripherals and the software devices interacts and exchange the necessary information in order to provide the emergency services to the accident area.

Conclusion

The overall process is automated that provides an efficient service to the people who is in need of emergency services. The components are greater in performance, reliable and very economical. Hence it is very user friendly. The Emergency Detection and Rescue System using mobile communication technology is very essential for people in need and can aid in minimizing the fatal due to accidents.

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