Accident Detection Using Android Smart Phone

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ABSTRACT— Nowadays, nobody in this world is ready to lookwhat's happening around them. Even though, if any accident occurs no one cares about it. This is an intention to implement an innovative solution for this problem by developing an Accident detection System using android smart phone from the accident zone.This system has been developed and implemented using the heart beat sensor based mobile technology integrated with the evolving android smart phone. The application for accident detection which primarily measures the heart beat rate using heart beat sensor. After getting the signal from sensor this system filter out the background noise and detect only the sound of the pulse. The microphone would need to be held near to the heart or somewhere the movement of blood made enough noise to be detect using some sort of audio signal processing. Then count the time between each pulse to get the pulse rate. The normal human heart beat range is 60 to 100 Beats Per Minute (BPM). If there is any variation from the normal heart beat range, then the system detects that may be an accident or not. Then the system will immediately transmit the location of the accident to the pre-configured contacts through Short Message Service (SMS). In case of an accident is occurred then the driver is prompted to respond by touch or voice in order to eliminate any false detection So the proposed system ensures that to reduce the human death ratio by accidents.

KEYWORDS—Accident Detection, Android Smart Phone, Heart beat Monitor, Alert Message, GPS, Sensor, Bluetooth.

I.   INTRODUCTION

In India, the World Health Organization (WHO) has revealed in its first ever Global Status Report on Road Safety that more people die in road accidents in India than anywhere else in the world, including the more populous China. Calling road fatalities an "epidemic" that will become the world's fifth biggest killer by 2030, the report said while rich nations had been able to lower their death rates, these were sharply on the rise in the third world. It said 90% of deaths on the world's roads occur in low and middle-income countries (21.5 and 19.5 per lakh of population, respectively) though they have just 48% of all registered vehicles. The statistics for India are chilling. At least 13 people die every hour in road accidents in the country, the latest report of the National Crime Records Bureau reveals. However, road safety experts say the real numbers could be higher since many of these accident cases are not even reported. "There is no estimate of how many injured in road accidents die a few hours or days after the accident," points out RohitBaluja, member of the UN Road Safety Collaboration and Commission of Global Road Safety representing Asia. Based on the records, India will become the world number 1 in Road Deaths due to the poor record of average 13 die every hour, which is 1.14 lakh per year. This will make India to be the first place. This causative information about the accidents is the intent to develop the proposed technology as scientific traffic engineering wings to reduce the fatalities due to accidents.
 The main objectives of this work are,
1. To Reduce the Human Death Ratio due to Road Accident in India.
2. If accident takes place, quick transmission of message to preconfigured contacts to intimate the victims.
3. To provide maximum assistance even in unpopulated area.
4. To incorporate the technology and make more versatile applications of defense& war fields
        This proposed methodology is the automatic system which will provide the solution for identifying the accident location. The physiological parameter such as heart rate is the vital information transmitted to the saved contacts spontaneously when the accidents occurred.

II.   ACCIDENT DETECTION

Accident detection is used to prevent an unfortunate incident that happens unexpectedly and unintentionally, typically resulting in damage or injury and also it is used to detect an event that happens by chance or that is without apparent or deliberate cause. The main purpose of accident detection is used to reduce the death ratio of a human and to provide the maximum assistance while accident occurs.

III.   PRELIMINARIES

1.   BLUETOOTH

Bluetooth technology is a cutting-edge open specification that enables short-range wireless connections between desktop and notebook computers, handhelds, personal digital assistants, mobile phones, camera phones, printers, digital cameras, headsets, keyboards and even a computer mouse. Bluetooth wireless technology uses a globally available frequency band (2.4GHz) for worldwide compatibility. In a nutshell, Bluetooth technology unplugs your digital peripherals and makes cable clutter a thing of the past. With Bluetooth technology, you can easily connect your computer with your Palm OS-based handheld device, mobile phone and other peripherals with Bluetooth technology — and do it wirelessly, within a 30-foot range. Bluetooth wireless technology is available across the board on computers. It is built into all PowerBook G4 computers as a standard feature and can be integrated into iBook, iMac and Power Mac computers as an option. Existing users can purchase a D-Link Bluetooth USB Adapter to enable their computer with Bluetooth technology.

2.   GPS TECHNOLOGY

The Global Positioning System (GPS) is a global navigation satellite system deployed by the US Department of Defense and maintained by the US Air Force. GPS is a space based radio navigation system that provides accurate location and timing services to anyone with a GPS receiver. This service, made available to civilians in 1996 for navigation purposes, is free of charge, can support an unlimited number ofusers, and functions anywhere in the world. Starting in 2004, the mobile phone industry began successful tests to incorporate GPS receivers into mobile phone devices to support 911 emergency location. Most of today's smart phones are equipped with fully functional GPS receivers and supporting applications.

3.   8051 MICROCONTROLLER

The AT89C52 is a low-power, high-performance CMOS 8-bit microcomputer with 8K bytes of Flash programmable and erasable read only memory (PEROM). The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard 80C51 and 80C52 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C52 is a powerful microcomputer which provides a highly-flexible and cost-effective solution to many embedded control applications.

IV.   EXISTING SYSTEM

AN ENHANCED ACCIDENT DETECTION AND VICTIM STATUS INDICATION SYSTEM

This project work is used to identify the accident occurrence and to detect the victim's status. The microcontroller based system hardware has been developed to acquire the various parameters such as accident location, heart rate and beat and body temperature at accident occurrence spot and the same data have been transmitted to the LabVIEW software to analyze and indicate the physiological status of the victims. The same data and analysis report will be transmitted to the mobile phones which are in emergency care center and phone numbers for which the users would like to send the intimation.

### A. Heart Rate Measuring Module

The IR sensor has been used for detecting the heart rate and the beat of the heart could be identified with the diaphragm and microphone assembly fixed in the seat belt module. IR has less noise and ambient light than at normal optical wavelength. The light is produced only when current passes through in the forward direction and block current in the reverse direction. Plethysmography is an infrared photo electric sensor used to changes in pulsatile blood flow from the finger. The Plethysmography operates by recording changes in blood volume as the arterial pulse expanse and contracts the microvasculature.
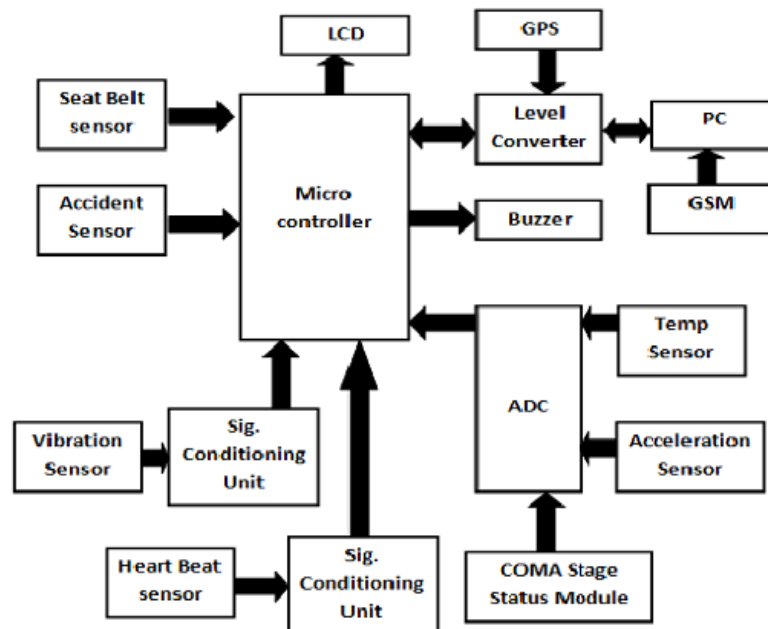
Architecture of accident detection system

B. Accident Identification Module

High-frequency crystals are typically cut in the shape of a simple, rectangular plate. Low-frequency crystals , such as those used in digital watches, are typically cut in the shape of a tuning fork. Quartz has the further advantage that its elastic constants and its size change in such a way that the frequency dependence on temperature can be very low. The result is that a quartz crystal behaves like a circuit composed of an inductor, capacitor and resistor, with a precise resonant frequency. So in this work the quartz crystal has been utilized as vibration sensor and the concomitant circuit has identified the accident occurrence and the potential difference has been transmitted to the micro-computer module for further processing.
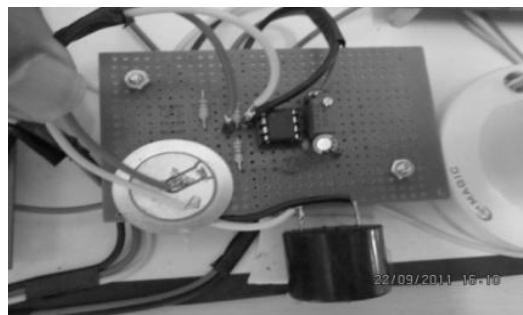
Photograph of vibration sensor module

C. Seat Belt Sensor Module

The reed switch is an electrical switch operated by an applied magnetic field. It consists of a pair of contacts on ferrous metal reeds in a hermetically sealed glass envelope filled with inert gas. The contacts may be normally open, closing when the magnetic field is present, or normally closed and opening when the magnetic field is applied. This switch may be actuated by a coil, making a reed relay, or by bringing a magnet near to the switch. Once the magnet is pulled away from the switch will go to its original position. This seat belt system could also be provided with other device which has the elastic diaphragm and microphone provision to pick up the heart sound and the same will be transmitted to the brain of the system.

Photograph of seat belt sensor (Reed switch) provision

E. GPS and GSM Module

The Global Positioning System (GPS) is a space-based global navigation satellite system that provides reliable location and time information in all weather and at all times and anywhere on or near the Earth will when and where there is an unobstructed line of sight to four or more GPS satellites. GPS satellites broadcast signals from space, which each GPS receiver uses to calculate its three-dimensional location (latitude, longitude, and altitude) plus the current time. This GPS module places the vital role to predict the location of the accident in this work. Presently this system will transmit the latitude and longitude, with this information the location could be calculated by the nearest GSM transmission location with the help of mobile service communication networks.

DRAWBACKS

- The system should be improved in such a way that all the modules are incorporated within the vehicles
- Integration with in an automobile is demand
  in this Accident detection system
- The conditions of false positive are maximized here.

V.   THE PROPOSED ACCIDENT DETECTION SYSTEM

The proposed methodology is the automatic system which will provide the solution for identifying the accident location.This system is using the heart beat sensor based mobile technology integrated with the android smart phone.The normal human heart beat range is 60 to 100 Beats Per Minute (BPM).If there is any variation from the normal heart beat range, then the system detects that may be an accident or not. Then the system will immediately transmit the location of the accident to the pre-configured contacts through Short Message Service (SMS). In case of an accident is occurred then the driver is prompted to respond by touch or voice in order to eliminate any false detection.
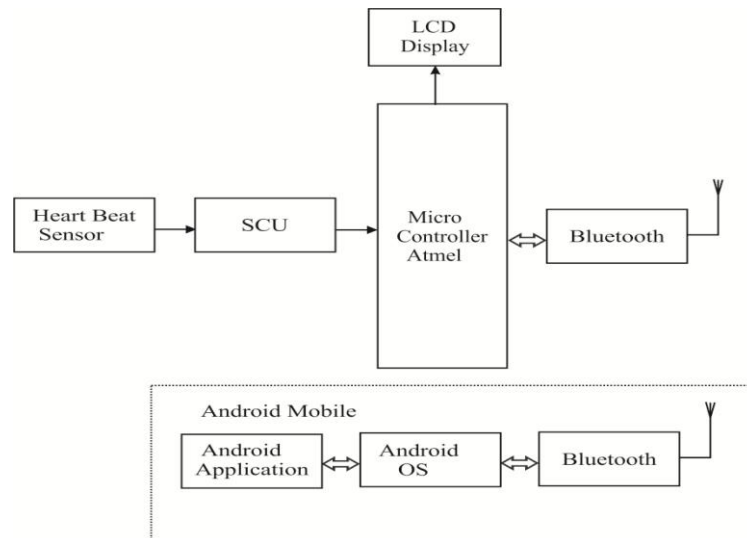
Proposed Accident detection System

Heart rate is measured by IR transmitter and receiver. Infrared transmitter is one type of LED which emits infrared rays generally called as IR Transmitter. Similarly IR Receiver is used to receive the IR rays transmitted by the IR transmitter. One important point is both IR transmitter and receiver should be placed straight line to each other. The IR transmitter and receiver are placed in the pulse rate sensor. When you want measure the pulse rate, the pulse rate sensor has to be clipped in the finger. The IR receiver is connected to the Vcc through the resistor which acts as potential divider. The potential divider output is connected to amplifier section. When supply is ON the IR transmitter passes the rays to the receiver. Depending on the blood flow, the IR rays are interrupted. Due to that IR receiver conduction is interrupted so variable pulse signals are generated in the potential divider point which is given to A1 amplifier through the capacitor C1. The coupling capacitor C1 is used to block the DC component because the capacitor reactance is depends on the frequency. For DC component the frequency is zero so the reactance is infinity now capacitor acts as open circuit for DC component. The amplifier section is constructed by the LM 324 quad operational amplifier. It consists of four independent, high gains and internally frequency compensated operational amplifiers named as A1, A2, A3 and A4 amplifiers. The varying pulse from the potential divider is amplified by the A1 amplifier. In this amplifier the capacitor C2 is connected in parallel with feedback resistor to filter the any DC component in the amplified signal. If any spikes in the amplified signals, they are further filtered by the C3 and C4 capacitors. After filtration the signal is again amplified by the A2 Amplifier.

Then amplified signal is given to inverting input terminal of comparator. The comparator is constructed by the A4 amplifier in which the reference voltage is given to non inverting input terminal. The reference voltage is generated by the A3 amplifier. Then the comparator compares the two signal and delivered the +12v to -12v square wave pulse at its output. Then the square wave signal is given to base of the BC 557 and BC547 switching transistors in order to convert the TTL voltage 0 to 5v level. Finally the TTL output is given to MM 74C04 inverter to invert the square pulse. Then the final square wave signal is given to microcontroller or other interfacing circuit in order to monitor the heart rate.

USER REGISTRATION

This module contains the details of the usersuch as name, mobile number, password, etc.Here the new user can also register with the same application. The contact numbers which we want to send the message alert can also be saved

INITIALIZING SENSOR

In this module, we use the external sensor to get the heart beat rate from the userAfter getting the signal from sensor this system filter out the background noise and detect only the sound of the pulse.Then the measured data are transmitted to mobile phone using bluetooth.

FETCHING LOCATION USING GPS

In this module, we invoke the gps(Global Positioning System) function in android deviceIt establish the function to our application to get the exact location by using location manager.Here we detect the exact location with the latitude and longitude.

UPDATING INFORMATION

In this module an emergency mode will activated in user smart phone to send a sms alert in case of an accident occurs.The sms that includes the current location and current heart beat rate of the user.

VI. CONCLUSION

This accident detection and alert system provide emergency responders with crucial information at the earliest possible time. Reducing the time between when an accident takes place and when it is detected can reduce mortality rates. The entire works have to be integrated with the automobile to validate its functionality and reliability. Thus this work will reduce the accident death ratio in considerable amount even in rural roads. Then it has a great importance in day to day life of the people in the country like India. This proposed work will provide vital information about the accidents even in unpopulated area. So, the pre-configured contacts could be able to serve to the victims with better efficiency and they could plan to have important first aid kits which have to be brought along with them to the accident spot. Thus this work ensures the reduction of death ratio and fatalities in the country like India and also which will have a greater importance in day to day life.

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