Women Safety Device using Arduino, GPS, and GSM Modules

A.ASHRITHA PATEL[1]
Dept.of electronics and communication
Institute of aeronautical engineering
Hyderabad,India
[1] ashrithaaennam@gmail.com

P.DEEPANVI[2]
Dept.of electronics and communication
Institute of aeronautical engineering
Hyderabad,India
[2] ponnurideepanvi@gmail.com

V.BINDU SRI N S S[3]
Dept.of electronics and communication
Institute of aeronautical engineering
Hyderabad,India
[3]bindusrivasantharao@gmail.com

MR.D.VEERASWAMY[4]
Dept.of electronics and communication
Institute of aeronautical engineering
Hyderabad,India
[4] Veeraswamy44@gmail.com

***Abstract*— In today's world, women's safety is a major worry. We suggest a safety device that uses Arduino, GPS, and GSM modules to give real-time tracking in order to solve this problem. By transmitting the women's current location to pre-registered contacts, this device protects women. The system is a vital instrument for personal safety because it is portable, user-friendly, and incredibly dependable.**

***Keywords*— GPS, GSM, Arduino, Women's safety.**

I. INTRODUCTION

A. *Introduction to Women Safety Device using Arduino,GPS and GSM Modules*

By automating emergency response systems and offering real-time position tracking, the Women Safety Device improves personal security and overcomes the drawbacks of conventional safety techniques that frequently depend on manual intervention. This gadget gives ladies in need a dependable, quick fix by utilizing an Arduino microcontroller, GPS, and GSM modules. In order to guarantee timely assistance, the GPS module determines and sends the user's exact position coordinates to a pre-configured emergency contact via SMS when the user pushes the emergency button.

The GSM module is essential for facilitating communication even in places with spotty or nonexistent internet connectivity. It also keeps the device working in distant or emergency scenarios when Wi-Fi might not be available. This greatly speeds up reaction times by ensuring that the warning reaches the emergency contacts. Furthermore, the gadget is made to be simple to use and requires no activation, so anyone may use it, regardless of technical proficiency.

Peace of mind is offered by the system's real-time tracking feature, which allows the user's position to be communicated with emergency services or trusted contacts in an emergency. Additionally, even in faraway locations, constant monitoring and communication are guaranteed by the combination of GPS and GSM technologies, increasing the system's dependability and efficiency. The device's smooth hardware, software, and communication technology integration improves convenience overall and enables prompt, effective support. In the end, the Women Safety Device is an essential instrument for enhancing women's safety since it provides a dependable, automated means of requesting assistance in an emergency.

II. LITERATURE SURVEY

1. *"Arduino Based Women Safety Tracker Device":* [1] By combining GPS and GSM modules with an automated alarm system that sounds even in the event that the panic button cannot be touched, the suggested solution provides a unique means of ensuring the protection of women.

2. *"Women Safety Device with GPS Tracking and Alerts"*:[2] To improve women's safety, the suggested Internet of Things-based safety gadget combines real time alerting systems, an Arduino microcontroller, and GPS tracking in a novel way. The masses may use it due to its cost and mobility, and the combination of sound, vibration, and constant location updates guarantees quick emergency responses and enhanced awareness in life threatening situations.

3. *"Women Safety Device Using Arduino"*: [3] To protect women, the wearable safety gadget combines a GPS tracker, a loud buzzer, and a trigger button that is positioned strategically. It tracks your location in real time, notifies contacts of emergencies, and utilizes a buzzer to warn people around you and discourage potential assailants. Its mobility and ease of use are guaranteed by its small, light design.

4. *"Women Safety Device Using IOT":* [4] The unique feature of this wearable safety gadget is its integration of GPS, GSM, and a wireless sensor network, which enables position sharing and real-time notifications with emergency contacts and authorities. One of its special features is a panic switch that, in an emergency, activates a laser diode and alarm to improve visibility and deterrence. The method guarantees women's protection in proactive as well as reactive ways.

5. *"Women's Safety Device With GPS Tracking and Alerts Using Arduino":* [5] This device provides real-time location monitoring and immediate emergency notifications by combining GPS in addition to GSM technology with an Arduino board in a novel way. Its unique feature is the ability to activate the complete system with a single switch, which guarantees prompt action in emergency situations by sending location-based SMS notifications to family members and authorities.

6. *"Women Safety Device Using GPS Module":* [6] By combining GPS and GSM for real-time location sharing, a buzzer to notify those in the vicinity, and a self-defense mechanism to shock the assailant with a non-lethal electric shock, this device significantly improves women's safety. This multipurpose tool gives women the proactive and reactive tools they need to protect themselves and make it easier for them to flee unsafe circumstances.

7. *"IoT-based Women Security System using GPS and GSM":* [7] For real-time location sharing and alert alerts, this wearable safety gadget combines a wireless sensor network with GPS and GSM technologies in a novel way. Its most notable feature is a panic switch that ensures complete safety precautions for women by activating a buzzer and laser diode in addition to sending emergency signals for increased visibility and deterrence.

III. EXISTING WORKS

A. *Existing System*

Mobile Apps: To send alerts in an emergency, a number of mobile apps provide SOS capabilities. These are unreliable in some circumstances, though, because they require manual activation and internet connectivity.

Standalone GPS Trackers: GPS trackers that are standalone are limited in their utility during emergencies because they merely track a user's location and do not notify emergency contacts.

Wearable Panic Buttons: While some gadgets have panic buttons, they frequently don't have real-time location sharing or GPS integration.

Alarm Systems: When a woman feels endangered, several safety gadgets have alarm systems that can sound sirens or alarms to indicate distress. The purpose of these sirens is to alert people in the area or deter the assailant. Responders might not be aware of the precise location of the woman in need of assistance, though, because these systems frequently do not have built-in GPS tracking.

.

B. *Limitations of Existing Systems*

Significant drawbacks of the current women's safety systems include their manual activation, which can be difficult in stressful situations, and their inability to track the user's location in real time to continuously monitor their movements. Since many solutions rely on internet access, they are useless in places with inadequate network coverage. Alarms and other standalone devices are frequently limited to drawing attention without connecting with emergency services, which slows down reaction times. They are also less dependable and useful because to issues with battery life, large designs, and the lack of automated threat detection. These drawbacks highlight the necessity of an system that improves accessibility, guarantees ongoing monitoring, and sends out immediate notifications, hence enhancing women's safety and emergency response effectiveness.

C. *Proposed System*

The women's safety equipment improves safety in emergency situations by utilizing IoT and contemporary components to guarantee real-time tracking and immediate alarms. An Arduino Uno microcontroller at the heart of the system is linked to a GPS module for tracking location in real time and a GSM module for making calls or sending distress signals. In an emergency, users can covertly activate the system by pressing a push button that serves as a panic trigger. The device is powered by lithium-ion batteries, which provide long-lasting use and guarantee portability and dependability. The user receives instant visual feedback thanks to an inbuilt LED display that shows the device's status, including battery levels and connection status.

The GSM module makes sure that SOS messages with GPS locations are transmitted to pre-defined recipients in places without internet availability, guaranteeing that no important notifications are overlooked. The little system is very useful for daily use because it is made to be both discrete and energy-efficient. This gadget provides a dependable and efficient way to enhance women's safety and emergency response skills by fusing cutting-edge IoT technology, real-time tracking, and automated notifications.

IV. HARDWARE

A. *Arduino Uno*

The Arduino is the central controller of a women's safety device, processing position data from the GPS module and controlling inputs from sensors like a panic button. It may activate a buzzer for aural alerts and connects to the GSM module to send emergency contacts SMS notifications with real-time location. Additionally, the Arduino delivers feedback via LEDs or an LCD screen and interacts with IoT modules for real-time tracking. The device's efficiency is increased by synchronizing all of its parts, which guarantees prompt, dependable answers in an emergency.

Fig. 1. Arduino UNO

B. GPS Module

The GPS module is essential to a women's safety gadget since it provides real-time position information, such as latitude and longitude coordinates. Sending location-based warnings during emergencies requires precise tracking of the user's position, which is made possible by it. The Arduino processes this data and sends it to emergency contacts via the GSM module, frequently in the form of a clickable Google Maps link. The GPS increases the safety device's overall efficacy by guaranteeing that responders can locate the user accurately and promptly.

Fig. 2. GPS Module

C. Lithium-ion Batteries

For women's safety equipment, lithium-ion batteries offer a small and effective power source that guarantees portability and continuous performance. Their high energy density powers parts like the Arduino, GPS, GSM module, enabling the gadget to run for extended periods of time. They are lightweight and rechargeable, making the gadget easy to carry around and recharge using a dedicated charger or USB. Their dependability increases the device's overall efficacy by guaranteeing that it will continue to function in an emergency.

Fig. 3. Lithium-ion Batteries

D. GSM Module

The GSM module in a women's safety device makes it easier to communicate by sending SMS notifications. To ensure prompt aid, it sends distress messages that include the user's current location, as determined by the GPS module. Even at faraway locations, its dependable connectivity guarantees that alerts are promptly received by the targeted receivers.

Fig. 4. GSM Module Sim 900

E. LCD 16x2

The LCD display of a women's safety gadget gives the user real-time feedback regarding the device's operation and status. By displaying notifications such as "Device Ready," "Alert Sent," or "Low Battery," it makes sure the user is aware of how the system is operating. In the event of an emergency, the display can also display the user's current GPS locations or other vital information. The LCD helps guarantee correct device operation and boosts user trust by providing clear visual feedback.

Fig. 5. LCD 16X2

F. Push Button

The push button of a women's safety device is the main emergency trigger, enabling the user to quickly activate the system in an emergency. Pressing it instructs the Arduino to start processes like obtaining position information from the GPS module, sending notifications through the GSM module, and turning on a buzzer for auditory warnings. Because of its ease of use and accessibility, the user may get assistance fast and with little effort. The primary interaction between the user and the safety device is the push button.

Fig. 6. Push Button

V. METHODOLOGY

A. *Block Diagram*

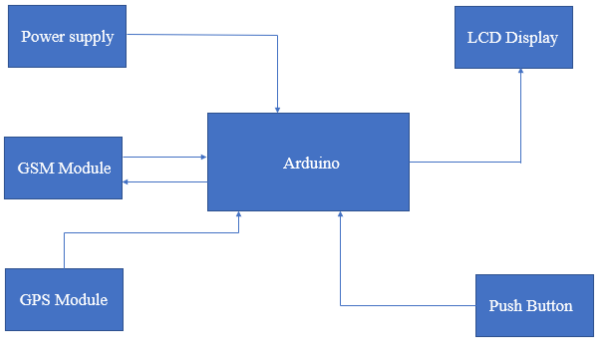

Fig. 7. Block Diagram

A women's safety gadget with a GPS module for tracking location and a GSM module for sending alerts to emergency contacts is depicted in the block diagram. The system is controlled by an Arduino microcontroller, which also has an LCD display for status updates and a push button for notifications. The device's portable power supply guarantees dependable operation in an emergency.

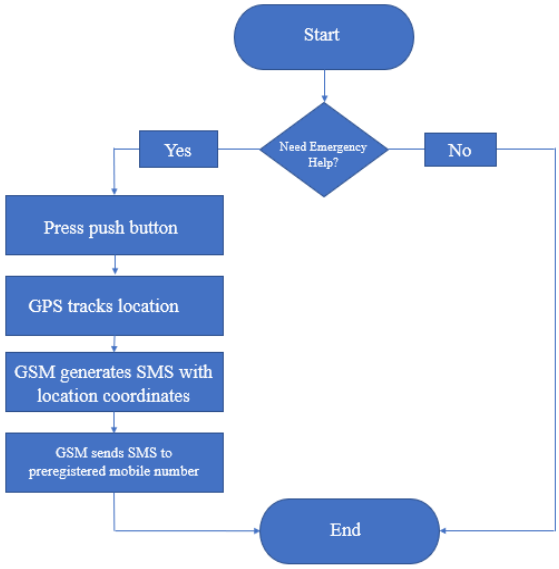

Fig. 8. Flow Chart

The flowchart describes how an Arduino, GPS, and GSM-enabled women's safety device works:

1) *Start:* Until an emergency occurs that calls for immediate assistance, the device stays inactive.
2) *Emergency Decision:* The user determines whether they require emergency assistance.
    a) If not, the process is terminated and the system stays inactive.
    b) The user activates the device if the answer is yes.
3) *Activate Device:* To start the safety procedure, the user hits the push button.
4) *Location tracking:* The user's current coordinates are retrieved by the GPS module.
5) *Alert Generation:* An SMS with the user's location is generated by the GSM module.
6) *Message Transmission:* To notify emergency contacts, the GSM module sends an SMS to a pre-registered mobile number.
7) *End:* The system waits for the subsequent activation after finishing the cycle.

B. *Implementation:*

To guarantee user safety, a number of components are included inside the women's safety gadget, such as an Arduino Uno, GPS and GSM modules, a push button, and an LCD display. As the master controller, the Arduino Uno is in charge of gathering location data from the GPS module, showing status information on the LCD, turning on the buzzer to sound an alert when something is close by, and communicating with the GSM module to transmit emergency messages. When the GPS module is turned on, it sends real-time location coordinates to pre-registered cell numbers. The Arduino processes these data and sends them as an SOS alert via the GSM module.

C. *Calibration Process:*

Making sure the GPS module is accurate for dependable location monitoring is the main goal of the women's safety device's calibration procedure. To ensure correct startup, the procedure starts with initializing the required libraries, including SoftwareSerial, and configuring the system, including the LCD display. The GPS module is then set up using functions like gps_convert() to transform the raw location data into readable latitude and longitude coordinates and get_gps() to receive the raw position data. The LCD shows the processed coordinates, which can be checked for accuracy by comparing them to known locations. If there are differences, the code parameters or module settings are changed. In order to confirm that the transmitted location data is accurate, the calibration is lastly

verified by pressing the push button to send out an SOS warning over the GSM module.

D. Main Code Implementation

With its Arduino, GPS, and GSM modules, the Women Safety Device offers a dependable emergency option. When enabled, it delivers real-time location warnings via SMS to an emergency contact and continuously tracks the user's GPS location. By pressing a straightforward button, the gadget sends a message to a pre-specified phone number with the user's latitude and longitude, initiating the emergency alert. While the GSM module connects to the mobile network to send an SMS, the GPS module keeps track of the user's location. The logic for continuously receiving GPS data, determining the button's state, and delivering warnings as needed is handled by the Arduino, which powers the device.

While the main loop reads and interprets GPS data in real-time, the device establishes connectivity with the GPS and GSM modules during the setup phase. The system sends an emergency message to the designated emergency contact after gathering the current coordinates if the button is hit. This approach is straightforward yet efficient; it gives women a simple means to ask for aid when they are in difficulty and makes sure that people who can help know where they are. This safety gadget can provide peace of mind and an extra degree of security, especially in places where quick assistance might not be easily accessible. The gadget can be worn as a portable safety gear and is lightweight and simple to operate

E. Testing and Deployment:

Following the Women Safety Device's coding and calibration, the system is put through a rigorous testing process that includes emergency scenario simulations to make sure all of its features—GPS tracking, GSM communication, and alert triggering—work as intended. Following deployment, users—like women or security personnel—get training on the device's proper operation. Regular maintenance, such as software upgrades, system examinations, and recalibration, preserves long-term dependability. To fix problems and enhance the device, user feedback is constantly gathered. Consistent safety support is ensured by continuous monitoring, which makes sure the system consistently recognizes distress signals, transmits precise position information, and sounds the emergency warning when necessary.

VI. RESULTS

A. System Functionality

For personal security, the Women Safety Device makes use of contemporary hardware elements such an Arduino, GPS, GSM modules, and a buzzer. When the user activates the gadget, it uses the Internet of Things to send emergency contacts an SMS with the device's current position. While the GSM module sends out signals in times of emergency, the GPS module gives precise coordinates. When the emergency button is pressed, the buzzer sounds an alarm to make sure the user's predicament is noticed. By automating emergency notifications, the system improves response times and minimizes the need for human interaction. It ensures prompt action by seamlessly integrating with local emergency services. Ultimately, IoT technology increases women's safety, security, and peace of mind in emergency situations by improving data accuracy and guaranteeing dependable notifications.

B. System outputs

The Women Safety Device effectively uses IoT to mimic automatic emergency warning creation and real-time location tracking. Key findings include:

1. *Automated Alerts via GSM Module:* The system notifies a pre-specified emergency contact's mobile number via SMS when the emergency button is hit. The user's real-time GPS coordinates are included in every message, allowing for instant location tracking and timely aid without requiring direct conversation. This improves reaction speed and safety by guaranteeing that assistance can be sent out promptly in emergency situations.

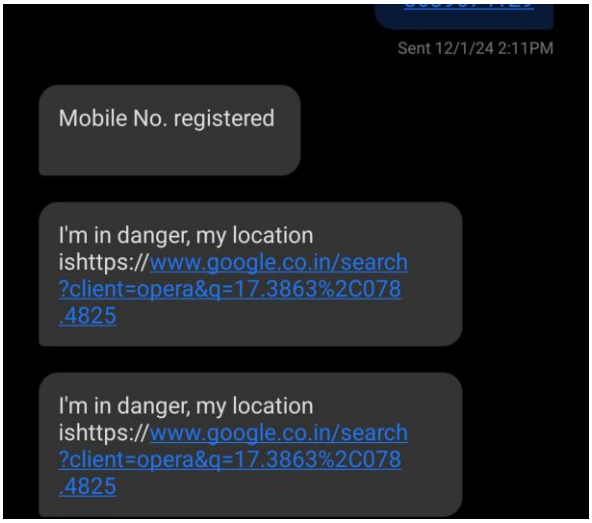

Fig. 9. Alert System for Women Safety Device

These findings imply that the suggested Women Safety Device provides a practical personal safety solution, improving security with automatic emergency warnings and real-time location tracking. The gadget guarantees prompt aid in emergency scenarios by sending out instant SMS notifications with exact GPS positions, speeding up reaction times and lowering dangers. By providing constant monitoring without requiring constant human engagement, this technology improves women's overall safety and gives them peace

of mind by guaranteeing that assistance is always available. The gadget is essential for improving personal security and facilitating quick response when necessary, which eventually leads to improved safety results.

.

VII. CONCLUSION & FUTURE WORK

A. *Conclusion*

In conclusion, a very dependable and efficient personal security solution is provided by the Women Safety Device, which makes use of Arduino, GPS, and GSM modules. It greatly improves safety by combining automatic emergency alarms with real-time location tracking to guarantee timely aid in dire circumstances. With just one button to initiate warnings, the device's user-friendliness speeds up reaction times and guarantees that assistance is always available. Its real-time data transfer and emergency network compatibility increase the overall efficacy of safety precautions. The technology is a promising addition to personal safety solutions since it not only gives women peace of mind but also gives them an automated instrument for protection.

B. *Future Scope*

The Future improvements to the Women Safety Device with Arduino, GPS, and GSM modules include voice communication for direct contact with emergency responders, sophisticated geofencing for proactive alarms, and interaction with mobile apps for real-time monitoring. Better battery efficiency with solar charging, wearable technology for covert use, and integration with nearby emergency services for quicker reaction times are possible additional enhancements. Pattern identification and early threat detection can be achieved by integrating AI and machine learning. These developments will improve the device's use, functionality, and dependability, increasing its efficacy in protecting women in a variety of scenarios.

.

REFERENCES

[1] Kumar, S., Singh, R., Pandey, M.: Design and development of a GPS-based women safety device using Arduino and GSM module. In: Proceedings of the International Conference on Emerging Trends in Electrical Engineering, 2019, New York, USA.

[2] Patel, D., Gupta, R., Sharma, S.: IoT-based women safety system using Arduino, GPS, and GSM modules. Int. J. Eng. Res. Technol. 9(4) (2020).

[3] Nair, A., Rani, M., Thakur, S.: Real-time tracking and alert system for women's safety using Arduino and GSM. In: 3rd International Conference on Embedded Systems and Internet of Things, Bangalore, India, pp. 50-55 (2018).

[4] Singh, J., Kumar, A., Gupta, S.: Design of an intelligent women safety device using Arduino, GPS, and GSM technology. J. Mech. Autom. Eng. 6(2), 102–107 (2019).

[5] Sharma, P., Soni, D., Prasad, A.: Development of a women safety system using GPS and GSM technologies. Int. J. Sci. Res. Dev. 7(1) (2020). ISSN 2319-7064.

[6] Verma, S., Sharma, V., Bansal, R.: Smart wearable women safety device using Arduino and GSM. Int. J. Innov. Technol. Eng. 5(3), 159–163 (2017).

[7] Gupta, A., Sharma, R., Sharma, M.: Smart women safety system using Arduino, GPS, and GSM. Int. J. Eng. Adv. Technol. 8(2), 109–113 (2019). ISSN 2249-8958.

[8] Singh, N., Sharma, S.: IoT-based women safety device for real-time tracking and emergency alerts. Int. J. Comput. Appl. 8(2), 223–227 (2019). ISSN 0975–8887.

[9] Choudhury, T., Ghosh, S.: GPS-based women safety system using Arduino and GSM module. Int. J. Emerg. Technol. Innov. Res. 7(5), 233–237 (2020).

[10] Reddy, S., Kumar, P., Subramanian, K.: Development of a real-time safety and alert system for women using Arduino, GPS, and GSM technology. J. Adv. Res. Technol. 4(6), 67–71 (2018).