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AUTOMATIC INJECTOR SYSTEM FOR WOMEN SAFETY

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Abstract: Ensuring women's safety is crucial in today's world. Our innovative device integrates advanced technologies, including an ESP32 microcontroller, NEO-6M GPS module, I2C LCD display, push buttons, relay-activated pepper spray, and a DC motor-controlled injector. The ESP32 microcontroller serves as the central processor, with push buttons for quick emergency activation. The NEO-6M GPS module provides real-time location tracking, while the I2C LCD display offers a user-friendly interface. In emergencies, the device can activate the pepper spray and injector mechanisms for self-defense. Integration with Google Firebase and the MIT App Inventor enables seamless communication with a mobile app, allowing users to receive alerts, share locations, and activate emergency features. This project addresses the persistent safety concerns women face, empowering them to move freely and confidently, even during odd hours.

Keywords : ESP32 microcontroller, NEO-6M GPS module, I2C LCD display, Google Firebase integration, Empowerment

I.INTRODUCTION:

Women's safety is a global concern, with women facing violence, harassment, and abuse in various settings. These threats impact their health and restrict their access to education, employment, and social participation. Addressing this requires collaboration from individuals, communities, and governments to promote gender equality and create safe environments. Innovative solutions, such as a new device leveraging the ESP32 microcontroller, GPS, and mobile apps, are essential. This device offers GPS tracking, emergency activation, and self-defense mechanisms like pepper spray and injection control. Integration with Google Firebase and MIT App Inventor enables real-time alerts and location sharing, empowering women to move confidently and safely. By utilizing technology, we aim to ensure women's safety and support their freedom.

II. LITERATURESURVEY

[1] "Kavach - Women Safety Device with GPS Tracking and SMS Alert" by Garima Tiwari, Adarsh Tiwari, Himanshu Verma, Kalyan Krishna Awasthi:

This Project presents a women safety detection system using GPS and GSM modems. The system can be interconnected with the alarm system and alert the neighbors. This detection and messaging system is composed of a GPS receiver, Microcontroller and a GSM Modem. GPS Receiver gets the location information from satellites in the form of latitude and longitude. The Microcontroller processes this information and this processed information is sent to the user using GSM modem A GSM modem is interfaced to the MCU.

[2] " Women Safety Device With GPS Tracking and Alerts using Arduino" by Anusha Kilar. M.Tulasiram:

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.

[3] "Human Tracing using Location based System" by G.S. Mate1, Sumit Gahire, Rameshwar Mane, Abhay Sharma, Ravikiran Waghmare :

This paper reviews different approaches for women and children safety through various devices and application proposed. Different algorithm is used to improve the accuracy of location. All the system uses the location based system to locate the object. The Google maps provide the best accuracy and location tracking. Development of such devices has reduce the crime in large Numbers but these devices is time consuming and requires internet. To overcome that we are developing a devices that does not requires internet at user end and takes lesser Time as user only need to tap the button.

[4] "Design and Implementation of a Rescue System for the Safety of Women" by using Arduino Controller by R Pavithra ,P Sangeetha ,S Vanila:

The main contribution of the paper is to develop a wearable armband for safety and protection of women and girls. This objective is achieved by the analysis of the physiological signal in conjunction with body position. The physiological signals that are analyzed are pulse rate sensor, vibration sensor and if there is any fault it additionally uses a fault detection sensor. Acquisition of raw data makes the Arduino controller function by activating the GPS to send alert messages via GSM and the wireless camera captures images and videos and sends images to the pre-decided contacts and also shares video calling to the family contact. The alarm is employed to alert the surroundings by its sound and meanwhile, she can also use a TAZER as a self-defense mechanism.

[5] "Internet of Things (IOT) based smart band to ensure the security for women" by K. Thamaraiselvi, S. Rinesh, L. Ramaparvathy, K. V :

The propose model will enhance the security and safety especially for girl children in India. In this connection smart band which comprises multiple sensors and programmable hardware. Smart band which communicates with smart phone through wireless communication. The application of a smart band has been developed and installed to smart phone with required quantities & smart band generates signal is send out to smart phone. Track the exact location with help of GPS and the automatic S MS service is done by GSM and screaming alarm which are already preprogrammed, whenever we receive emergency signal, smart phone which will automatically send "help me & save me, I am in danger situation" .

[6] "Safety Watch Based on the Internet of Things" by D. Vaithiyanathan ,Kaushal Verma ,Preeti Verma ,Baljit Kaur:

The authors aim to develop an independent smartwatch with safety features that do not depend on other devices or servers for its operation and can be used in the state of an urgent situation to call for assistance by delivering a short message service (S MS) alert message employing position tracking and physical condition statistics, voice calls and can also be used for self-defense.

[7] "IOT Based wearable women safety Device" by Nimish M. Kharat ,Baliram Deshmukh :

A wearable women safety system that reads and gathers patterns such as body temperature and pulse rate while running and when the input readings are greater than normal, the system will automatically call and send message accordingly to several people, as well as the venue, so that help can be sent to the person who is in troublesome situation.

III.PROPOSED METHODOLOGY

Requirement Analysis: Conduct a thorough analysis of the safety needs and preferences of women users. Identify key features and functionalities required in the safety device, considering factors such as portability, ease of use, and effectiveness in emergency situations.

Hardware Selection and Integration: Choose appropriate hardware components such as the ESP32 microcontroller, NEO-6M GPS module, push buttons, relay, DC motor, and LCD display. Design a circuit layout and integrate the hardware components to ensure seamless operation of the safety device.

Software Development:

- Microcontroller Programming
- GPS Tracking
- Firebase Integration
- Mobile Application Development

User Feedback and Iteration: Gather feedback from women users through user testing sessions and surveys. Use this feedback to identify areas for improvement and iterate on the design and functionality of the safety device and mobile application.

Deployment and Training: Deploy the safety device to a pilot group of users and provide training on its usage and features. Collect feedback from users during the deployment phase to further refine the device and ensure its effectiveness in real-world scenarios.

Evaluation and Documentation: Evaluate the performance of the safety device based on user feedback, effectiveness in emergency situations, and adherence to safety standards. Document the design, development process, and outcomes for future reference and dissemination.

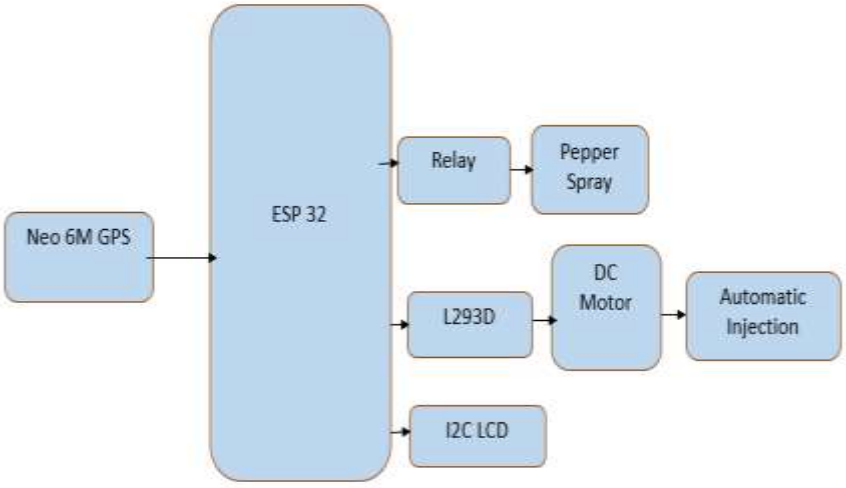


Fig 1 Kit Implementation diagram

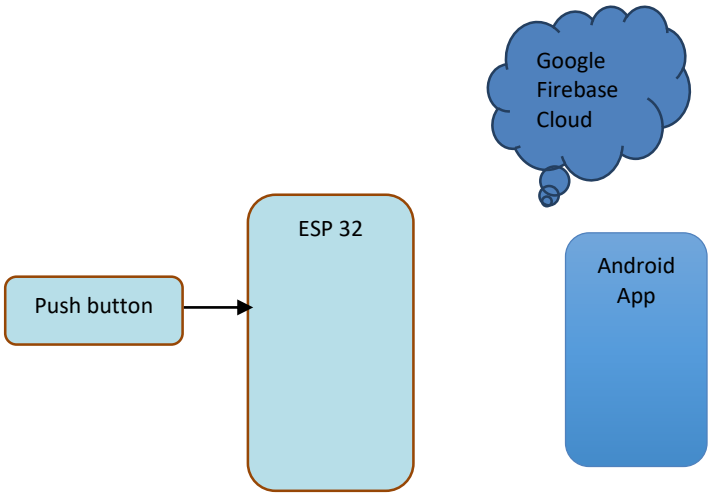


Fig 2 Wrist band implementation diagram

Overall working of the Device:

The Women Safety Device is a device that initiates upon startup, configuring hardware components and establishing connections with peripherals like the GPS module, LCD display, and push buttons. It operates in an idle state, continuously monitoring user input and periodically retrieving GPS location data. When a user presses an emergency button, the device transitions to emergency mode, triggering the pepper spray mechanism and injection control mechanism if necessary. The device also retrieves GPS coordinates and transmits them to a connected mobile application via Google Firebase for real-time tracking and monitoring. The mobile application receives the alert and displays it to the user, potentially triggering additional actions. The user can acknowledge the alert through the mobile application, signalling their safety or needing assistance. The device returns to the idle state once the emergency situation is resolved. The device continues to monitor user input and GPS data, ensuring readiness for future emergencies.

Women Safety Device Hardware and Software Requirements

Hardware Requirements:
• ESP32 Microcontroller: Central processing unit for real-time communication and data processing.
• Neo-6M GPS Module: Provides accurate location tracking capabilities.
• Push Buttons: Input devices for triggering emergency responses or activating device functionalities.
• Relay: Controls the activation of the pepper spray mechanism.
• DC Motor: Controls the injection control mechanism.
• I2C LCD Display: Displays relevant information to the user.
• Power Supply: Stable, reliable, and capable of supplying sufficient voltage and current.
• Enclosure: Secure housing of hardware components.
• Connectivity Components: Include wires, connectors, and headers.
• Optional Components: LEDs, sensors, and sound modules.

Software Requirements:
• ESP32 Firmware Development Environment: Platforms for writing, compiling, and uploading firmware code.
• GPS Data Processing Software: Software for processing GPS data.
• Mobile Application Development Tools: Tools for designing and developing a mobile application.
• Google Firebase Integration: Software tools for real-time communication, data storage, and synchronization.
• Code Editors and IDEs: Text editors or IDEs for writing and editing code.

IV.ADVANTAGE

1. Comprehensive safety features
2. Portability and Discreetness
3. Immediate Assistance
4. Real Time Communication
5. Customizable and User Friendly
6. Enhanced Safety Awareness
7. Scalability and Accessibility
8. Empowerment and Confidence

V.DISADVANTAGES

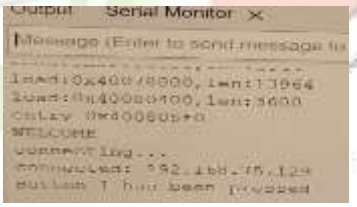
1. Monitoring was tedious.
2. Mischance in arriving rate
3. There is no hidden camera detector which is portable to ensure our privacy
4. Connectivity issue
5. Power Consumption and Battery Life

VI.APPLICATIONS

1.Personal Safety
2.Community Safety programs
3.Travel Safety
4.Domestic Violence Support
5.Emergency Services
6. Wireless Communication

VII. RESULT

The Women Safety Device project has yielded significant results, enhancing personal security and empowering users. The device integrates multiple safety features, including real-time GPS tracking and emergency activation mechanisms such as pepper spray and an injector, all accessible through a user-friendly interface. Integration with Google Firebase ensures seamless communication with a mobile application, enabling instant alerts and location sharing with emergency contacts and authorities. Users have reported feeling more empowered and confident, carrying the discreet and portable device without drawing attention.



The project has also raised awareness about personal safety, encouraging proactive measures among users. Despite challenges like continuous monitoring, connectivity issues, and power consumption, the project has demonstrated scalability for broader applications, including community safety programs and emergency services. Future improvements could address these challenges and enhance features like privacy and security with the addition of a hidden camera detector. Overall, the Women Safety Device project showcases the potential of technology to significantly improve safety outcomes, contributing to the empowerment and security of women in various settings.

VIII. CONCLUSION AND FUTURE WORK

The Women Safety Device project has successfully addressed critical issues related to women's safety by leveraging advanced technologies and innovative design. By integrating features like real-time GPS tracking, pepper spray activation, and seamless communication through Google Firebase, the device provides a comprehensive solution for enhancing personal security. Users have reported feeling more empowered and secure, knowing they have access to immediate assistance and can share their location in emergencies.

Throughout the project, significant achievements have been made in raising awareness about personal safety and encouraging proactive measures among users. Despite facing challenges such as continuous monitoring requirements, connectivity issues, and power consumption, the project has demonstrated scalability for broader applications, including community safety programs and emergency services.

Looking ahead, future iterations of the Women Safety Device project will focus on several key areas to enhance its functionality and impact. Firstly, efforts will be directed towards improving monitoring efficiency and power management to extend battery life and reduce operational costs. Enhancements in connectivity will address existing issues by exploring alternative communication methods and integrating offline functionalities to ensure reliability in all environments.Additionally, plans to integrate a hidden camera detector and improve data encryption protocols aim to further safeguard user privacy and security. User feedback will guide iterative design improvements to enhance the device's user interface and overall usability.

Collaborations with community organizations and governments will expand deployment opportunities, fostering broader adoption and increasing the device's impact in diverse settings. Educational campaigns will promote awareness and educate users on the device's capabilities and the importance of personal safety measures.

In conclusion, the Women Safety Device project has laid a solid foundation for leveraging technology to enhance women's safety. With ongoing development and strategic enhancements, the device will continue to empower women and contribute significantly to improving safety outcomes globally.

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