Human Safety Monitoring System Using IOT

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Abstract

The primary purpose of this project is to ensure the safety of human beings in case of emrgency situations that might include both health related emergencies and life threat from the external sources through constant monitoring of the person using a device built using IOT techniques. The device constantly monitors the person's pulse and position using sensors and its readings. The code is written such that if any of the values cross the threshold readings, then the device automatically alerts the surroundings police stations and sends a s.o.s message to the victim's gaurdian through message. The device is also equipped with fake symptom detection technology and an emergency button to improve the accuracy of the device.

Keywords: *Arduino, Global System for Mobiles(GSM), Global Positioning System(GPS), Pulse Sensor, Temperature Sensor, Flex Sensor, Motion Sensor, Buzzer, Switch*

1. Introduction

Human safety is one of the major issues in today's World. We hear the news of people's harassments than their achievements. Many technologies have been introduced for people safety but still sexual harassment, eve-teasing, kidnapping and others are taking place in our country. In recent years crimes against people has increased to a great extent. There are many existing apps and devices for people security via smart phones. Though the smart phones have increased rapidly, it is not possible to have the phone all the time in our hand to make a call or click on it. In most of the emergency situations the victim is in a position where he/she is unable to operate on the mobile phones or gadgets.so this paper proposes the system which is a solution to the prescribed problem.

Modern problems need modern solutions. The device described in the paper ensures safety and security of the people even if they don't carry any type of smart phones. An automated detection system is developed which sends an alert message to the number predefined and to the police department along with the location co-ordinates of the person. This can be achieved using the sensors which can sense various factors such as the abnormal body reactions like the rise in temperature, change in heartbeat and provides an alert message to the mobile numbers registered. This device is suitable in the situations where the victim may not be in a position to activate the device or to use the mobile phone. The location of the victim can be updated so that the victim can be rescued in time. A buzzer is included in the device to alert the surroundings so that the victim can be rescued.

2. Related Work

The following components ensure successful functioning of the device:

The proposed system deals with ensuring the safety of the human, so a proper background work needs to be made to design the system so that the system is accurate in the real time scenarios. The system needs to be tested with real time scenarios and its working needs to be carefully monitored and updated to suit the real time needs.

In the existing systems when the people face a dangerous situation, he/she has to activate the device by clicking a button of the device to activate it. The device gets activated and an alert message will be sent to the family members.
In case of an android app the people must use the mobile to send the message which is not possible in

all situations. If a manually activated device which is used to alert others during emergency situations by sending messages through GSM where the location is shared by GPS, it will be of no use when the victim is either unconscious or doesn't have mobile phone and electronic gadget.

There might be a scenario where the person is   actually safe but his/her pulse increases due to his own fear. To prevent sending alert messages during those scenarios, care has been taken so that the LED in the system glows for 10seconds without sending any alert message. Within those 10seconds if the victim clicks on the button provided by the system, it is an indicator that the person is safe and fake emotions have been raised by the person. But if the victim doesn't respond within 10seconds then without any further delay, message is sent to the concerned well-wishers and police stations.

3. Proposed Architecture

Human Safety Monitoring System proposes a device which would help the victim to alert the police department, family and the surrounding people. The proposed device can be turned on by the activation of the sensors when the readings of the body cross a certain level.

In this system four sensors- temperature, pulse, motion and flex sensors are used for the activation of the device. When a particular value of the sensor is reached, they get activated. Pulse sensor works both when the rate passes over the threshold limit and falls down below the limit. Buzzer is included in the device to alert the surrounding people so that the victim can be rescued in time.

In the alert message the location coordinates will be shared along with the readings of the sensors. The location of the victim gets updated for regular intervals of time.
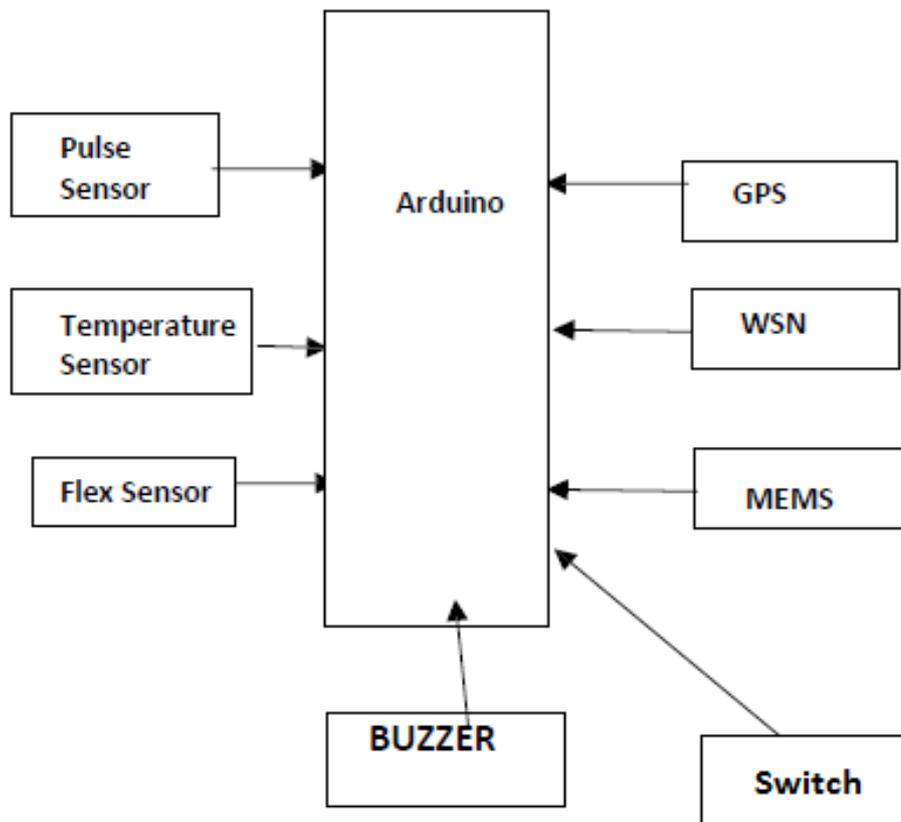
Block Diagram
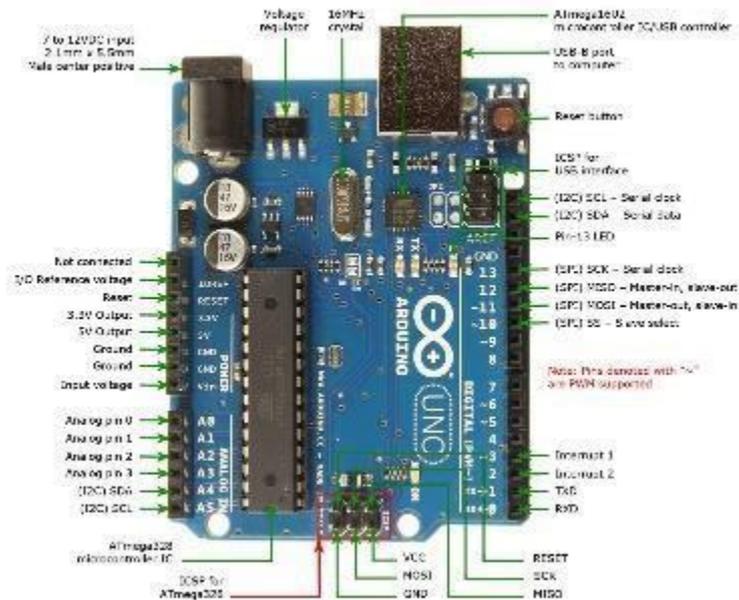

FIGURE 1. Block Diagram

FIGURE 2. Arduino Board

Arduino Integrated Development Environment also called as the Arduino Software which is an IDE that contains a text editor for the execution of the code and a message area to display the message, a text console for displaying the output of the execution and a toolbar the Arduino IDE is connected to the Arduino hardware and is used to communicate with the hardware. The Arduino contains the analog, pins digital pins, power pins and the pins used for the communication. The console in Arduino IDE is used to display the text output by the Arduino, which include the complete error messages and other key functionality parameters of the system and its dependencies. It is the hallmark unit of any IOT based devices and needs to be programmed well in order to maintain the robustness of the system and also to achieve our required functionality information. To these analog and digital pins other devices are connected to communicate with one other and it acts as a bridge for the communication between other devices. The code to the Arduino can be uploaded from Arduino IDE. Once we have selected the correct serial port then the option provided by the Arduino IDE to upload the code into Arduino using the toolbar or we can select the upload option available from the sketch menu. The number of devices connected to the Arduino board is limited based on the pins provided on the board. There are two separate pins which can be used to communicate with the GPS and GSM. The power input supported by the pins differ from one other.

i   Sensing Module

Sensing Module consists of the sensors which calculate the changes and convert the changes that occur into the digital and signals. The sensors included are temperature, flex, pulse and mems accelerometer. These sensors are connected to the analog and digital pins of the arduino interface. The arduino power pins provide the required power to the sensors for their operation. These sensors will be connected to the human body. The sensors will store the readings in the flash memory. The data which is obtained either in analog or digital signals will be converted into the suitable format of human understanding. All the data collected will be stored using the Wireless Sensor Network.

In the sensing module each and every data will be sent to the arduino for the processing of the data and based on the value sent to the arduino the output will be generated. The device gets activated by bending the flex sensor which transfers the value of bending to the arduino and if it exceeds the threshold value of the flex sensor the arduino provides the power input to the device and the device activates the functions of the monitoring system. The proposed system include flex sensor, temperature sensor, pulse sensor, mems accelerometer. The working of flex sensor is based on the

concept of the thermal resistance. If the flex sensor is bent then the thermal resistance increases and if it rises above the threshold value then the device gets activated. It is based on the amount of pressure and bend on the flex sensor. It can be placed on the fingers and in case of the emergency situations the victim can bend their fingers so that the flex sensor gets bent and the device gets activated. The varying resistance of the flex sensor is directly proportional to the amount of turn of the sensor. The resistance change will depend on the linearity of the surface and the amount of resistance will vary for each amount of the bend. The flex sensor works in the operating voltage range of 0 to 5 volts and the power rating provided to the flex sensor is 1 watt in the peak and 0.5 for the continuous phase of the flex sensor. The range of the turn resistance provided by the flex sensor will be in the range of 45k to 125k ohms. The required power for the flex sensor will be provided by the Arduino board and it is connected to the power pin of the Arduino board.

The temperature sensor is connected to the body of the victim and the temperature sensor is used to gather the surrounding temperature and it will convert the temperature readings into the signals that can be converted into the format that is suitable for the understanding. The signals from the temperature sensors will be collected by the Arduino device and will be processed by it . If the temperature reading cross the threshold readings then the device gets activated and the power to a led light connected to the Arduino gets supplied and the led glows for certain period of time. If the victim will not switch of the device then the messages of the location of the victim will be sent to the registered mobile numbers. MEMS accelerometer is connected in the system. MEMS calculate the changes in the moment of the victim by getting the position of the victim with respect to the three axes and all directions. If there is any sudden moment of the victim and based on the value calculated on the position of the victim with respect to the movement of the victim and changes if the value reaches and rises above the threshold value then the same process repeats and led glows. If the victim will not respond then the messages will be sent to the registered mobile numbers. The last sensor the heartbeat sensor works based on the rate of the heartbeat. It calculates the heartbeat of the victim and if the heartbeat rises above the normal range then the alert message will be sent to the registered users. There will be another emergency button in the system so that the victim can directly activate the device and send the message to the registered numbers.

ii Location Module

FIGURE 3. GPS Module

The location module uses the GPS device to locate the coordinates of the victim. The Global Positioning System GPS, is a device that is based on the space-based radio navigation system. The GPS system works without the interaction of the user and it does not require the user to transmit the data, and it will operate independently using other telephonic or internet reception, though these technologies can enhance the usefulness of the GPS positioning information. The GPS system can provide the critical positioning capabilities to military, civil, and commercial users around the world. The location of the victim gets updated for every few seconds so that the victim can be rescued in time. The GPS device connected to the Arduino board and the Arduino board provides the power required for the GPS module and the data to be processed is provided by one of the two pins that the GPS device is connected. The location coordinates of the victim gets sent to the registered users for regular intervals of time and the coordinates gets updated by the movement of the victim. The GPS

modules contains three segments. They include space segment, control segment and the user segment. The user segment consists of the receiver that is connected to the GPS module which receives the information from the space and control segments. The working of the GPS is based on the triangulation method. In this method of triangulation the location of a place is traced by three satellites and the coordinates of the location is provided by the fourth satellite with respect to three satellites. This principle is used by the GPS module toget the location coordinates of the victim.

iii Database Module

The data gathered from the Arduino device gets transferred through the Wireless Sensor Network that is included in the system. The data that is received by the Arduino using sensors. The WSN acts as a bridge between the system and the network and the data related to the system that is stored in the network can be retrieved using the queries related to the data stored. The wireless sensor network has limited storage capacity, limited bandwidth . Local Positioning Algorithm and Global Positioning System can be used to get the data of the coordinates and to store the data in the database. The data received from all the sensors is monitored by the Arduino and the final values are stored in the knowledge base, so that we use the data for any of the additional services like tracking the persons health behavior at several points of his/her life-cycle.
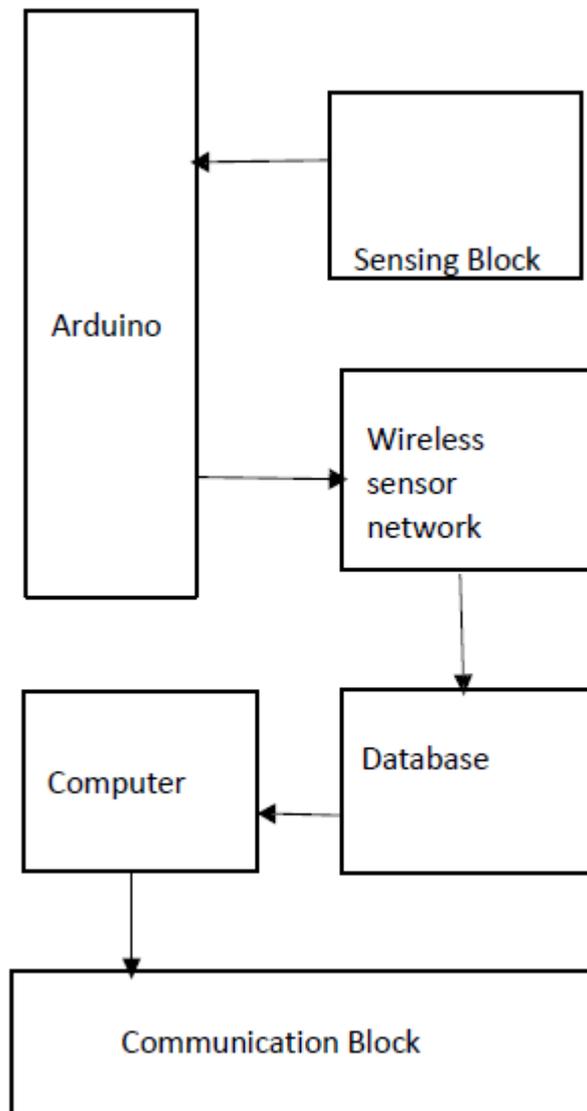

FIGURE 4. WSN Working Diagram

The layers included in the WSN architecture are power management plane, task management plane, mobility management plane along with the other network layers. The data from the sensors will be transmitted through the wireless links and to the network using the data ethernet.

iv   Software Module

The software part helps in programming the logic behind processing sensor values, checking for threshold levels. It also helps in integrating GPS, GSM and WSN modules to ensure the location tracking of the victim. The coding part would be completed in IDE like VS code and SQL server. Once the coding part is done, it can be fed into the Arduino board for real-time functioning and monitoring of the status of the person. It also helps in coding the logic for Fake emotion detection which is very important feature of this project. It also helps in getting the input values from sensors both in analog and digital form and also help in inter-conversion of the same. The port connection on the Arduino board is also set using the software module of the project.
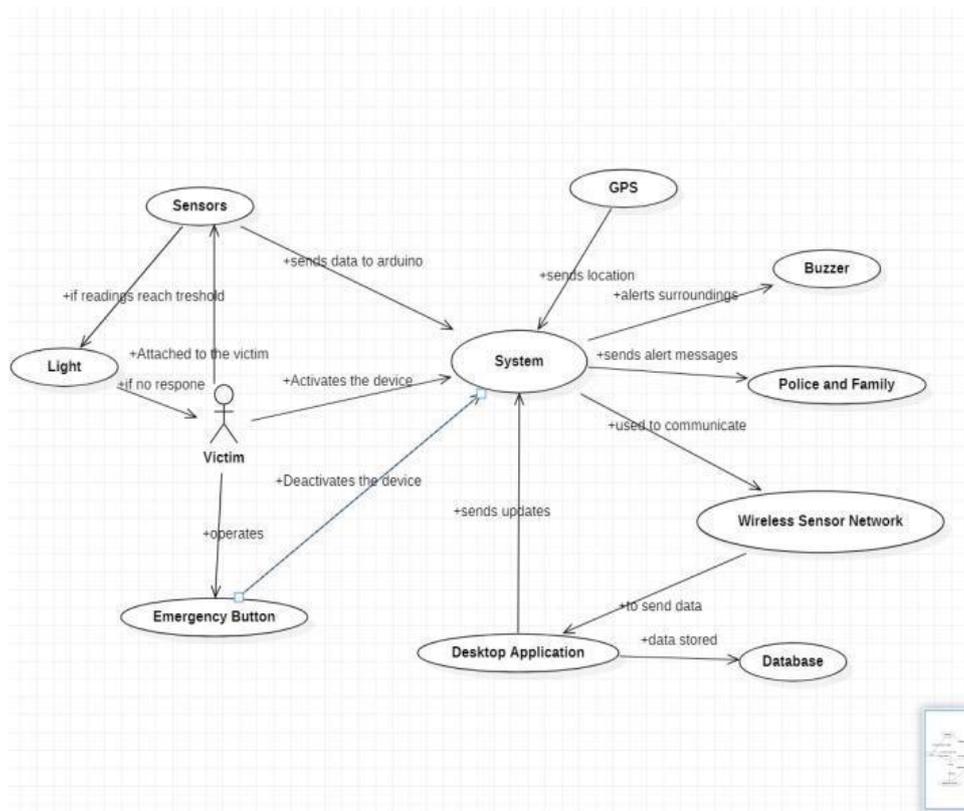
Architecture Diagram

FIGURE 5. Architecture Diagram

4.   Conclusion

This paper proposes a system which ensure the safety and security of a human being in life-threatening situations. The Hallmark of the system is to work automatically and without mobile phone. This system has as mechanism to detect fake emotions and report accordingly to the surrounding police stations and caretakers. The System is also equipped with emergency button for manual activation. So this device can be carried by the victim along anywhere and can be used at anytime without much user interaction and with best functionality. This system addresses the problems that prevailed in the existing systems. In this system we tried to overcome the drawbacks of using sensors and tried to increase the accuracy of sensors and the human safety monitoring system.

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