Emergency Alert Device-Based on GSM and GPS Technology

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Abstract: As we all are aware of continuous rise in graph of crimes against women and kidnapping of children, also recent growth of crime against senior citizens. As a result of all these activities, a big question mark is there about the human security. In this paper, we are proposing an idea, how to provide a full security to human by employing the advanced technologies been available to us such as GSM-GPS tracking. When a human is in uneasy situation the pulse rate varies accordingly, this variation is going to be the base of the proposed device activation. Once the device gets activated it will start tracking the location of the person using GPS (global positioning system) and will send emergency message using GSM (global system for mobile communication) to the saved contacts and the police control room. The best thing about this system is that it does not need a smart phone. To the best of our knowledge this device will leave no stone unturned to deal with emergency situation.

1. INTRODUCTION

It sounds like an anise in desert, if we talk about a device which aims at providing a feel of security to a person in present condition where rise in crime chart can be clearly seen [5] [6]. Following paper is presented with such an idea to deal with all type of emergency situation related to human life, which may be encountered while being alone. This device employees number of modules such as ATMega328 board [8], GSM shield (SIM 900a)[2][9], GPS(G4-GPS6MV2)[4][3], pulse rate measuring sensor, a band pass filter, a frequency to voltage converter and power supply unit. This device is going to mean a lot especially for women of India as they have to face many adverse situations every day.

2. LITERATURE REVIEW

Real time tracking of an object or a human is becoming a very interesting field day by day. We are already available with many of such popular phenomena. One such popular application is tracking of vehicle and keeps regular monitoring of them [2][4]. These types of devices, which are used for vehicle tacking also includes web application that provide exact location of target. Also GSM has came up with many modification in common application, so that it can be used effectively in education sector, traffic control, banks, public advertisements, stock exchange etc. one of such idea is GSM based on e-notice board [1]. This present a way of developing reliable and an authentic wireless communication between mobile phone and microcontroller using GSM (global system for mobile communication) modem (modulator-demodulator).

These two fabulous technologies GSM and GPS can be used for security purpose of human beings. Such a device which uses GSM based emergency notification via SMS can be very useful to security [7]. GPS tracking has became a very frequently used technique, but when we talk about the ethical problems of GPS tracking, many questions arises in mind. One such study is done by the Ktina Michael , Andrew McNamee and MG Michael (School of Information Technology and Computer Science, University of Wollongong, Australia). In their paper they attempted to answer some questions like, who is liable for providing an incorrect geographical location for an emergency service call? Does a government agency or the police force have the right to location information for a given subscriber? This study emphases on the urgent need for the development of an ethical framework and other industry guidelines [3].

3. PROPOSED DESIGN

In this proposed design the functioning being with the pulse rate measurement by a piezo sensor working as a vibration sensor. The output of this sensor is passed through an amplifier and a band pass filter to limits the signal and afterwards given to a frequency to voltage converter, so that we can get a voltage value corresponding to the normal pulse rate. When a person will be in uneasy situation the pulse rate varies accordingly, when the threshold value is crossed, the microcontroller reads data from the GPS module. GSM module will send an emergency message along with the tracked location information to the saved number in the SIM being used. Within every 2 minutes location information will be updates and send.

4. METHODOLOGY

4.1. HARDWARE DISCRIPTION
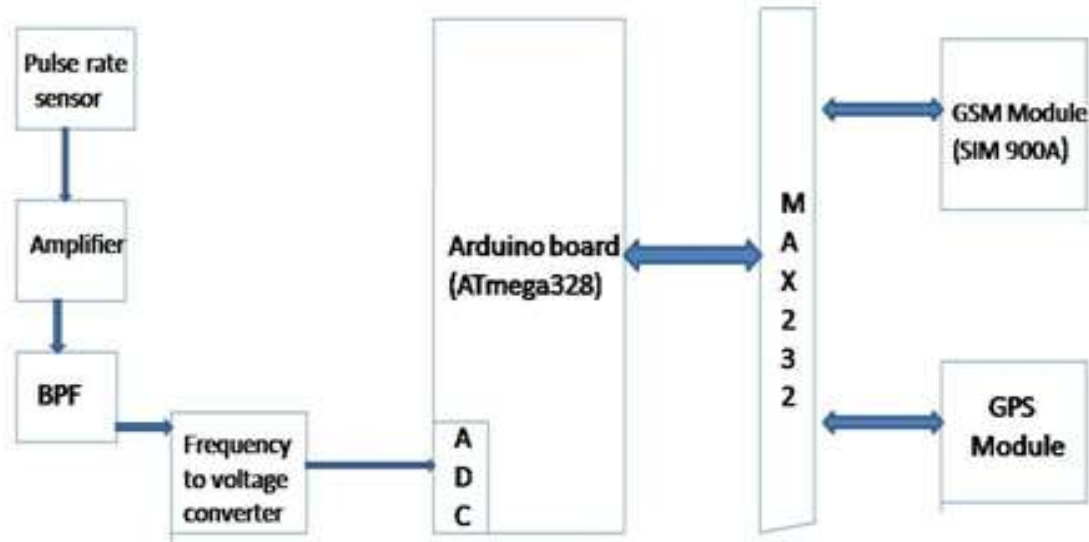
4.1.1.   GPS Module: This is a GPS Receiver (5v serial) with high gain having 4 pin 2.5 mm patch strip. The third generation POT (Patch On Top) is used by the receiver for the GPS module. It can be interfaced with normal 5V microcontroller with the help of the in built 3V-5V converter. The interfacing is made easy with the help of low pin count (4 pin) strip. The 4 pins are 5V, TX, RX and GND. This standalone 5V GPS module does not require external components. It consists of internal RTC Back up battery and can be directly connected to USART of the microcontroller. The current date, time, longitude, altitude, speed, and travel direction / heading among other data are provided by the module and can be used in many applications including navigation, fleet management, tracking systems, mapping and robotics. The module can support up to 51 channels. The GPS solution enables small form factor devices which deliver major advancements in GPS performances, accuracy, integration, computing power and flexibility.

4.1.2.   GSM Module (SIM 900A): It is a wireless MODEM-just like dial-up MODEM, which works with GSM wireless network. But there is a difference between dial-up MODEM and wireless MODEM. Dial-up MODEM send and receive data through a fixed telephone line while wireless MODEM send and receive data through radio waves. GSM (Global system for mobile)/GPRS (general packet radio service) TTL-modem is SIM 900 quad-band GSM/GPRS device, works an frequencies 850mhz,900mhz,1800mhz and 1900mz.it is very in size and easy use as plug in GSM MODEM. The modem is designed with 3v3 and 5vdc TTL interfacing circuitry, which allows use to directly interface with 5v micro-controllers (pic,avr,aurdino,8051, as well as 3v3 microcontrollers, arm, charts xx ,etc). the board rate can be configured from 9600-115200.

Features:

* Quad based GSM/GPRS:850/900/1800/1900 MH$_z$
* $_{Built}$ in RS232 to TTL or vice versa logic converter (MAX232)

- Configurable Baud rate
- Most status and Controlling pins are available
- SMA(Subminiature Version A) connector with GSM L Type Antenna
- LDB9 connector (Serial port) provided for easy interfacing
- Built in network status LED
- Input voltage:-5V to 12V

4.1.3. Arduino ATMega328 Board: Arduino ATMega328 board: The Arduino Duemilanove ("2009") is a ATmega328 microcontroller based board based which consists of 14 digital input/output pins (6 of which can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller. It can be simply connected to a computer with a USB cable or powered with an AC-to-DC adapter or battery to get it started. The ATMEL AVR core combines a rich instruction set with 32 general purpose working register. All the 32 registers are directly connected to the Arithmetic And Logic Unit, allowing two independent registers to be accessed in one clock cycle. The resulting architecture is more code efficient while achieving throughputs up to ten times faster than conventional CISC microcontroller.

Feature:

- 32 Kbytes of In-system programmable flash memory with READ-while-WRITE capabilities
- 1024 bytes EEPROM
- 2kbytes SRAM
- 32 general purpose I/O lines
- On-chip debugging support and programming

4.1.4. Pulse Rate Measuring Sensor: We are using the LTD1-028K as pulse rate measuring sensor. This is a multipurpose, piezoelectric sensor for detecting physical phenomena such as vibrations or impact. The piezo film element is laminated to a sheet of polyester (Mylar), and produces a useable electrical signal output when forces are applied to the sensing area. The dual wire lead attached to the sensor allows a circuit or monitoring device to process the signal.

Features:

- Minimum Impedance: $1M\Omega$
- Preferred Impedance:$10M\Omega$ and higher
- Output Voltage:-10mV-100V depending on force and circuit impedance
- Storage Temperature:- -40 degree Celsius to +70 degree Celsius
- Operating Temperature:- 0 degree Celsius to +70 degree Celsius

4.2.   SOFTWARE ALGORITHM:

1. Define the receiver and transmitter pin number of GPS module.
2. Setup the serial buffer with baud rate 9600 and bit rate 4800.
3. Now setup a loop which will do the following
4. Read the contact number from SIM card memory
5. Take data from GPS module.
6. Convert the longitude and latitude from GPS into an Goggle URL.
7. Attach this URL with the emergency message.
8. Send this message to all the numbers from SIM memory periodically until device   is reset

CONCLUSION

The proposed design will deal with critical issues faced by human in the near past and will help to solve them with technologically sound equipments and ideas. This system can overcome the fear that scares every human in the country about her safety and security.

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