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Women's Security Smart System based on IoT Applications

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Abstract: *Women safety has been becoming the main criteria in our society, as they are facing many physical harassments. Here in this project, we are preparing an IoT based security smart band which will help both women and children to some extent. The smart system works based on physical action mechanism as well as non-physical action mechanism and helps in sending the messages with their location to police and dear ones. In few cases women may not be able to use their physical action, so we will use automatic mechanism using force resistive sensor, NTC thermistor temperature sensor and heart rate sensor to sense and sends SMS with their location to police and dear ones. As women entered into many fields where they may encounter many tough situations. So, this system is somewhat useful for working women. Here we design the system that can be used in creating a safety device that women can wear easily. In smart world the smart wearable device is one of the best options for protection.*

Keywords: IoT, Global Positioning System, Global System for Mobile Communication, Heart Rate Sensor, Arduino Uno, Pressure Sensor, Temperature Sensor, Push Button, Women Safety.

I. INTRODUCTION

The existence of women in various fields made them to face greater violence against them. Initially women were bounded to the four walls of the houses but after globalization they have got their rights to stand equally with men, so they marked their presence in different fields. Even though they got their rights, they are still facing some sexual harassments. Now a days there are many IoT devices which helps in communication in critical times. This project implements a smart system proto type consisting of Arduino uno board, pressure sensor (force sensitive resistor), heart rate sensor, NTC thermistor temperature sensor, push button, Global Positioning System-Global System for Mobile communication module, power supply. When the button is pressed, SMS will be sent to predefined contact people around for help. In few cases women may not be able to use their physical actions to press the switch so we use automatic mechanism using force sensitive sensor, NTC thermistor temperature sensor and heart rate sensor. Physical devices through which all electronic devices is called the Internet of Things, cloud computing and sensors are connected. In the IOT the privacy is very high. It is very helpful to people to develop a smart-based security. The sensors are developed in such a way that there is a automatic response without any triggering buttons. This can help people can overcome difficulties like women security, constructing smart city.

Multiple sensors like pulse rate sensor, pressure sensor, Bluetooth sensor, GPS are used for safety purposes. To calculate the pulse rate of human by using pulse rate sensor, to calculate the temperature of human body by using temperature sensor. To transfer the data from smart device to smart phone by using Bluetooth device. The GPS is used to identify the location. internet of things is used to send the location and message to nearby police station if there is any high change in the heartbeat level. Arduino is used in the proposed system.

The proposed application gives the security system which is designed to help women to do their work with comfort and can to the places they wanted and work with comfort. Body sensors and Global positioning system are used to track location and send messages to nearby police station and relatives.

II. EXISTING TECHNIQUES

[1] explains about sending the messages for help and location to the selected contacts and police on pressing the button by means of GPS and GSM. It also detects the hidden camera. It also works on another application named android application,

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which shows icons named ‘women safety’, ’SOS message’, ’video recorder’, ’hidden camera’. Based on respective icon clicking, the application starts working.

[2] paper discusses about giving a way to the victim(he/she) to escape from the culprit by means of electric gloves, which gives an order of 3000 volts for few fractions of seconds. This paper also describes about smart pendant with led flash, which focuses led flash on culprit. This system also captures images and sends them to preset EMAIL addresses.

[3] gives the way to continuously monitoring of incoming messages from dear ones by means of micro controller. In case of no network conditions, the system starts working on pressing the switch, which allows the speech circuit to give shouting as output and also gives electric shock to the culprit. This system also sends messages of location through GPS and GSM.

[4] uses Raspberry pi zero W, which starts working on pressing the emergency button. The raspberry pi camera takes images and send them to the preset email ids along with their locations from the cloud database. This system also provides electric shock to the culprits by means of additional circuit named Electric shock system.

[5] is a wearable device. We have two sections one is transmitter and the other is receiver. When the device is ON the sensors will take the readings continuously and the microcontroller will compare the readings with the threshold values. If the values are higher than the threshold values then the microcontroller will generate the message that will send to the contacts stored in the sim using GSM. The location is detected by GPS. If we press Push button in emergency situation then it directly sends message using GSM.

[6] is the system that display and send messages when women are in trouble. The microcontroller PICI6F876A is the main driver that control the system. Here we have three types of buttons to indicate the situation there. If button 1 is pressed that is for eve teasing. Similarly, button 2 for snatched and button 3 for kidnapped. It will send the SMS and track the location.

[7] talks about the device that is placed in public places and it remains invisible to the offender and easily triggered by its user with many options to provide secure communication. It uses face detection and analyses the expressions such as fear, smile, anger. If fear or anger is detected then alert message is sent using GSM and alarm gets activated. This is done by interfacing MATLAB with PIC microcontroller.

[8] is made for protecting the women. It will look like an accessory to the women outside but it is the self-defense and protecting system made for women. It has the tracking ability by using GSM and GPS. The smart band will be connected to the phone by preprogrammed application. It will give electric shock and it has the screaming alarm to call for the help. It will also measure the heartbeat and temperature; it will also detect the motion object. It will send the SMS to the police and saved numbers if there is an emergency.

[9] this device is attached to the footwear. The device is activated when the feet is tapped to the ground 10 times within 5 seconds and the other way is to press the button. Then the device will send the SMS to the contacts for every 30 seconds until the device is off. We have a heartbeat sensor that will detect any abnormal change in heartbeat. These values are shown in the women security application that is installed on her mobile, which is developed using android platform. Using this application both audio and buzzer will be activated.

[10] in this we use Raspberry pi 3 B+ as a main component. If we press the button buzzer will activated and produces sound which will alert the surroundings and it activates nerve stimulator which will produce shocks to protect ourselves from the attacker and it also activates video camera which will record the present scenario of evidence. There is another way in which the android application is activated by the voice command of the victim by saying ‘EMERGENCY’ after that the system will send message to the contacts. The GSM module is connected to the speaker and microphone because the victim can speak and listen to the person from his contact.

[11] we use security authentication to activate the device. There are different authentication methods like fingerprint, iris, face, voice. But we use fingerprint as security authentication activate the device. It activates the electric shock circuit which will produce high voltage to protect from the attacker and it also activates GSM and GPS will detect the location of the women and GSM will deliver their position to the contacts. We use SIM 808 which consists of both GSM and GPS on a single board.

[12] in this we have a smart band which is connected to the mobile. The band is equipped with heart rate sensor, temperature sensor etc. These sensors take values when the device is on. If the accident occurs then the values will increase over the threshold value. Then the application which is installed in the mobile will send the message and location link using GSM and GPS in the mobile.

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III. Proposed Method

The existing techniques discussed above are mostly based on physical action mechanism, that is the systems starts working when the women switch the push button. Some of the them are based on mobile applications, which in turn needs women's action. So, to overcome this problem we came up with an idea which also discusses the situation when a woman is not able to give any physical action along with when she is able to. Thus, both situations may help the women in danger to some extent.

IV. Methodology

The complete process of the system is based on to mechanisms. They are

1. Physical action mechanism
2. Non-Physical action mechanism

4.1 Physical Action Mechanism

The physical action mechanism works based on whether the women is able to use her physical actions. If the women switch the push button, then the physical action mechanism starts working by delivering the position of the women to the predefined contacts or police.

4.2 Non-Physical Action Mechanism

The non-physical action mechanism works based on three sensors readings that are taken by the sensors. The force pressure sensor, NTC temperature sensor and heart rate and SPO2 sensor take the readings from the women body. Based on their high conditions, the global positioning system-global system for mobile communication module delivers the SMS to the predefined contacts. The high condition for the heart rate sensor is 90 beats per minute.

V. Flowchart

The system is designed as the flow chart shown below. The brief introduction of methodology is given in this flow chart.

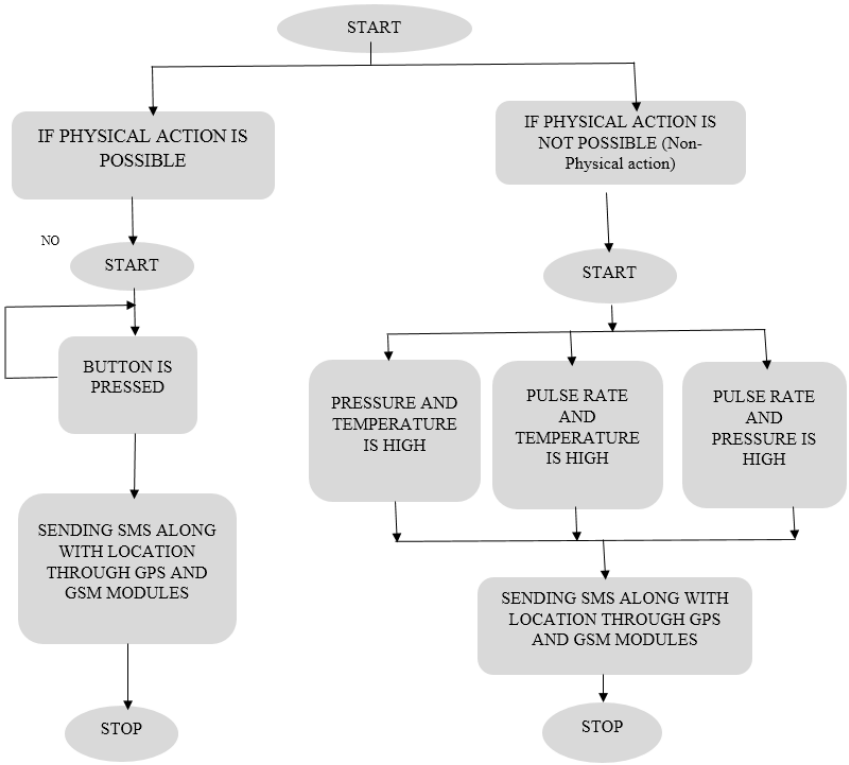

Figure 1: System Flow chart

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VI. System Block Diagram

The block diagram shown in the Fig.2 describes the interfacing of sensors and modules to the Arduino uno. For the detection of temperature, pulse rate and pressure we used temperature, pulse rate and pressure sensors respectively. The system also uses push button for victim to press the switch to send the GPS location to selected contacts.

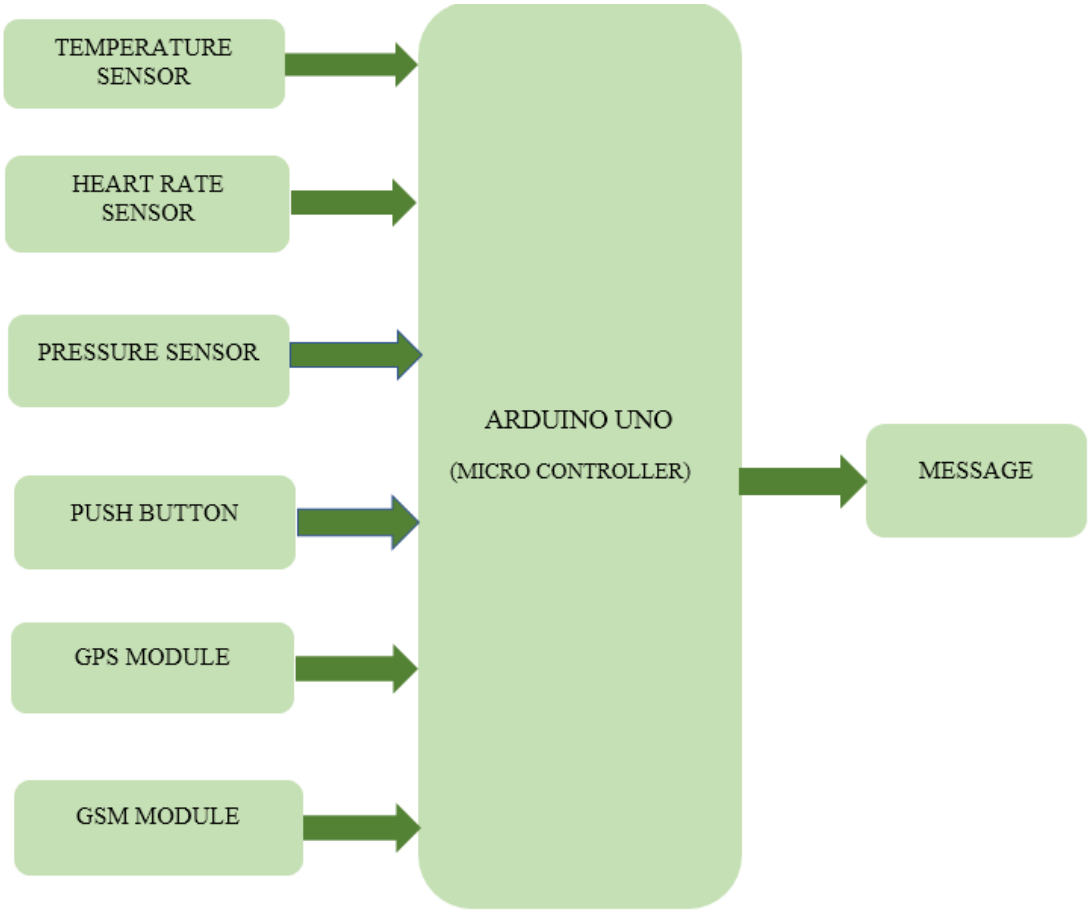

Figure 2: Block diagram of the system

VII. Components

7.1 Arduino uno

An open source microcontroller used to communicate the sensors, modules and control their operations by receiving different signals from various sensors and modules that are interfaced to it.

7.2 Pressure Sensor

It is used to detect the physical pressure, squeezing and weight and changes the resistor values since it is a force sensitive resistor. Resistance is inversely proportional to the pressure that is applied.

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7.3 Temperature Sensor

The temperature sensor that is used here is NTC thermistor temperature sensor is a low cost sensor which senses the temperature of the surrounding environment within the range 20-80 degree Celsius.

7.4 Heart Rate and SPO2 Sensor:

The heart rate sensor used here is MAX30100. The MAX30100 sensor is a heart rate and pulse oximetry sensor, that continuously monitors the heart rate of the human body. The sensor is composed of two LEDs to obtain the results of the heart rate.

7.5 Push Button

It is a switch when pressed activates the physical action mechanism.

7.6 Global Positioning System and Global System for Mobile Communication Module

The Global Positioning System fetches the information related to location of the victim from satellites. The Global System Mobile communication module will deliver the location information as a message to the desired contacts. The module used here is SIM800L and TG621K-GL GPS. Global positioning system (GPS) is a satellite-based system that uses satellites and ground stations to measure and compute its position on earth. GPS is also known as Navigation System with Time and Ranging (NAVSTAR) GPS. GPS receiver needs to receive data from at least 4 satellites for accuracy purposes. GPS receiver does not transmit any information to the satellites.

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7.7 Power Supply

The power supply to microcontroller is given through a battery of 12 volts. The battery is used to supply power to all microcontroller interfaced sensors.

7.8 SMS Gateway

From a telecommunication network short message service allows a computer to send sms transmissions. Per month generally direct to mobile gateway allows are used for hundreds to thousands of text messages.once sms gateway receiving their ration we use gateway to send messages to customers.

7.9 Smart Device

Generally smart device integrated with micro controllers. Micro controller supports three sensors. namely pulse rate sensor, Bluetooth sensor and Temperature sensor. The smart device having trigger button on it, which is used to send the messages.

7.10 Sensors

Now a days, All types of sensors are available in the market. Some of sensors are very costly as per there requirements. Generally sensors are used to get the information from anywhere. we are using three types of sensors. Those are pulse rate sensor, Temperature sensor and Bluetooth sensor. To calcurate the pulse rate of human by using pulse rate sensor, to calculate the temperature of human body by using temperature sensor. To transfer the data from smart device to smart phone by using Bluetooth device.

7.11 Arduino Uno

Arduino Uno is a one type of microcontroller device and developed by Arduino. This device has 14 digital input/output pins. it can be powered by the USB cable. Uno means one in italian.

Technical specifications of Arduino Uno:

- Operating Voltage: 5 Volts
- Input Voltage: 7 to 20 Volts
- Digital I/O Pins: 14 (of which 6 can provide PWM output)
- PWM Pins: 6 (Pin # 3, 5, 6, 9, 10 and 11)
- UART: 1
- I2C: 1
- SPI: 1
- Analog Input Pins: 6
- DC Current per I/O Pin: 20 mA
- DC Current for 3.3V Pin: 50 mA
- Flash Memory: 32 KB of which 0.5 KB used by bootloader
- SRAM: 2 KB
- EEPROM: 1 KB
- Clock Speed: 16 MHz
- Length: 68.6 mm
- Width: 53.4 mm
- Weight: 25 g
- ICSP Header: Yes
- Power Sources: DC Power Jack & USB Port

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7.12 GSM

A GSM modem is a device which can be either a mobile phone or a modem device which can be used to make a computer or any other processor communicate over a network. A GSM modem requires a SIM card to be operated and operates over a network range subscribed by the network operator. It can be connected to a computer through serial, USB or Bluetooth connection.

7.13 General Pin Functions

- LED: There is a built-in LED driven by digital pin 13. When the pin is high value, the LED is on, when the pin is low, it is off.
- VIN: The input voltage to the Arduino/Genuino board when it is using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
- 5V: This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 20V), the USB connector (5V), or the VIN pin of the board (7-20V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage the board.
- 3V3: A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- GND: Ground pins.
- IOREF: This pin on the Arduino/Genuino Special pin functions

Each of the 14 digital pins and 6 analog pins on the Uno can be used as an input or output, under software control (using pinMode(), digitalWrite(), and digitalRead() functions). They operate at 5 volts. Each pin can provide or receive 20 mA as the recommended operating condition and has an internal pull-up resistor (disconnected by default) of 20-50K ohm. A maximum of 40mA must not be exceeded on any I/O pin to avoid permanent damage to the microcontroller. The Uno has 6 analog inputs, labeled A0 through A5; each provides 10 bits of resolution (i.e. 1024 different values). By default, they measure from ground to 5 volts, though it is possible to change the upper end of the range using the AREF pin and the analog Reference() function.

In addition, some pins have specialized functions:

- Serial / UART: pins 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL serial chip.
- External interrupts: pins 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value.
- PWM (pulse-width modulation): pins 3, 5, 6, 9, 10, and 11. Can provide 8-bit PWM output with the analogWrite() function.
- SPI (Serial Peripheral Interface): pins 10 (SS), 11 (MOSI), 12 (MISO), and 13 (SCK). These pins support SPI communication using the SPI library.
- TWI (two-wire interface) / I²C: pin SDA (A4) and pin SCL (A5). Support TWI communication using the Wire library.
- AREF (analog reference): Reference voltage for the analog inputs.board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source, or enable voltage translators on the outputs to work with the 5V or 3.3V.
- Reset: Typically used to add a reset button to shields that block the one on the board.

Automatic (software) reset

Rather than requiring a physical press of the reset button before an upload, the Arduino/Genuino Uno board is designed in a way that allows it to be reset by software running on a connected computer. One of the hardware flow control lines (DTR) of the ATmega8U2/16U2 is connected to the reset line of the ATmega328 via a 100 nanofarad capacitor. When this line is asserted (taken low), the reset line drops long enough to reset the chip.

This setup has other implications. When the Uno is connected to a computer running Mac OS X or Linux, it resets each time a connection is made to it from software (via USB). For the following half-second or so, the bootloader is running on

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the Uno. While it is programmed to ignore malformed data (i.e. anything besides an upload of new code), it will intercept the first few bytes of data sent to the board after a connection is opened.

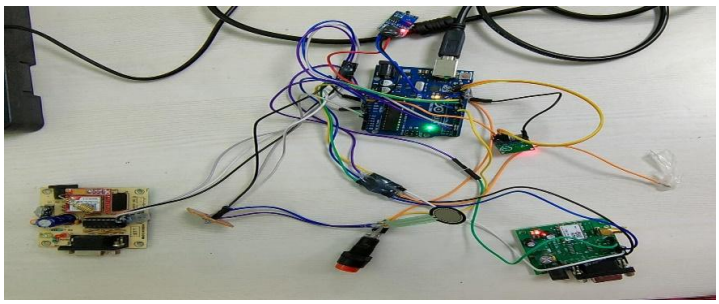
7.14 Advantages

- Safety Device which can be conveyed by everybody.
- Ultra-low power utilization.
- Compact in size with wireless network.
- Easy and quick to install & Easy Maintenance.
- Environmentally friendly system

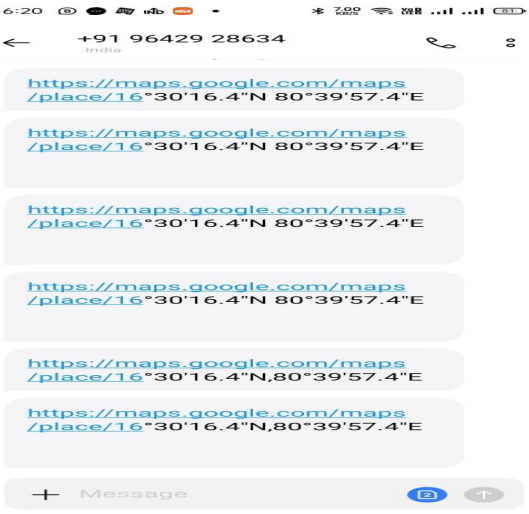
7.15 Applications

- Can be utilized for the security of ladies, kids, impaired and matured individuals.
- Can be utilized as a legitimate proof of wrongdoing with correct.
- Location data for indictment.

VIII. SYSTEM HARDWARE



IX. RESULT



The following pictures showed the result of the complete mechanism. As shown below the physical action mechanism was done using push button, Global Positioning System and Global System for Mobile communication module, Arduino uno. On pressing the push button, the mechanism started sending location of the person in the form of Short Message Service to the predefined contacts through Global Positioning System and Global System for Mobile communication modules. If in case the person is unable to reach the push button, the second mechanism starts working. The non-physical action mechanism was done interfacing Global Positioning System, Global System for Mobile communication and Arduino with sensors like

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NTC thermistor sensor, force sensitive resistor sensor and heart rate and SPO2 sensor. Based on the high conditions of sensor readings the Global positioning System and Global System for Mobile communication modules sent the Short Message Service to the desired contacts or police.

X. CONCLUSION

The theme of design is to provide the protection to the women at low cost. The system is helpful when there is no one to rescue the person in danger. The system is used to prevent the damage to the person in emergency situations to some extent.

XI. FUTURE SCOPE

The system prototype can be implemented into any wearable device like ring, chain, watch.

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