

Smart IOT-Based Women Safety System:A Robust Real-Time Approach

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Abstract— One of the main concerns of every culture is women's safety, as many women face numerous forms of abuse such as molestation, rape, harassment, and domestic violence for a variety of social and cultural causes. The Internet of Things, or IOT, is emerging as a potential technology to help with daily issues and offer assistance with managing different tasks. The community has implemented a number of IOT-based devices to assist women in managing potential safety risks. This study offers a comprehensive assessment of the literature showing IOT devices for women's safety, their key characteristics, wearable technology, sensors employed, and machine learning techniques applied. The findings showed that many sensor types—pressure, heart rate, and other typical sensors in these devices—are employed to record the condition of women experiencing safety concerns. Additionally, the gadgets used several technologies, including as Arduino, the global positioning system (GPS), and the worldwide system for mobile communication (GSM), to convey the notifications. Furthermore, this paper suggests an architectural model that outlines key elements required to create women's safety IoT devices. Finally, this study highlights the utilization of sensor combinations to obtain a variety of input data types that may improve the accuracy and precision of identifying potential threats.

Keywords—Women's safety, Arduino UNO, Heart beat Sensors, Switch, GPS, GSM.

I. INTRODUCTION

Women's safety in today's society is a serious concern since they are unable to leave their homes at any time owing to sexual and physical abuse and a fear of violence. Even in

the twenty-first century, with technology advancing quickly and new devices being created, women and girls continue to face difficulties. Women are skilled at uniting disparate parties behind a single cause. To advance liberty, they frequently cooperate across racial, religious, political, and cultural differences. Women's safety is important, as we all know, but we also need to consider how well they should be safeguarded. Since women are less physically fit than men, a helping hand would be beneficial to them in an emergency. The greatest method to reduce your chances of falling victim to violent crimes (such as rape, robbery, sexual assault, or domestic abuse) is to know how to defend yourself and look for resources that can assist you escape dangerous situations. This device will protect you, lower your risk, and provide aid if you get into trouble or lose your pals during a night out and are unable to find your way home.

Women's safety has gained a great deal of attention in society, particularly in cities where harassment and assault are sadly frequent occurrences. In addition to being essential for one's own well-being, protecting women is also a basic human right. Recent technological advancements, especially in the field of the Internet of Things (IoT), have opened up new avenues for tackling these safety problems.

The alarming statistics on incidents of violence against women highlight the urgent need for creative solutions. Conventional methods of personal safety are still important, but they might not always provide help right away. The purpose of this study is to explore how IoT components can be integrated to create a robust system that empowers women by improving security and safety protocols. Addressing safety concerns has hope thanks to the Internet of Things' ability to connect devices and provide seamless

communication. By leveraging the Internet of Things, intelligent systems that can respond to emergencies and provide real-time communication and monitoring features can be created. The focus of this study is on combining necessary components, such as an Arduino Uno, GPS, GSM, buzzer, and panic button, to create a workable solution for women's protection.

II. LITERATURE SURVEY

In order to solve the issue of women's safety and empower them to face fear, this article suggests an Internet of Things-based solution. This project uses an Arduino-interfaced fingerprint sensor, GPS, and GSM modules. Additionally, the design incorporates a shock wave generator that serves as a weapon and aids in women's self-defense [1].

In order to provide a safe atmosphere for women in society and to enable them to travel anywhere without fear, a smart wearable technology for women's safety was designed in this study. The device was designed using an Arduino UNO, an L2C LCD display, a power source, a body touch sensor, an emergency button, a camera, and a panic switch. It also snaps a photo of the unknown person and texts it to the designated mobile number [2].

In this paper The system serves four main purposes, first to send the victim's location to the pre programmed contact numbers with the help of GPS and GSM. Secondly, she can turn the buzzer on so that nearby people can help her to get out of the situation. Storing the women's pulse rate to Thing Speak cloud with the help of WiFi ESP8266 and sending the same data to registered contact numbers will be the third main purpose of this device. Along with this the fourth main purpose is that she can give a shock to the abuser just by turning the other switch on and touching the device to the abuser's body so that current will pass through him. That shock will not kill the abuser but women will get a chance to escape from the location [3].

The "women's safety system using IOT" project is effective in protecting women when they are in danger, and the suggested system would function in two different ways. Through the use of a sensor and a switch, if she suddenly collapses due to a medical issue such as fainting, the sensor will activate and notify those nearby [4].

III. METHODOLOGY

Ensuring women's safety through intelligent IoT system design is essential to resolving safety issues. To offer strong protection, it should have features like automated reaction mechanisms, emergency notifications, and real-time tracking. Its efficacy and adoption also depend heavily on incorporating user-friendly interfaces and guaranteeing data confidentiality and privacy.

A. EXISTING SYSTEM

The women's alert system in the previous system was made possible by an application. The applications have an SOS number that is used to increase security and warn the victim's family members. The traditional method of resolving women's safety issues is laden with drawbacks and mostly depends on human interaction.

i. *Security system:* Women can send distress signals and disclose their whereabouts with trusted friends or authorities in case of danger by wearing wearable technology like smart jewelry, watches, or bracelets with panic buttons and GPS tracking. Women's safety can be improved with IoT-enabled home security systems that include features like motion sensors, smart locks, and video surveillance cameras. These systems can monitor their houses in real-time and send out notifications regarding any suspicious activity or unauthorized access.

ii. *Safety system:* Women's travel safety can be improved by integrating IOT technology into ride-sharing services and public transit networks. These services can offer features like emergency buttons, real-time car tracking, and automated warnings for authorities in the event of an incident. By encouraging cooperation and fast reaction to security risks, establishing IoT-based community safety networks where locals can exchange information, report occurrences, and request assistance in real-time can help build a safer environment for women.

B. PROPOSED SYSTEM

System incorporates an integrated buzzer, offering all necessary parts. The Arduino Uno serves as the main processing device that manages the integration and is the focal point of our Internet of Things-based women's safety solution. The GPS module, panic button, buzzer, and GSM900A module are all connected to the Arduino Uno. In an emergency, real-time position data from the GPS module is vital, and the panic button acts as a manual trigger.

The goal of the women safety system is to put the users' health first by combining an emergency switch with cardiac monitoring. The device senses both normal heartbeats and emergency scenarios via an interface that consists of a switch and a heartbeat sensor. When the emergency switch is pressed or a sudden irregularity in heartbeat is detected, the system sends out a message including the user's GPS location. When using a microcontroller, such the Arduino, the system processes the switch input and heartbeat data in real time. The inclusion of a GSM module makes message sending easier. The device sends a message to the user with their current GPS coordinates when it detects a change in heartbeat, which is suggestive of distress. When the designated switch is touched in an emergency, a prompt alert is sent out that includes the user's exact GPS location. This function improves human safety by guaranteeing a prompt reaction in emergency scenarios. The system prioritizes the seamless integration of technology into daily life and offers a strong safety mechanism specifically for women. It is inconspicuous and easy to use.

C. ARCHITECTURE

The Arduino Uno serves as the main processing unit that manages the coordination and integration of crucial components, making it the focal point of our Internet of Things-based women's safety solution. The GSM900A module, panic button, buzzer, and GPS module are all connected to the Arduino Uno. In an emergency, the GPS module provides position data in real time, and the panic button acts as a manual trigger. The buzzer alerts the user and anyone nearby with an instant auditory alarm.

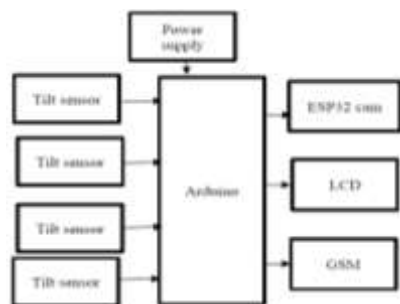


Fig. 1 Block diagram

This women safety system provides a comprehensive and rapid solution by combining GPS technology, emergency switches, and heart rate monitoring. This guarantees that users may promptly and effectively convey distress situations to designated contacts. Real-time health monitoring adds an additional degree of security, making this initiative a comprehensive approach to women's well-being in a variety of circumstances.

D. ALGORITHM

Step 1: Set up the Arduino Uno and its related components as

well as the system.

Step 2: Always keep an eye on the status of the panic button.

When the panic button is pressed,

- the GPS module is turned on and real-time location information is retrieved.
- Set off the module to transmit location-based emergency warnings.
- Turn on the buzzer to deliver a loud alert right away.

Step 3: Put effective power management into practice.

- While in standby mode, reduce the amount of time that non-essential components are operating.
- Ensure that all necessary modules are switched on for prompt response upon activation.

Step 4: Include redundancy measures.

- Create secure channels of communication to guarantee the accuracy of emergency alerts.

Step 5: Include an intuitive user interface.

- Permit users to see the safety status and get alerts.

Step 6: Repeat the monitoring procedure indefinitely to keep

responsiveness:

- Regularly check on the other sensors and the emergency button.

Step 7: Close the algorithm.

E. FLOWCHART

Activity diagram is another important diagram in UML to describe dynamic aspects of the system. Activity diagram is basically a flow



Fig. 2 Flow chart diagram

The flowchart outlines the steps that an Internet of Things (IoT) safety system designed specifically for women would take. It starts with the system being initialized and moves on to the continuous monitoring of the panic button. When the panic button is pressed, the device uses the GPS

module to obtain current position information, instructs the module to send out emergency alerts, and simultaneously sounds a buzzer to provide instantaneous audio notification. The system then comes to an end. When the panic button is not touched, the flow implements redundancy controls, power management, and an intuitive user interface. The procedure then repeats itself to keep an eye on the panic button at all times. This flowchart is an example of a methodical approach to improving women's safety by integrating IoT components to guarantee a dependable and responsive system.

F. HARDWARE TOOLS USED

i. Arduino

The Arduino UNO, with its USB connectivity, 14 digital I/O pins, 6 analog pins, and ATMEGA328 microcontroller, is a very useful addition to the world of electronics. Moreover, serial communication via TX and Rx pins is supported.



Fig. 3 Arduino UNO

The Arduino UNO and Arduino Mega are the most widely used Arduino boards, while there have been many other versions released onto the market, including the Arduino Due, Arduino Mega, Arduino Leonardo, and Arduino UNO. The easiest, most affordable, and most straightforward solution if you're thinking of creating a project with digital electronics, embedded systems, robotics, or the Internet of Things would be to use an Arduino UNO. The open-source electronics site Arduino.cc created the Arduino UNO, a microcontroller board primarily built on the AVR microcontroller Atmega328.

ii. LCD

LCD (Liquid Crystal Display) technology is used in smaller PCs and scratch pad displays. Similar to gas-plasma and light-producing diode (LED) innovations, LCDs enable presentations that are far thinner than those of cathode beam tube (CRT) innovations. LCD displays consume significantly less electricity than gas and LED displays since they operate by obstructing light rather than emitting it.



Fig. 4 LCD display

iii. GPS

Navigation System with Time and Ranging (NAVSTAR) GPS is another name for GPS. For accuracy purposes, a GPS receiver must receive data from a minimum of four satellites. The GPS receiver doesn't send any data to the satellites.

Numerous applications, including fleet management, cabs, and cell phones, employ this GPS receiver.



Fig. 5 GPS Module

iv. SWITCH and GSM

A push button switch is a kind of switch that uses an air switch or a basic electric mechanism to turn anything on or off. They may have a latching action function or a momentary action function, depending on the model. Typically, the button is made of a sturdy, long-lasting material like plastic or metal. There are several sizes and forms available for push-button switches. Here at Herga, we have a variety of push-button switches.



Fig. 6 GSM Module

Global system for mobile communication, or GSM, is a type of mobile communication modem. At Bell Laboratories, the concept for GSM was conceived in 1970. It is a globally utilized mobile communication system. GSM is an open digital cellular technology that uses the 850MHz, 900MHz, 1800MHz, and 1900MHz frequency bands to deliver mobile voice and data services. Time division multiple access (TDMA) technology was used in

the development of the GSM system, which is a digital system designed for communication. After the data has been reduced and digitalized, a GSM transmits it across a channel carrying two distinct streams of client data, each scheduled for a certain time slot. The data rates that the digital system can handle range from 64 Kbps to 120 Mbps.

v. TILT SENSOR

Micro-electromechanical systems are referred to as MEMS/Tilt systems. These are a collection of gadgets, and their small size and manner of design can be used to characterize them. The 1-100-micrometer components can be used to create these sensors.

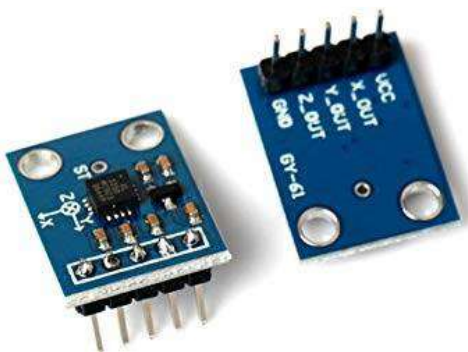


Fig. 7 Tilt Sensor

vi. HEARTBEAT SENSOR

Heart rate monitoring is crucial for athletes and patients alike since it provides insight into the health of the heart. There are other methods for determining heart rate, but electrocardiography is the most accurate. Nonetheless, using a heartbeat sensor is a simpler method of keeping an eye on your heart rate. It is available in various sizes and shapes and provides an instantaneous heartbeat measurement.

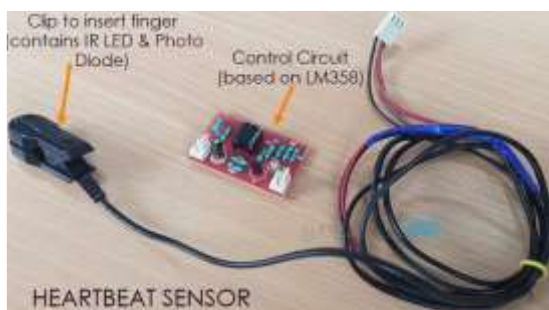


Fig. 8 Heartbeat Sensor

vii. Arduino IDE

The official software introduced by Arduino.cc, known as the Arduino IDE (Integrated Development Environment), is primarily used for authoring, compiling, and uploading code to the Arduino device.



Installing and starting the code compilation on the go is easy with this open-source software, which works with almost all Arduino modules.

IV. RESULTS AND DISCUSSIONS

The implemented women's safety system showed good integration with an Arduino Uno, GPS, GSM900A, panic button, and buzzer. The system started the GPS module, sent emergency alerts via the Atmega328, and turned on the buzzer to provide immediate response when the panic button was touched.

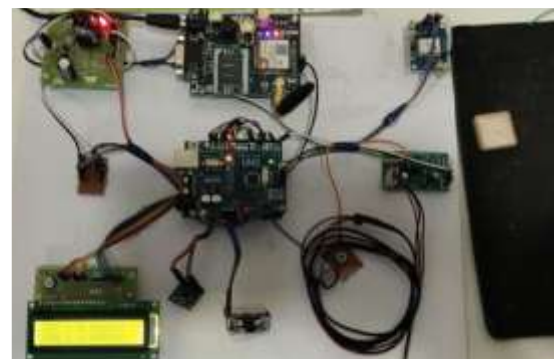


Fig. 8 Main components of Arduino UNO

The system demonstrated efficient redundancy and power management, ensuring reliable operation. The panic button's manual activation provides consumers with a quick way to call for help. The system's usability is increased by the Arduino Uno's adaptability and its simple design. Although the first model shows promise, more testing and scalability assessments, as well as user interface improvements, are necessary for practical implementation.

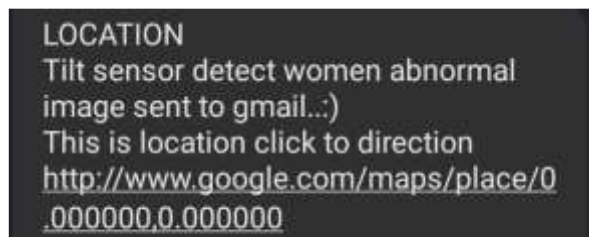


Fig. Location access SMS

V. CONCLUSIONS

This idea proposes an alternate method of device switching that combines GPS and GSM functionality with fingerprint identification technology. When a gadget switches from a remote location, it no longer requires a person to be present in close proximity to operate it. With this method, several users can manage the functioning of the device, and the fingerprint sensor's authentication feature speeds up fault correction.

Promising results have been obtained from the development and evaluation of an Internet of Things (IoT)-based safety system for women that makes use of an Arduino Uno, GPS, GSM900A, panic button, and buzzer. These components worked well together to demonstrate the system's ability to respond quickly and effectively in emergency situations. Users can quickly request assistance by manually pressing the panic button, and situation awareness is increased by the buzzer's aural response. The Internet of Things-based safety system for women represents a significant advancement in resolving safety-related concerns. By laying the foundation for the construction of workable and reliable solutions, this program helps to create safer conditions for women. The effective implementation is a step in the right direction toward improving public safety through the use of technology.

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