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Women's Safety Device using GPS and GSM Module

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ABSTRACT: Women's safety has become a key concern in recent years, as occurrences of harassment and violence have increased. This paper describes the design and development of a women's safety gadget that uses GSM and GPS technology to give real-time location tracking and emergency notifications. The suggested system includes a GPS module for tracking the user's location and a GSM module for transmitting distress signals to designated contacts. The device has a panic button that, when hit, activates the system and sends an SOS message to family members and authorities, as well as the user's present location. This method attempts to increase women's security and confidence by allowing them to seek aid quickly in perilous situations. The device's effectiveness is tested using a variety of test scenarios, which demonstrate its dependability and reactivity in real-world situations.

KEYWORDS: Women's safety device, GPS Module, GSM Module, Safety

I. INTRODUCTION

We have already looked at the numerous threats that women face in today's environment. In today's world, women's safety has taken on a fundamental importance. Women are not safe from harm whether they are at home, at work, or in school, prevent them from reaching their full potential. The prevalence of violence against women in a developing nation that is expanding overall appears disgusting and alarming. We have created a women safety device just to start an escape mechanism and give confidence to all the women strolling alone but feeling safe. Identifying a dangerous circumstance and providing warnings prior to entering the worst situation is very necessary. The system advances towards sending alerts and calling as soon as the victim feels unsafe. Also, many times it happens that the mobile phone is not charged or does not have a network; in this case, the hardware device can be used, which is independent of the mobile. The components of the system are an Arduino UNO, a GPS module, a GSM module, and a battery/charger. As soon as the push button is touched, an emergency message is sent to instilled phone number along with the victim's location.

II. RELATED WORK

Monisha et al. (2016) [1] have worked on a safety gadget and application named FEMME that uses an ARM controller is proposed in the paper [1]. It's a security gadget made especially for females. The item will be acquired alternatively, users can install the app on their smartphones and accessible during times of need. Fastest and most efficient method for someone in need of assistance to get in touch. Pressing the volume key and launching the application both of the power buttons. When the program is being utilized, first, four primary icons, an audio recorder, an SOS alert, and a hidden camera detector and video recorder. When the option is pressed, a recording and message is sent to the pre-programmed contacts or find the covert cameras. As opposed to that, however, press of the button to turn on the device. Although the device must be pressed to be activated, it is connected to a smartphone and has two buttons: one being the secret camera button and the emergency button identification. If the emergency button is pressed just once (one click), to track and send the GPS location to a preset contacts with their most recent location once every two minutes. If so When the double click is made, the audio recorder is turned on and is dispatched an emergency assistance message to contacts that were pre-programmed. If so When a long press is made, the preset is automatically invoked. make touch. The device operates utilizing an ARM controller in order to The controller is an all-in-one system with internet access delivers more while consuming less electricity.



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Chougula et al. (2014) [2] developed a portable device that resembles a belt. This apparatus comprises a GPS module, an Arduino board, a GSM shield, and screaming pressure and alarm sensors. The Arduino board the microcontroller can be powered by electricity or connected to a computer, possibly via a battery or an adaptor. The GSM shield offers information, voice, SMS, and fax combined within a compact form factor. It is a very potent single-chip processor that supports inexpensive phones and is compatible with nearly all telephone systems. It also boasts great efficiency and speech quality. offerings. The GPS module displays the current time and date. matching latitude and longitude, as well as transmits speed and if the victim is on the move, the direction of travel. It facilitates following the victim and facilitates locating and locating them. The single chip voice recording feature of the screaming alarm and the capacity to replay content for 40–60 seconds. It is best utilized in voice recorders that are portable. The pressure gauge produces a signal that is applied pressure; typically, it is utilized to record the shift in pressure. This gadget has a pressure sensor threshold limit that is established. When the threshold is crossed, the device activates and begins tracking the victim's whereabouts. utilizing a GPS module and transmitting the position to contacts on file as well as additional emergency services including the police control room each two minutes with the most recent location. The alarm when turned on, and sirens are sent out to alert people that the there's an issue nearby, and assistance is required.

Bhavale et al. (2015) [3] suggested a solution that a wearable safety device with a camera to snap images of possible assailants and a panic button to send alerts. With the use of GPS, the victim is located, and an image is taken. An picture link and an emergency message will be sent to all required contacts. Thus, the system can utilize Arduino is a Linux-based board. Included algorithms consist of Trilateration and HaversineThe main goal of this initiative is to give schoolchildren and working women security. ThusThey enhanced a wireless, portable safety device for women and a bus tracking system with a digital camera to capture a picture of that specific incident and an emergency press button to act as an alert. GSM sends warning signals, tracks the victim's current location, and includes a camera to take a photo.

Shrutikaa Mukund et al. [4] introduces the Shakthi Band, a wearable safety device designed to protect women in dangerous situations. With rising crime rates against women (NCRB 2021), the bracelet functions as an emergency tool, connected to a mobile app that provides real-time information such as location, audio, and video. When a panic switch is pressed, the device notifies authorities and pre-programmed contacts of the user's position and trouble message. This innovative solution is intended to assist authorities or relatives in locating the user after a crime and aims to overcome the shortcomings of existing safety measures, offering an effective and user-friendly solution to the growing safety issues that women encounter. The device is equipped with several components, including a high-definition camera, a microchip connected to an E-SIM, a GPS tracker, and a distress signal. These features work together to continuously record real-time data and alert nearby police stations in case of an emergency. The system includes cloud storage for data, ensuring it can be accessed even if the bracelet is destroyed. The paper highlights several scenarios where the bracelet could prevent or mitigate assaults, aiding authorities in apprehending perpetrators through the data stored and transmitted. The authors emphasize the importance of making the bracelet accessible and affordable, with plans for crowdfunding, marketing, and outreach to rural women through organizations like OxFam India and Bharatiya Grameen Mahila Sangh. By implementing both organic and paid digital marketing strategies, the authors hope to reach a large audience and provide women with an effective tool for personal safety.

Riddhi Shah et al. [5] have worked on Women Safety Device with GPS Tracking and Alerts is a system designed for women safety. The system ensures the safety of women by monitoring the heartbeat. The heartbeat is monitored from the moment the system is switched on. When the heartbeat is increased beyond the normal range, GSM module sends the current location obtained from GPS module to pre-stored contacts 3 times. Earlier, the human input was in need in order to send the emergency signal. But by this system, we eliminate the need of human interaction. Here, the system automatically detects if there is an emergency situation, and takes action i.e. sending the alert message of current location to the pre-stored contacts. Index Terms: GPS module, Encoder-Decoder IC, heartbeat sensor, hybrid module.

Rutuja Thore et al. (2023) [6] mainly focus on women and child safety. Here they have built Safety device using IOT" which uses GPS and GSM modules for real time positioning and messaging respectively. The fundamental of the system is Arduino. The ability of IoT-based safety devices to automate alarm systems and integrate numerous sensors (such as those for motion, temperature, and speech) has made them a hot study topic. Discuss literature that explores the use of IoT in wearable devices that constantly monitor the user's environment and can be triggered without manual intervention. The system is built in two parts receiver & transmitter it enables communication between device



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components. Working to this device is when the SOS button is pressed, the device sends continuous SMS alerts and phone calls with the victim's live GPS location to pre-registered contacts like family, friends, or authorities. This ensures timely assistance in emergency situations. The gadget is intended to be portable, simple to use, and affordable to the typical user, making it ideal for widespread adoption.

Doreen N Sisanalli et al. [7] worked on women safety application developed in such a way that whenever the women presses the button emergency alert is transmitted to the police station and to the close ones. Special feature of the device is its authentication feature that only if the fingerprint is of the women whose phone it is the app will start working and send the alert and the location. If the women is not exposed to danger yet but is lonely or feeling unsafe then also the application is useful, The women has to scan her fingerprint in every fixed intervals of time, showcasing that she is safe yet. Once the finger print scanning is stopped considering that the women is unconscious or injured a double security feature is established and location is sent to the police and other members and buzzer is on alerting the people near her. System uses SIM808(combined GPS and GSM module), Fingerprint sensor, Microcontroller, Wi-Fi module, Power supply, Buzzer, LCD display.

Sampanna M et al. (2023) [8] looks at new technology approaches to the concerning 55% rise in recorded crimes against women. The article examines a variety of strategies, ranging from complex IoT-based systems that use GSM and GPS technology for real-time position tracking and communication, to smartphone applications like "Wosapp" that enable covert alerting of authorities. Smart security bands and rings are examples of wearable technology that are notable for their ability to integrate several functions, such as emergency alarms and pulse monitoring. The review discusses the features, benefits, and limits of various implementations. Although the authors acknowledge the tremendous progress made in this area, they also point out ongoing issues with user privacy, accessibility, and technological dependability. They come to the conclusion that more compact, effective, and efficient technologies are still required, even in light of the creative ideas that have been put forth. The study highlights how a thorough strategy that integrates various technologies might give women the tools they need for self-defense, thereby promoting safer surroundings and bringing about a greater shift in society by lowering the number of crimes against women.

Pallavi Deshpande et al. (2019) & (2021) [9], [10] to guide the structure, format, and flow of this paper for conference publication. While their studies informed our organizational approach, no direct content or references were used, ensuring the originality of this work.

III. EASE OF USE

The effectiveness of women's safety devices that leverage GPS and GSM technology hinges significantly on their ease of use. In an emergency, the ability to rapidly and intuitively engage safety features can be the difference between life and death. Here are the important features that contribute to the use of these devices:

Simple Activation Mechanism

Device features straightforward activation methods, such as a single panic button or a quick double-click mechanism. This allows users to send an SOS message without fumbling or needing to navigate complex menus, which is critical during high-stress situations

Compact and Lightweight Design

Many women express concerns about carrying additional weight in their bags. Therefore, safety devices must be designed to be compact and lightweight, ensuring they can be easily carried without adding bulk. This encourages more women to keep safety devices on hand, increasing their likelihood of use when needed

Independence from Smartphones

The device operates independently of mobile phones. This independence is crucial in scenarios where a user may not have immediate access to their phone or where the phone battery may be depleted. Device utilizing GSM module can send alert and location data directly without needing an internet connection, thus broadening their usability in various environments.



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Feedback Mechanisms

Effective feedback mechanisms are vital for ensuring users know their alerts have been successfully sent. Many devices provide auditory or visual signals upon activation, confirming that help has been requested. This reassurance can significantly reduce panic during emergencies and encourage users to trust the device's functionality.

In conclusion, the ease of use of women's safety devices utilizing GPS and GSM technology is characterized by intuitive designs, portability, multifunctionality, independence from smartphones, and effective feedback systems. These elements collectively contribute to creating a reliable tool that empowers women to feel secure and confident in their ability to respond to potential threats. By focusing on user-centered design principles, developers can enhance the effectiveness of these devices in real-world scenarios

eq. (3)

IV. METHODOLOGY

The development of a women safety device utilizing GPS and GSM technology involves a systematic approach that encompasses design, integration, and testing phases. The process is designed to make sure that the gadget is efficient, simple to use, and dependable in emergency scenarios.

A. System design

The first step entails envisioning the device's architecture, as well as selecting suitable components such as:

Microcontroller: Due to its ease of use and adaptability, the Arduino Uno is the preferred model.

GPS Module : A NEO-6M GPS module is utilized for accurate location tracking.

GSM Module: The SIM800C GSM module is selected for sending SMS alerts.

Panic Button: A simple push button serves as the activation mechanism.

B. Component Integration

The integration of components is performed as follows:

Wiring: All components are connected to the Arduino board. The GPS module connects via UART, while the GSM module interfaces through the same protocol. An Arduino digital input pin is linked to the panic button.

Programming

Arduino IDE is employed for coding the microcontroller. The program includes:

Initialization: Setting up serial communication with the GPS and GSM modules.

Button Monitoring: Continuously checking the state of the panic button. When press, it triggers a sequence of actions:

GPS Location Retrieval: The device retrieves latitude and longitude coordinates using the GPS module.

SMS Transmission: The GSM module sends an SMS containing location information to pre-defined emergency contacts. This can be represented mathematically as:

"Emergency Emergency need help at

18°27'34.3"N

73°53'04.5"E"

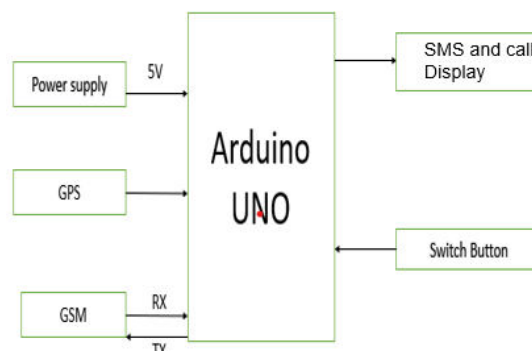


Fig [1] – Block diagram1



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The fig [1] is a block diagram of an Arduino UNO-based system. The Arduino UNO is at the center, connected to several peripheral components. A power supply provides 5V to the Arduino. A GPS module is linked directly to the Arduino. A GSM is connected to RX and TX pins for communication. Finally, a switch button is also connected to the Arduino. This setup appears to be a basic configuration for a project that might involve location tracking, wireless communication, user input, and information display.

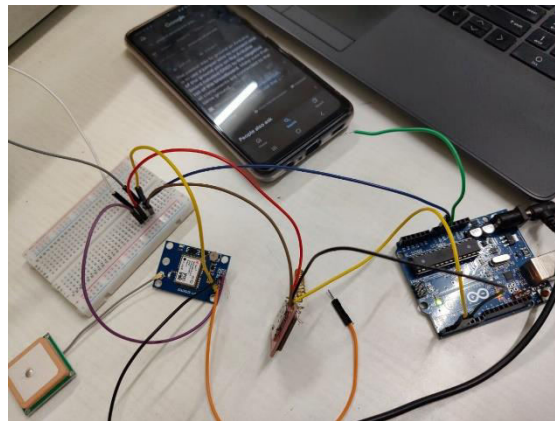


Fig [2] – Prototype

Fig [2] provides the implementation of the system outlined in fig [1]

V. RESULT AND ANALYSIS

The implementation of a device utilizing GPS and GSM technology has yielded promising results as shown in Fig[3], demonstrating its potential to enhance personal security for women in various environments. The device integrates multiple functionalities aimed at ensuring rapid response during emergencies, thereby addressing the critical need for effective safety measures.

User feedback collected during testing phases indicated that the device's interface is intuitive and easy to navigate. Participants reported that activating the device was straightforward, requiring minimal effort even in high-stress situations. The design incorporates button for emergency activation, ensuring accessibility for all users, including those who may not be technologically savvy. Additionally, the call indicator provides reassurance that alerts have been successfully dispatched.



Fig [3] – Final Project Model



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Future Scope

The safety features embedded within the device significantly contribute to its effectiveness. For instance, a built-in alarm system activates upon panic button engagement, producing loud sounds that can deter attackers and attract nearby assistance. Furthermore, some iterations of the device include a shock mechanism designed to incapacitate an assailant temporarily, providing the user with an opportunity to escape.

Despite its successes, several limitations were identified during testing phases. Issues such as battery life under continuous use and potential connectivity problems in remote areas were noted. To address these concerns, future iterations will focus on optimizing power consumption through energy-efficient components and enhancing GSM signal reception capabilities.

VI. CONCLUSION AND FUTURE WORK

In the nearly seven decades since India gained independence, women have undeniably made substantial progress, yet they continue to face numerous challenges and social injustices within the male-dominated society.

In an era where personal safety is paramount, the development of a women safety device utilizing GPS and GSM technology represents a significant advancement in protective measures. This innovative device, equipped with a panic button, empowers users by providing a swift and effective means of communication during emergencies. The integration of GPS and GSM modules into this device exemplifies the potential of technology to address real-world challenges. As we continue to prioritize women safety, this device plays a crucial role in reducing vulnerability and increasing confidence in public spaces. By equipping women with tools that enable them to take control of their safety, we contribute to a broader societal shift towards empowerment and protection.

In conclusion, this women safety device stands as a beacon of hope and innovation, offering peace of mind in an unpredictable world. Its implementation could pave the way for safer communities and inspire further advancements in personal safety.

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[11] A Framework for Segmentation and Classification of Arrhythmia Using Novel Bidirectional LSTM Network Archana Ratnaparkhil Pallavi Deshpandel and Gauri Ghule 1

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