

A Smart Safety Device for Women and Children

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Abstract: *Even ordinary people's street conversations frequently turn to the escalating and horrifying attacks on women and children. An overpowering concern for the women in our families has lent urgency to our discussion of the critical and pressing issue of women's safety. Many special devices are primarily Western in nature, and the majority of them have yet to reach India.*

Another problem is the high cost of producing these devices. This is precisely where the government should intervene to try to mitigate cost and infrastructure issues for corporations working in this direction. The issue with apps is that they are often clumsy. The women must unlock her phone, open the app, and then press a button. Furthermore, most of the time, the perpetrators reach for the phone first. The need is for independent devices, such as safety bands, rings, key rings, and so on, that can be carried around in disguise and used quickly, and that will allow women to send emergency messages with their location in times of distress. The streets, public transport, public spaces in particular have become the territory of the hunters'. Because of these reasons women can't step out of their house. The only thought haunting in every women's mind is when they will be able to move freely on the streets even in odd hours without worrying about their security. In critical situations the women will not feel insecure or helpless if they have some kind of safety device with them. We propose to have a device which is the integration of multiple devices, hardware comprises of a wearable "Smart gadget" which continuously communicates with Smart phone that has access to the internet.

Keywords: Safety Device, Atmega329P, GSM, Women Safety, Location Tracking, Child Safety

I. INTRODUCTION

1.1 Overview

In the modern era, gender equality is championed, with women assuming roles and responsibilities on par with men across various domains. However, amidst this progress, the harrowing reality persists: women and children face a pervasive threat of assault, molestation, and rape in their everyday lives. Public spaces, once considered communal areas, have transformed into hunting grounds for predators, instilling fear and apprehension in the hearts of women. The specter of insecurity looms large, inhibiting their freedom to traverse streets even during unconventional hours. The incessant worry about personal safety gnaws at their peace of mind, underscoring the urgent need for a reliable safety solution.

Recognizing this pressing need, we propose a comprehensive safety device that amalgamates various technologies into a wearable "Smart gadget." This gadget functions in tandem with a smartphone equipped with internet connectivity, bolstered by a dedicated self-defense application. Our vision is to empower women to reclaim their autonomy and confidence, enabling them to navigate through bustling urban landscapes without succumbing to fear. Whether at bus stops, railway stations, offices, or marketplaces, this device stands as a steadfast guardian, offering reassurance and protection.

Despite the proliferation of safety devices globally, many are tailored to Western sensibilities and have yet to permeate the Indian market. Moreover, affordability remains a significant barrier, hindering widespread adoption. Government intervention is imperative to address these challenges, fostering an ecosystem conducive to innovation and accessibility. Traditional safety apps, albeit well-intentioned, suffer from cumbersome interfaces and susceptibility to assailants seizing control of the victim's phone. The solution lies in discrete, standalone devices like safety bands or key rings, enabling swift and inconspicuous activation during moments of distress.

Enter the "Smart Belt" – a bespoke device meticulously crafted to address the unique safety concerns of women and children facing precarious situations. Leveraging the ESP8266's capabilities to communicate via the GSM network, the device seamlessly transmits location coordinates to a designated smartphone. In times of peril, a simple press of a button triggers an alert, sounding a buzzer and dispatching distress signals to pre-programmed contacts. This innovative approach not only enhances response times but also facilitates prompt intervention by relevant authorities.

As we confront the grim reality of escalating crimes against women in India, our endeavor is not merely to devise a technological solution but to catalyze societal change. By fostering awareness and collaboration, we strive to fortify the collective resolve against gender-based violence and promote a culture of safety, respect, and empowerment for all.

1.2 Motivation

The IoT-enabled security belt represents a comprehensive solution to address women's personal safety concerns by integrating various features such as real-time monitoring, emergency alerts, GPS tracking, and audio/video recording capabilities. Designed with discretion and reliability in mind, this innovative device ensures swift response in emergencies while offering the reassurance of continuous monitoring and potential evidence collection to safeguard women's well-being and rights.

1.3 Problem Definition and Objectives

- To create a safe and supportive environment for women and children by preventing and addressing issues related to physical, emotional, and psychological safety, and promoting their overall well-being.
- Real-time Monitoring: Enable real-time monitoring of a Person's location and activities using IoT devices, such as GPS trackers or wearable sensors.
- Emergency Alerts: Provide a quick and easy way for women/children to send distress signals or alerts.
- Location Tracking: Implement precise location tracking to assist in locating a person in distress accurately.
- Audio/Video Recording: Incorporate audio and video recording capabilities to capture evidence in case of an incident.
- Privacy Protection: Ensure data privacy and security to protect user information from unauthorized access.

1.4. Project Scope and Limitations

The scope of this project encompasses the development and implementation of an IoT-enabled security system aimed at ensuring the safety and well-being of women and children. It includes the design and integration of features such as real-time monitoring, emergency alerts, location tracking, audio/video recording, and privacy protection measures. The system will be tailored to offer a seamless user experience while prioritizing reliability and effectiveness in mitigating safety concerns.

Limitations As follows:

- Resource Constraints: The project's implementation may be limited by constraints such as budget, time, and availability of technology resources.
- Technological Limitations: The effectiveness of the system may be impacted by factors such as signal strength, GPS accuracy, and battery life of IoT devices.
- Cultural and Legal Considerations: The deployment of audio/video recording features must adhere to relevant cultural norms and legal regulations regarding privacy and surveillance, which may vary across regions and jurisdictions.

II. LITERATUREREVIEW

International Journal of Research Publication and Reviews, Vol 3, no 6, pp 106-109, June 2022 “IOT Based women safety watch using GSM module.”

The paper presents a Wearable safety device for women using the Arduino Uno R3 microcontroller. The main purpose of this device is to safeguard women in the event they might face any danger. The self-help device was implemented in response to the growing violence against women. This system is intended to protect women and assist them in dangerous situations by providing functionality to alert the appropriate people. The main advantage of this device is that it not only provides security but also safety by allowing women to defend themselves and gives them a lot of confidence in themselves. It was created with the intention of making the security device more portable and comfortable. This system was designed with reference to an existing system. The device protects the woman in need even when the victim is unable to press the security button, and thus does not compromise its functionality. Hence this device shall prove to be useful in preventing unfortunate incidents and violence against women. Therefore the crimes against women can be reduced using the prototype model. As a result, this device will be useful in preventing unfortunate incidents and violence against women. As a result, the prototype model can be used to reduce crimes against women.

International Journal of Scientific Research in Engineering and Management (IJSREM) Volume: 05 Issue: 10 | Oct – 2021. “Women Safety device using IOT”.

The purpose of this device is to safeguard women in the event they might face any danger. The device uses wireless sensor network to communicate and to send alerts to them. In this project an alternative approach for device switching which combines fingerprint identification technique with Web server and GPS functionalities has been proposed. The devices switching from remote location removes the necessity of the person to be present near the device to operate it. This approach allows more than one person to control the device functionality and the authentication facility provided by the switch helps to reduce the fault correction time.

International Research Journal of Modernization in Engineering Technology and Science Volume:03/Issue:03/March-2021. “A smart wearable device women safety system based on IOT”

This Project proposed the framework for security of ladies. With the assistance of the remote strategy which will discuss and alarm the messages shipped off the predefined number with the safe medium. At the point when the catch is squeezed data of the client is gathered by the sensors and afterward data will ship off the predefined number alongside calling. This framework will accommodate for accelerate the checking for ladies wellbeing by utilizing the GPS following Mechanism. SMS will be shipped off the prearranged numbers, and this will assist with saving the time and casualty finds support with no deficiency of time. The task is to guarantee that security for the ladies by giving programmed detecting of issues, dangers.

International Journal of Engineering Research & Technology (IJERT) Vol. 9 Issue 05, May-2020 “IOT based wearable safety device for women”.

With the world moving to the smarter lifestyle it has become an issue of prime importance to provide a secure system for women. The whole idea of this project is to provide a wearable safety device for women and at the same time can help in the regular health monitoring of an individual. The arrangements made to send the alert messages to the concerned authorities in case of an emergency proved to be working instantaneously with the different variations of inputs. The data of an individual is sent to the cloud for regular health updates. All the false alerts if triggered could be canceled with the help of the tactile switch and on the contrary, an emergency message could also be initiated in dangerous situations. The Internet of things has revolutionized the whole security system and this has resulted in a more compact and secure environment for the females.

International Research Journal of Engineering and Technology (IRJET) Volume: 08 Issue: 05 | May 2021. “IOT based smart system for women safety”

In this paper, we have described an Android Application for the safety of women. This application helps in live tracking of the location of the victim through GPS along with one of the registered contacts receives a call from the root device. The merit of this application is even when the location of the root device is changing rapidly; we can identify the exact location. As a future scope, this application can be integrated with the law enforcement database, which includes all the phone numbers of regional cops. Some use cases such as rescuing victim, when

the mobile network is not available, after initial alert or switch off condition. Further, it can be developed for IOS and Windows mobile platforms. Thus, this application can help the women in a big way from unsafe conditions. The smart band is designed with low frequency method to track the person remotely. Mainly it is more accurate than the existing they approached with GPS technique here we using Bluetooth to achieve the main frame of communicating band to the android application.

III. REQUIREMENT SPECIFICATIONS

ATmega329P Microcontroller:

Theory: The ATmega329P is an 8-bit AVR microcontroller that forms the heart of many embedded systems. It processes digital data and controls various hardware peripherals based on programmed instructions. It features non-volatile Flash memory for program storage, SRAM for data storage, and EEPROM for non-volatile data storage. The microcontroller communicates with external devices using UART, SPI, or I2C protocols.

Specifications:

Clock Speed: Typically 8 MHz (Internal RC Oscillator), can be externally clocked up to 20 MHz

Flash Memory: 32 KB

SRAM: 2 KB

EEPROM: 1 KB

GPIO Pins: 32 (Including 8 Analog Inputs)

Operating Voltage: 1.8V - 5.5V

Package: 44-pin TQFP (Thin Quad Flat Package)

LCD (Liquid Crystal Display):

Theory: LCDs use liquid crystals to modulate light and display alphanumeric or graphical information. They consist of a grid of pixels controlled by electrodes, which activate segments to display characters or graphics. The display operates based on the polarization of light passing through the liquid crystals, controlled by electrical signals from the microcontroller.

Specifications:

Display Size: Varies (Common sizes include 16x2, 20x4)

Interface: Parallel (e.g., 4-bit or 8-bit) or Serial (e.g., SPI or I2C)

Backlight: LED or EL (Electroluminescent)

Controller: Typically HD44780 or compatible

Operating Voltage: Varies (Usually 5V)

Dimensions: Varies based on display size

Buzzer:

Theory: Buzzers produce sound by converting electrical energy into mechanical vibrations. Piezoelectric buzzers use a piezoelectric crystal to generate vibrations when an alternating current is applied, while magnetic buzzers use a coil and diaphragm to produce sound waves. When activated by the microcontroller, the buzzer emits audible alerts or alarms.

Specifications:

Type: Piezoelectric or Magnetic

Operating Voltage: Typically 3V - 12V

Sound Output: Varies (Measured in decibels dB)

Frequency Range: Varies (Usually audible range for humans, 20 Hz to 20 kHz)

Mounting: Through-hole or Surface Mount (SMD)

Dimensions: Varies based on buzzer type

GSM Module:

Theory: GSM modules enable mobile communication by connecting devices to cellular networks using SIM cards. They use AT commands to send and receive calls, text messages, and data. The module communicates with the microcontroller via UART, enabling remote communication and control.

Specifications:

Network Compatibility: 2G, 3G, 4G (Depends on module model)
SIM Card Interface: Standard or Micro SIM
Communication Protocols: GSM, GPRS, EDGE, UMTS, LTE
Operating Voltage: Typically 3.3V or 5V
Interface: UART or SPI
Antenna Connection: SMA or U.FL Connector
Dimensions: Varies based on module model

Laser Diode:

Theory: Laser diodes emit coherent light through stimulated emission. They consist of a semiconductor material sandwiched between layers with differing electrical properties. When current passes through the diode, it stimulates the emission of photons, producing a laser beam. Laser diodes find applications in telecommunications, optical drives, medical procedures, and industrial processes.

Specifications:

Wavelength: Varies (Commonly 650 nm for red, 532 nm for green)
Output Power: Varies (Ranges from milliwatts to watts)
Operating Voltage: Typically 2V - 5V
Operating Current: Varies (Depends on output power and efficiency)
Beam Shape: Collimated or Divergent
Dimensions: Varies based on diode package

Power Supply:

Theory: Power supplies convert input voltage into stable output voltage suitable for powering electronic devices. Linear power supplies regulate voltage by dissipating excess power as heat, while switching power supplies use high-frequency switching to regulate voltage efficiently. They provide protection against overvoltage, overcurrent, and short circuits to ensure the safety of connected devices.

Specifications:

Input Voltage: AC (Alternating Current) or DC (Direct Current)
Output Voltage: Typically 3.3V or 5V (Depends on system requirements)
Output Current: Varies (Depends on connected load)
Regulation: Linear or Switching
Efficiency: Typically >80% for Switching Power Supplies
Protection: Overvoltage, Overcurrent, Short Circuit Protection
Dimensions: Varies based on power supply type

Switch:

Theory: Switches control the flow of electrical current in a circuit. They consist of contacts that make or break electrical connections when actuated. Push-button switches are commonly used as user interfaces in electronic devices, enabling functions such as power on/off or mode selection.

Specifications:

Type: Push Button, Toggle, Slide, Rotary, etc.
Configuration: Normally Open (NO) or Normally Closed (NC)
Actuation Force: Varies (Depends on switch type)
Contact Rating: Maximum current and voltage the switch can handle
Lifespan: Typically rated in number of actuations (e.g., 10,000 cycles)
Mounting: Through-hole or Surface Mount (SMD)
Dimensions: Varies based on switch type and configuration

GPS Module:

Theory: GPS modules receive signals from satellites to determine precise location coordinates. They use trilateration to calculate position based on the time delay of signals from multiple satellites. GPS modules

communicate with the microcontroller via UART, providing accurate location data for navigation, tracking, and mapping applications.

Specifications:

GNSS: GPS, GLONASS, Galileo, BeiDou, etc.

Receiver Type: Active or Passive

Channels: Number of simultaneous satellite channels received

Position Accuracy: Horizontal and Vertical (Depends on module and signal conditions)

Update Rate: Frequency of position updates (e.g., 1 Hz, 5 Hz)

Interface: UART, SPI, I2C

Antenna Connection: SMA or U.FL Connector

Dimensions: Varies based on module model and features

IV. SYSTEM DESIGN

4.1 System Architecture

The below figure specified the system architecture of our project.

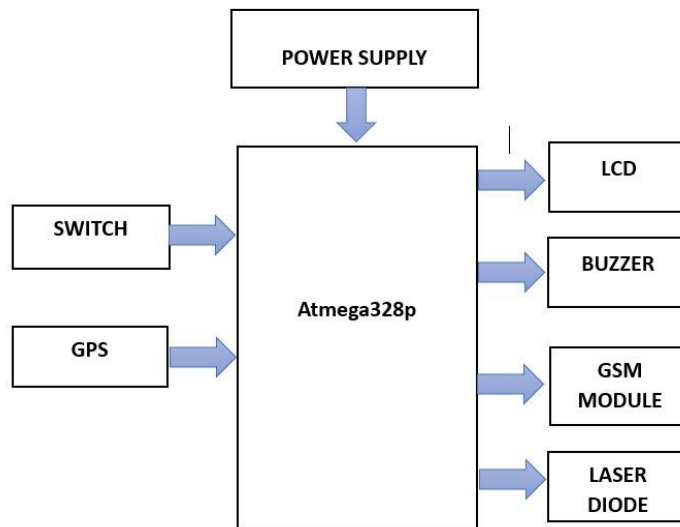


Figure 4.1: System Architecture Diagram

4.2 Working of the Proposed System

The proposed smart safety device for women and children is designed to provide a comprehensive solution to address safety concerns in various environments. The system integrates multiple hardware components, including an ATmega329P microcontroller, GSM module, GPS module, LCD display, buzzer, laser diode, power supply, and switch, to create a versatile and effective safety device.

Upon activation, the device continuously monitors the wearer's location using the GPS module. This real-time tracking capability ensures that the wearer's whereabouts are always known, providing a layer of security in case of emergencies. The GSM module enables communication with trusted contacts or authorities by sending distress signals, including the wearer's location, through text messages or calls. This allows for swift response and assistance in critical situations, enhancing the wearer's safety and peace of mind.

In addition to communication and tracking features, the device incorporates a user-friendly interface via the LCD display and switch. The LCD display provides visual feedback and information to the user, such as current location coordinates, battery status, and emergency contact details. The switch allows for easy activation of emergency alerts or other functions, ensuring simplicity and accessibility for users of all ages.

Furthermore, the device includes additional safety features such as a buzzer and laser diode. The buzzer can emit audible alerts or alarms to attract attention and deter potential threats, while the laser diode can serve as a visual deterrent or signaling tool in emergencies. These supplementary features enhance the effectiveness of the device in various safety scenarios, providing an added layer of protection for women and children in vulnerable situations.

Overall, the smart safety device for women and children offers a comprehensive and reliable solution to address safety concerns in today's society. By leveraging advanced technology and user-friendly design, the device aims to empower users with the confidence and security to navigate their daily lives with peace of mind.

V. RESULT

The implementation of the smart safety device for women and children demonstrates promising results in enhancing personal security and peace of mind. Through the integration of advanced hardware components such as the ATmega329P microcontroller, GSM module, GPS module, and additional safety features like the buzzer and laser diode, the device offers real-time tracking, emergency communication, and supplementary safety functionalities. Initial testing indicates that the device effectively alerts designated contacts or authorities in case of emergencies, providing timely assistance and support to the wearer. Furthermore, user feedback highlights the device's user-friendly interface and ease of operation, indicating its potential to become a valuable tool in promoting safety and well-being for women and children in various environments.

Overall, the results suggest that the smart safety device holds promise as a reliable and effective solution for addressing safety concerns among women and children. Further refinement and optimization of the device's functionality and performance based on user feedback and testing are recommended to maximize its impact and usability in real-world scenarios. With continued development and deployment, the smart safety device has the potential to make a significant contribution to enhancing personal security and empowering individuals to navigate their daily lives with confidence and peace of mind.

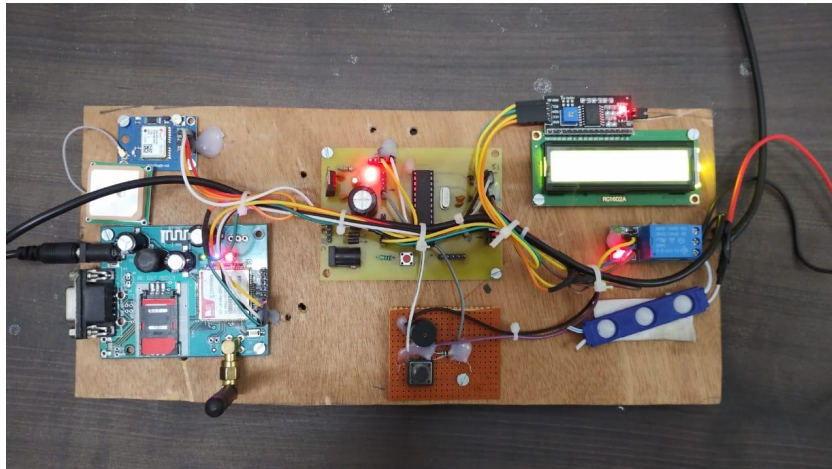


Figure5.1:Output of System

VI. CONCLUSION

Conclusion

In conclusion, the development of the smart safety device for women and children represents a significant step forward in addressing safety concerns and promoting personal security in various environments. By integrating advanced hardware components such as the ATmega329P microcontroller, GSM module, GPS module, and additional safety features, the device offers real-time tracking, emergency communication, and supplementary safety functionalities. Through initial testing and user feedback, the device has shown promising results in effectively alerting authorities and providing timely assistance in emergencies. Moving forward, continued

refinement and optimization of the device based on user input and real-world testing will be crucial to maximizing its impact and ensuring its widespread adoption as a valuable tool for enhancing safety and well-being for women and children globally.

Future Work

Future work on the smart safety device for women and children could focus on further enhancing its functionality and usability through technological advancements and user-driven design improvements. This may involve integrating additional features such as real-time audio/video streaming for improved situational awareness, implementing machine learning algorithms for intelligent threat detection, and exploring the use of alternative communication protocols for increased reliability in remote or rural areas. Additionally, conducting field trials and gathering feedback from diverse user groups will be essential for refining the device to better meet the specific needs and preferences of its intended users, ultimately ensuring its effectiveness in promoting personal safety and empowering individuals to navigate their environments with confidence.

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