

Design and Implementation of Intelligent System to Enhance Safety and Security

Ram Kumar.V¹, Sam Jefferson.C², SanjeevKumar.R³, Manoharan.L⁴

^{1,2,3}(Student, Department of Electronics and Communication Engineering,
Jeppiaar SRR Engineering College, India)

⁴(Assistant professor, Department of Electronics and Communication engineering,
Jeppiaar SRR engineering College, India)

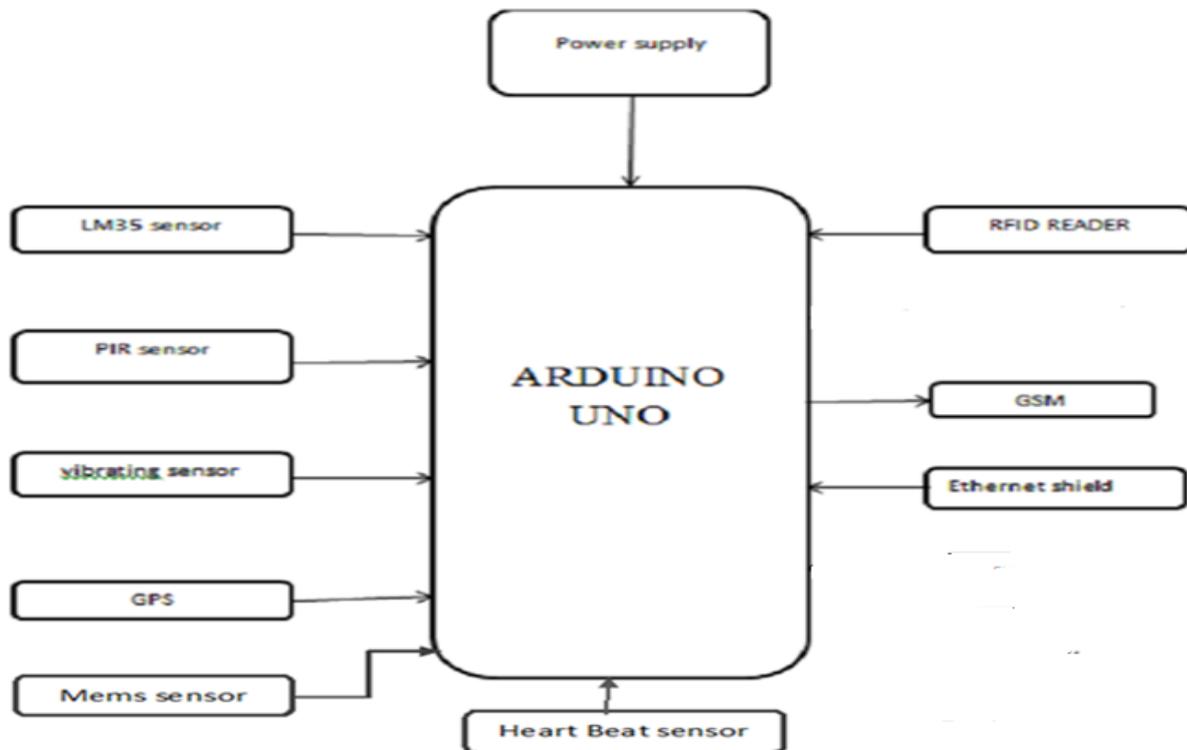
Abstract: Safety and security is lagging in this digital world. Safety of children is considered to be a question mark till now. Child kidnapping and child abusing cases are increasing day by day in our country. School going children are the main targets of the predators. In this paper, we have proposed a prototype model for children, based on embedded system. It comprises Arduino Uno, GPS Module, GSM Module and various sensor to monitor the activities and health status of the child, by the parents. Our proposed system resulted in a strong, low cost and user-friendly system to solve the problem of safety against the School going children

Keywords: Child safety, Embedded System, Smart security, Arduino Microcontroller, GPS

1. INTRODUCTION

Today in the modern world lot of technologies has been developed. Likewise, crimes have also increased with the same number. Child safety has become one of the very serious threat in the society. The most affected are the school going children. This model adopted embedded system to ensure the security of the children to rectify the worries of parents regarding their child safety. In this scenario, our system Ensure the live tracking for their because parents worries are genuine. This paper proposed a model for child safety and security through mobile phones that provides the option to track the location of their children as well as in case of emergency automatically the device send the health status and its current location via short message service. In this proposed system, we can measure a children's temperature heart beat rate for safety precaution and we can track the location of children using GPS. Here, the advanced technology of RFID reader is used to get the all information of the children details. This project will give a dramatic change in the child safety. GPS based tracking is for helping parents and guardians to keep an eye on the child's wherever they are. GPS is a most promising and growing technology for automation identification and data capture of moving and non-moving objects. Childs tracking and monitoring their live health status is important to enhance security for school going children.

2. BLOCK DIAGRAM



3. HARDWARE COMPONENTS

3.1 Vibration Sensor

The vibration is a flexible device which are used for measuring various processes. This sensor uses the piezoelectric effect while measuring the changes within acceleration, pressure, force otherwise strain by changing to electrical charge. It is a transducer to detect abnormal vibration of an that may be indicative of mechanical problems. The vibration sensor or charge accelerometer measure the vibration base on the piezoelectric effect. under acceleration, the mass causes a share stress applied to the sensing crystals. This stress produces a proportional electric output by piezoelectric material. The internal structure of a vibration sensor is like a metal ball that is fixed in special spring as a pole, around it is the other pole. When the vibration gets on to an extent, the two poles are connected so as to Determine that the shock occurs. Vibration sensor outputs only as digital signal.

3.2 PIR Sensor

PIR detects a personality's being on the move inside more or less 10m from the detector. This can be a mean price, because the actual detection vary is between 5m and 12m. PIR area unit basically made from a pyro electrical detector, which may find the levels of actinic radiation. PIR sensors area unit unimaginable, they're flat management and marginal effect, have a good lens vary, and area unit straight-forward to interface with. Most PIR sensor have a 3-pin association at the facet or bottom. One pin is ground another, pin is signal and also the last pin is power. Power is typically up to 5v. interfacing PIR with microcontroller is extremely straight forward and easy. The PIR act as a digital output therefore all you wish to try and do is listening for the pin to flip high or low. The motion is often detected by checking for high signal on one I/O pin. Once the detector warms up the output can stay low till there's motion, at which era the output can swing high from some of seconds, then come low. If motion continues the output can cycle during this matter till the sensor line of sight of still once more.

3.3 Temperature Sensor

Temperature is the most often-measured environment amount. This may well be expected since most physical, electronic, chemical, mechanical, and biological system are plagued by temperature. Certain chemical reactions, biological processes, and even electronic circuit perform best among restricted temperature ranges. Temperature is one of the most common measure variable and that there are many ways of sensing it. Temperature sensing can be done either through direct contact with the heat sources, or remotely, while not direct contact with the supply victimization radiated energy instead. There are a lot of temperature sensor are available on the market today, including thermocouple, resistance temperature detectors (RTDs), thermistor, infrared, and semiconductor sensor

3.4 Mems Sensor

Micro-Electro Mechanical systems (MEMS) is a technology that combines computers with small mechanical device such as sensor, valves, gears, mirrors, and actuators embedded in semiconductor chips. MEMS or what he calls analogue computing will be “the foundational technology of the next decade.” MEMS are also sometimes called smart matter. In automobile air-bags the MEMS are used as an accelerometer. They’ve replace as less reliable device at cheapest and slow promise of being able to inflate a bag not only on the basis of sensed deceleration but also on the basis of the size of the person they are protecting. Basically, a MEMS device contains micro-circuitry on small silicon chip into which some mechanical device such as a mirror or sensor has been manufactured. Such chips can be built in large quantities at low cost, making them cost effective for many uses.

3.5 Heartbeat Sensor

A person’s heartbeat is the sound of the contracting or expanding of valves in his/her’s heart as they force blood from one region to another. The number of times that the heart beats per minute (BPM). The beat of the heart can be felt in any artery that lies close to the skin is the pulse. Heart Beat can be measured based on optical power variation as light is scattered or absorbed through the blood as the heart beat changes. The heartbeat sensor consists of a LED and a detector like a light detecting resistor. The heart beat pulses cause a variation in the flow of blood in different regions of the body. When a tissue is illuminated with the light source, it means light emitted by the LED, it either reflects or transmits the light. The blood absorbs some of the light and the transmitted or the reflected light is received by the light detector. Depending upon the tissue in the blood the light is absorbed. The detector output is an electrical signal and is proportional to the heart beat rate. This signal is actually a DC signal related to the tissues and blood volume and the AC component synchronous with the heartbeat, caused by pulsatile changes in arterial blood volume and it is superimposed on the DC signal.

3.6 Ethernet Shield

The Arduino Ethernet Shield is used to connect the Arduino Board to the internet. It is based on the wiz net W5100 Ethernet chip (data sheet). The Wiz net W5100 provides a network (IP) stack capable of both transfer control protocol(TCP) and UDP. It supports up to four simultaneous socket connections. Ethernet library is used to write sketches which can be connected to the internet using the shield. The Ethernet shield is connected to an Arduino board using long wire-wrap headers which extend through the shield. This keeps the pin layout intact and allows another shield to be stacked on top of the Arduino. Arduino communicates with both the W5100 and SD card using the SPI bus (through the ICSP header). This is on digital pins 11, 12, and 13 on the Demeaned and pins 50, 51, and 52 on the Mega. On both boards, 10th pin is used to select the W5100 and 4th pin for the SD card. These pins cannot be used for general I/O. On the Mega, the hardware SS pin, 53, is not used to select either the W5100 or the SD card.

3.7 GSM

Global System for Mobile communication (GSM) is a globally accepted standard for the digital cellular communication. GSM is the name of a standardization that group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating at 900 MHz

3.8 GSM Modem:

A GSM modem is a wireless modem that works with a GSM (Global System for Mobile Communication) wireless network. A wireless modem of GSM module behaves like a dial-up modem. The difference between a dial-up modem and wireless modem is that the dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves. A GSM modem can be an external device or a PC Card or PCMCIA Card. Typically, an external GSM modem is

connected to the computer through a serial cable or a USB cable. A GSM modem in the form of a PC Card or PCMCIA Card is designed for use with a laptop computer. It should be inserted into one of the PC Card or PCMCIA Card slots of a laptop computer. Like a GSM mobile phone, a GSM modem also requires a SIM card in order to operate

3.9 GPS

Various GPS modules are designed for many different applications. The modules are classified into two families: FGPMMOSLx and FGPM MOPAx series (x denotes the model number). The major difference between these two families is the inclusion of patch antenna. PAX comes with the ceramic antenna, while SLx does not come with patch antenna. These GPS modules provide a complete GPS solution that excels in position, speed, and accuracy performances as well as high insensitivity and tracking capabilities in urban environment. The GPS module are powered with 3.3V to 5V power supply. GPS chipset, the world's leading digital media solution provider and largest fab-less IC Company in. GPS is a satellite navigation system used to determine the ground position of an object. GPS technology was first used by the United States military and then expanded into civilian use over the next few decades. Nowadays, GPS receivers are included in many commercial products, such as automobiles, smartphones, watches, and GIS devices.

3.10 Arduino Uno

Arduino Uno is a single-board microcontroller meant to make the application more accessible which are interactive objects and its surroundings. The hardware features with an open-source hardware board designed around an 8-bit Atmel AVR microcontroller or a 32-bit Atmel ARM. Current models consists an USB interface, 6 analog input pins and 14 digital input output pins that allows the user to attach various extension boards. The Arduino Uno board is a microcontroller based on the ATmega328 chip. It has 14 digital input/output pins in which 6 can be used as PWM outputs, a 16 MHz ceramic resonator, an ICSP header, an USB connection, a power jack and a reset button. This contains all the required support needed for microcontroller. In order to get started, they are simply connected to a computer with a USB cable or DC adapter. Arduino Uno Board varies from all other boards and it doesn't use the FTDI USB-to-serial driver chip in them. It is featured by the Atmega16U2 microchip that is programmed as a USB-to-serial converter

4. SOFTWARE COMPONENTS

4.1 Arduino Ide

Arduino IDE is an open source software that is mainly used for writing and compiling the code into the Arduino Module boards. It is an official Arduino software, making code compilation too easy that even a common person with no prior technical knowledge can do the coding and make the microcontroller work. It is easily available for operating systems like MAC, Windows, Linux and runs on the Java Platform that comes with inbuilt functions and commands that play a vital role for debugging, editing and compiling the code in the environment. A range of Arduino modules available including Arduino Uno, Arduino Mega, Arduino Leonardo, Arduino Micro and many more. Each of them contains a microcontroller on the board that is actually programmed and accepts the information in the form of code. The main code, also known as a sketch, created on the IDE platform will ultimately generate a Hex File which is then transferred and uploaded in the controller on the board. The IDE environment mainly contains two basic parts: Editor and Compiler, where Editor is used for writing the required code and Compiler is used for compiling and uploading the code into the given Arduino Module. This environment supports both C and C++ languages.

4.2 Embedded C

Embedded C is most popular programming language in software field for developing electronic gadgets through microcontroller. Each processor used in the electronic system with an associated with embedded software. Embedded C programming plays a key role in performing specific function by the microcontroller. In day-to-day life, we used many electronic devices such as mobile phone, washing machine, digital camera, etc. These all device working is based on microcontroller that are programmed by embedded C

5. WORKING

In this project, we use Arduino atmega328 as the microcontroller as the main controller. The controller has 6 analog and 14 digital pins. ATmega328 microcontrollers are from the 8-bit AVR microcontroller family. Here we use various sensors to sense the child's activity. First when the child enters into the school bus the RFID tag which is placed in the Identity Card with the child is sensed by the RFID reader EM18 module and

sends an SMS to the parent that the child entered into his/her school bus through another controller fixed in the school bus. The GPS module senses the exact location coordinates (latitude and longitude) of the child and update it to the parent according to the embedded c program depends on how we program it. The GSM module sends SMS to the parents about these information's to the parents. The heartbeat sensor that is going to attach in the child's hand or in the any other part of the body of child senses his/her heartbeat when it is abnormal it sends a message that your child's heartbeat is abnormal please check his/her health immediately and the parent can contact the incharge in the school or wherever, nearby the child. The vibration sensor senses the vibration of the child when he or she is hit heavily or during an accident and immediately sends an SMS if the vibration range is beyond the threshold set in the program. Body Temperature of the child is also monitored and sends an SMS if the child is feverish or below the threshold of normal Temperature. PIR sensor senses motion of the child. If the child is moving it senses the movement opposite to it. If there is no movement for a long time the GSM alerts with a SMS. The mems sensor senses the heavy angle variation of the child. Heavy angle variations happen when the child is abnormal like shaking the body or trying to run from a predator (scary moments). The GSM alerts the parent with an SMS. The Ethernet shield used here is to connected using a LAN cable and feeding the IP address of the system i.e. parents pc or laptop or smartphone and van be viewed from anywhere by simply typing the IP address. In future, it has been planned to implement a camera to take pictures and store using the PIR sensor's data. If a person crosses the child it takes photographs. This process happens according to the Embedded c program that has been typed in the Arduino IDE software and Uploaded in the Arduino Uno atmega328 board. This is a prototype model and in future it can be developed as a watch by using Nano technology to make this Controller and sensors to a very very small size.

6. CONCLUSION

The early system used here has no facility of monitoring the activities with internet and a Bluetooth module is used to transfer information. But our proposed system has live tracking of the child without delay and health monitoring of the child and is successfully done. So, Parents need not to worry about their child's safety and health condition when they are not with them and in the school.

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