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Empowering Women's Safety Using IoT

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Abstract

Safeguarding women in public areas continues to be a ongoing challenge, requiring innovative strategies to tackle this societal issue. The study presented in this paper delves into "Enhancing Women's Safety with IoT," examining the incorporation of crucial elements such as Arduino Uno, GPS, GSM900A, buzzer, and a panic button. This integration aims to develop an intelligent system for augmenting women's safety measures. The pressing need for this research is emphasized by the disturbingly high occurrence of violence targeting women in urban settings. While traditional safety measures are essential, they may not always offer prompt assistance. By utilizing the potential of the Internet of Things (IoT), our research concentrates on creating a safety system that is both proactive and responsive. The suggested solution seeks to empower women through the provision of real-time monitoring, communication, and emergency response functionalities. The methodology section elucidates the reasoning behind choosing each IoT component and furnishes a stepwise guide for implementing the system. A comprehensive system architecture diagram illustrates the interplay among Arduino Uno, GPS, GSM900A, buzzer, and the panic button. The discussion interprets the results, compares the proposed system with existing solutions, and addresses potential challenges. The study concludes by summarizing key findings, emphasizing the significance of the proposed IoT-based system, and suggesting avenues for future research. This research contributes to the ongoing discourse on women's safety, offering a technological solution that not only responds to emergencies but also proactively enhances the overall safety experience for women in public spaces.

Keywords: Women's Safety, Internet of Things (IoT), Arduino Uno, GPS, GSM900a

1. Introduction

The issue of women's safety has become a significant societal focus, especially in urban settings where incidents of harassment and assault are regrettably common. Safeguarding women is not only crucial for personal welfare but is also a fundamental human right. Recent progress in technology, particularly within the domain of the Internet of Things (IoT), has created fresh possibilities for addressing these safety concerns.The concerning data related to instances of violence against women emphasize the immediate requirement for inventive solutions. While conventional approaches to personal safety remain vital, they may not consistently offer prompt assistance. This paper aims to investigate the incorporation of IoT elements to establish a resilient system capable of empowering women through the enhancement of safety and security measures. The potential of the Internet of Things to link devices and facilitate smooth communication presents a hopeful path for tackling safety issues. Through the utilization of IoT, it is possible to develop smart systems that not only react to emergencies but also offer real-time monitoring and communication functionalities. This study concentrates on incorporating essential elements, including Arduino Uno, GPS, GSM900A, buzzer, and a panic button, to formulate a viable solution for women's safety..The main goal of this

study is to devise, execute, and assess an Internet of Things (IoT) system geared towards enhancing women's safety measures. Through the integration of hardware components and smart algorithms, our aim is to establish a dependable and user-friendly system suitable for adoption in diverse settings.This research holds importance in tackling a critical societal problem by utilizing the capabilities of IoT technology. The intended system seeks to offer women a proactive and responsive safety mechanism, promoting a feeling of security and empowering them to navigate public spaces with increased confidence.

2. Literature Survey

[1] This paper proposes aIoT based solution to address the problem of women safety and to help them to be fearless.This project makes use of GPS,GSM modules,a fingerprint sensor that are interfaced with arduino. The design also includes shock wave generator that acts as weaponry and helps woman to defend herself.

[2] In this paper they developed a smart wearable device for womens safety to make a safe environment for women in the society and allows them to go anywhere fear free. The Arduino UNO, L2C LCD display, power source, body touch sensor, emergency button, camera, and panic switch were used in the design of the gadget. Additionally, it takes a picture of the stranger and telegrams it to the registered mobile number.

[3] 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.

[4] This project, "women’s safety system using IOT” is successful in providing safety to women when she is in danger, and this proposed system would work in two ways. By pressing the switch and by using a sensor when she suddenly falls due to health conditions like fainting the sensor will work and alert the surrounding people in these conditions

3. Methodology

3.1 Existing system

In the preceding system, the women's alert system was facilitated through an application. To enhance security, the applications include an SOS number, triggering alerts to the victim's family members**.**

3.2 Proposed system

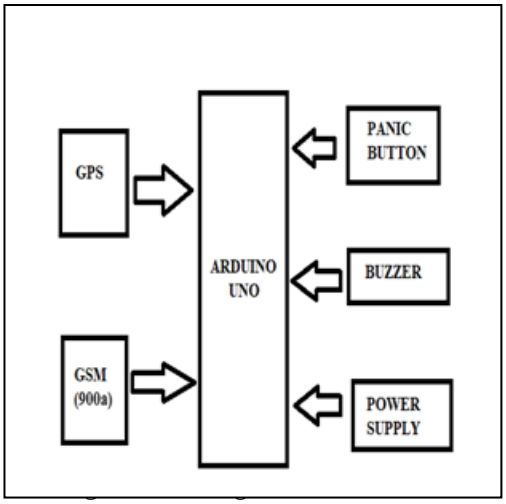
In the envisioned system, we have developed a set of tools to activate the alert system. Within this project, we utilized the Arduino controller to oversee the entire system. The GSM component is employed for sending SMS messages containing GPS locations and a switch is pressed when the person is in danger .Here we adding a buzzer which will and emits a sound when the women presses the switch

3.2.2 *Comparison of existing apps and devices*

Table 1. Comparison of Existing apps and devices[3]

Name	Applications	Disadvantages
VithU app	Alert messages are sent out to the listed contacts, who receive your message along with your physical location.	We have to click the power button for 2 times consecutively. It is not possible at all the situation.
Nirbhaya	Lets the user send an SMS alert or call to with single touch to the pre-selected contacts with exact location. Updates every 300 meters you move. We can also Shake to alert.	This app is also physically dependant.
SOS-Stay Safe	On shaking the device or clicking the power button it sends alert message with your name and voice recording, Your exact location and battery level of your phone. Ordinary phone can receive the message.	If girls fail to shake or click button or if girls become unconscious this app is not worth for sure safety.

3.3 Architecture



The central hub of our IoT-based women's safety solution is the Arduino Uno, functioning as the primary processing unit that coordinates the integration and collaboration of essential components. Linked to the Arduino Uno are the GPS module, panic button, buzzer, and GSM900A module. The GPS module supplies real-time location data crucial for emergency situations, while the panic button serves as a manual trigger. The buzzer operates as an immediate

audible alarm, notifying the user and those in proximity. The GSM900A module facilitates communication through mobile networks, enabling the transmission of emergency alerts. The initiation of the overall communication flow occurs upon activation, with the Arduino Uno processing information, triggering the GSM900A, and simultaneously activating the buzzer. To ensure reliabilitya power supply is connected the system incorporates efficient power management and redundancy measures. While not explicitly depicted, a user-friendly interface is integrated, providing enhanced control over safety settings and notifications. This architectural design guarantees a responsive and trustworthy women's safety system, offering empowerment through the utilization of IoT technology.

3.4 *Algorithm*

Step 1. Initialize the system, including the setup of Arduino Uno and the associated modules.
Step 2. Continuously monitor the state of the panic button:
a. If the panic button is pressed:
- Activate the GPS module to retrieve real-time location data.
- Trigger the GSM900A module to send emergency alerts containing location information.
- Activate the buzzer to provide an immediate audible alarm.

Step 3. Implement efficient power management:
- In standby mode, conserve power by minimizing the operation of non-essential components.
- Upon activation, ensure all required modules are powered up for immediate response.

Step4. Incorporate redundancy measures:
- Establish a secure communication channels to ensure the reliability of emergency alerts.

Step 5. Integrate a user-friendly interface:
- Allow users to view safety status, and receive notifications.

Step 6. Continuously loop through the monitoring process to maintain responsiveness:
- Monitor the panic button and other sensors regularly.

Step 7. End the algorithm.

3.5 Flowchart

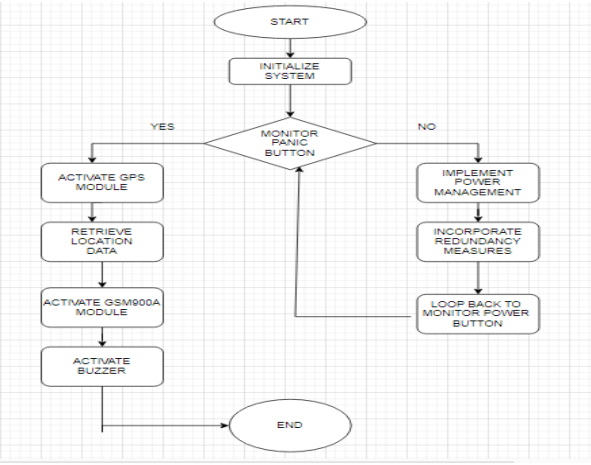


Fig .2 flowchart diagram

The flowchart delineates the sequential operations of an IoT-based safety system tailored for women. It commences with the initialization of the system, progressing to the ongoing surveillance of the panic button. Should the panic button be activated, the system engages the GPS module to acquire real-time location data, prompts the GSM900A module to dispatch emergency alerts, and concurrently triggers a buzzer for immediate audible notification. Subsequently, the system concludes. In the absence of a pressed panic button, the flow proceeds to execute power management, integrate redundancy measures, and introduce a user-friendly interface. The process then loops back to continuously monitor the panic button. This flowchart exemplifies a methodical strategy in enhancing women's safety, employing the integration of IoT components to ensure a system that is both responsive and dependable.

3.6 Hardware tools used

3.6.1 Arduino Uno

Fig.3 Arduino uno

The Arduino Uno is a board containing the microcontroller. It is equipped with both digital and analog input/output pins, USB connectivity, a power jack, and an ICSP header.

Serving as the core processing unit, the Arduino Uno oversees information flow and system control. It decodes inputs from the panic button and GPS module, processes the data, and instructs the GSM900A module and buzzer accordingly. The Arduino Uno's adaptability and programmable nature render it an essential element in coordinating the entire system's functionality.

3.6.2 GPS Module

Fig.4 GPS module

A GPS module commonly comprises a GPS receiver and an antenna, communicating with satellites to ascertain precise geographical coordinates, including latitude, longitude, and altitude information. The GPS module plays a crucial role in obtaining up-to-the-minute location data. Upon pressing the panic button, the Arduino Uno triggers the GPS module to retrieve the current location. This data is essential for transmitting accurate location details in emergency alerts, thereby improving the effectiveness of the safety system.

3.6.3. GSM900A Module

Fig.5 GSM module

The GSM900A module is a component utilizing the Global System for Mobile Communications (GSM) technology, facilitating communication via mobile networks. It generally supports SIM cards and provides interfaces for connecting to microcontrollers.Functioning as the communication conduit, the GSM900A module enables the transmission of emergency alerts to predetermined contacts or a central monitoring system. It utilizes mobile networks to dispatch SMS or alternative notifications, guaranteeing swift notification of relevant parties about the user's location in times of emergency.

3.6.4 Panic Button

Fig.6 panic button

The panic button is a physical switch or button that users can press to initiate a predefined action or response.In this scenario, the panic button functions as a manual initiator for emergency situations. Pressing it prompts the Arduino Uno to activate the GPS module, commence communication through the GSM900A module, and activate the buzzer. This manual activation provides users with the capability to promptly and effortlessly seek assistance when necessary.

3.6.5 Buzzer

Fig.7 buzzer

A buzzer is an electronic device generating sound when an electric current is applied. It is frequently employed for producing audible alerts. The buzzer acts as an audible alarm in response to the panic button being pressed. Its immediate sound output serves as a feedback mechanism for the user, indicating that the emergency sequence has been initiated. Additionally, the buzzer alerts those in the vicinity, enhancing situational awareness during emergency scenarios. Together, these hardware components form a robust and integrated system designed to enhance women's safety through proactive measures and rapid response in critical situations. The synergy of the Arduino Uno, GPS module, GSM900A module, panic button, and buzzer creates a comprehensive solution for addressing safety concerns.

4. Results and Discussions

4.1 Results

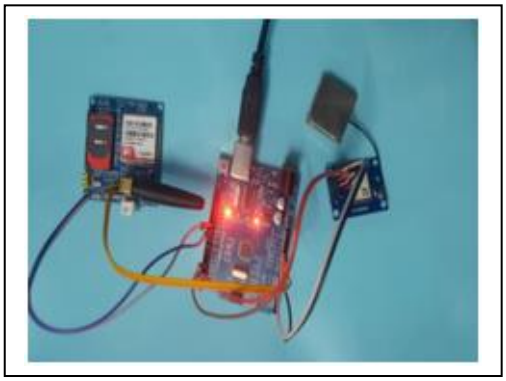


Fig. 8 Main components

Fig.9 Result in SMS

The deployed women's safety system, utilizing Arduino Uno, GPS, GSM900A, panic button, and buzzer, demonstrated effective integration. When the panic button was pressed, the system initiated the GPS module, transmitted emergency alerts through the GSM900A module, and activated the buzzer for prompt feedback.

4.2 Discussion

The system showcased effective power management and redundancy, guaranteeing consistent performance. The manual activation of the panic button offers users a rapid way to request assistance. The versatility of Arduino Uno and the straightforward design of the system enhance its practicality. While the initial model exhibits potential, additional testing and evaluations for scalability, along with enhancements to the user interface, are imperative for real-world applicability.

5. Conclusion

The creation and assessment of the IoT-based safety system for women, employing Arduino Uno, GPS, GSM900A, panic button, and buzzer, have produced promising outcomes. The effective integration of these elements illustrated the system's capability to deliver prompt and efficient responses in emergency scenarios. The manual initiation using the panic button provides users with a swift means to request assistance, and the audible feedback from the buzzer heightens situational awareness.

In summary, the IoT-based safety system for women constitutes a noteworthy progression in addressing safety issues. This initiative establishes the groundwork for the development of pragmatic and dependable solutions, contributing to the creation of safer environments for women. The successful execution represents a positive step forward in utilizing technology for the enhancement of public safety.

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