



WOMEN SAFETY SYSTEM USING LPC2148

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Abstract: Women's safety is a critical concern in today's world. This project presents a Women Safety System using the LPC2148 microcontroller, GSM module, GPS module, and an emergency switch. The system is designed to provide a rapid response mechanism in case of danger by sending an SMS alert with real-time location details to predefined emergency contacts. In this project GSM, GPS, LCD, EEPROM, LED and Switch is interfaced to LPC2148. When a woman feels threatened, she can press the emergency switch. This triggers the LPC2148 microcontroller, which then fetches GPS coordinates from the GPS receiver and sends an SMS containing the location details via the GSM module. And also activates a buzzer to alert people nearby. Here EEPROM is used for saving the updated mobile numbers. If user want to change the mobile numbers, through SMS user can change. For that user has to follow one predefined syntax of message content. If any new message is received and having proper syntax then only new mobile number is updated otherwise simply application program will skip that. Applications of this project is Women's safety in public spaces, Emergency alert system for vulnerable individuals and personal security for travelers and night workers.

Index terms: emergency, Global Positioning System, Liquid Crystal Display, Global system for Message, Women Safety

Introduction: In contemporary society, concerns regarding women's safety have escalated significantly. Despite various legislative and social initiatives, incidents of harassment, assault, and violence against women remain alarmingly prevalent across urban and rural landscapes. This persistent threat not only jeopardizes physical well-being but also instills a pervasive sense of fear and insecurity, hindering women's mobility, independence, and overall participation in public life. The existing mechanisms for ensuring immediate assistance during distress often suffer from delays, lack of effective communication, and insufficient tracking capabilities, underscoring the urgent need for more proactive and efficient safety solutions. This project addresses this critical societal challenge by proposing the

development of a Women Safety System utilizing the LPC2148 micro-controller. The core objective of this system is to provide women with a reliable, discreet, and rapid means of seeking help during emergency situations. By integrating cutting-edge embedded technology, our system aims to empower individuals with a personal safety device that can instantly alert predefined contacts and relevant authorities about their distress and location. The LPC2148, a high-performance ARM7TDMI-S™ based microcontroller, has been chosen as the central processing unit due to its compact size, low power consumption, robust peripheral set (including multiple UARTs, I2C, SPI, and GPIOs), and sufficient processing power for real-time applications. These features make it an ideal choice for a portable and efficient safety device. The system will leverage

technologies such as GPS for accurate location tracking, GSM for sending emergency alerts (SMS and calls), and a discreet panic button for user activation. Ultimately, this project seeks to contribute to a safer environment for women by providing a technological deterrent and a lifeline during emergencies. The implementation of this system is envisioned to reduce response times, enhance the chances of timely intervention, and ultimately foster a greater sense of security and confidence among women in their daily lives.

LITERATURE REVIEW: The concept of a “Women’s Safety System” has evolved far beyond the traditional panic button approach. Today, it represents an interconnected ecosystem of technological innovations, government policies, and community-driven initiatives, all aimed at enhancing personal security and promoting rapid emergency response. These systems integrate hardware, software, data analytics, and social awareness to provide a multi-dimensional defense framework for women’s safety. In India, where the need for proactive safety measures is particularly critical due to increasing urbanization and complex social challenges, numerous public and private sector initiatives have emerged. These solutions collectively aim to reduce response time, improve coordination among agencies, and empower women with tools for prevention, protection, and justice.

Mobile Applications: Mobile-based safety applications have become the most accessible and widely adopted tools due to the ubiquity of smartphones. Leveraging built-in features such as GPS, GSM, and internet connectivity, these apps provide real-time support, location tracking, and evidence capture functionalities that are crucial during emergencies.

SOS / Panic Button Apps:

Applications such as 112 India, Himmat Plus, My Safetipin, and bSafe serve as digital lifelines during crises. When a user activates the panic feature—through a single tap, shaking the phone, or pressing a designated hardware key—the app

automatically transmits an SOS alert containing the user’s real-time GPS location to pre-registered emergency contacts and, in some cases, directly to law enforcement authorities. These alerts often include additional information such as the user’s battery level, device status, and movement trajectory to assist responders.

Location Tracking and Safety Circles:

Apps like Life360 and My Safetipin emphasize community safety by allowing women to share their live location with trusted individuals. This feature fosters accountability and provides family members or friends with reassurance regarding a user’s safety. In cases of prolonged inactivity or deviation from a planned route, the app can automatically trigger a location-sharing alert.

Crowdsourced Data and Safe Route Mapping:

Platforms such as My Safetipin employ crowdsourced data to assess the safety level of various public areas. Using parameters like street lighting, crowd density, CCTV presence, and public transport availability, the app generates a Safety Score for different routes. This empowers users to make informed decisions and select safer travel paths, especially during nighttime commutes.

Discreet Safety Features:

Many modern safety apps integrate subtle mechanisms such as fake call triggers or background audio/video recording to discreetly manage dangerous situations. These tools allow users to appear calm in the presence of an aggressor while still transmitting evidence and distress signals in real-time—crucial for situations where overt actions may escalate danger.

2. Wearable Technology

Wearable devices represent the next step in personal safety innovation, providing hands-free, discreet, and instantaneous activation of emergency features. Unlike mobile apps, wearables ensure accessibility even when a user’s phone is out of reach or disabled.

Smart Jewellery and Accessories:

Startups such as Kwema and Nimb have developed smart rings, pendants, and bracelets that integrate seamlessly with users’ everyday fashion

while concealing emergency triggers. With a simple button press, these accessories can send SOS alerts via a connected smartphone, sharing GPS coordinates and activating live tracking features. This fusion of style and security promotes consistent adoption without compromising aesthetics.

Smart Bands and Fitness Trackers:

Certain smart bands are equipped with biosensors capable of continuously monitoring vital signs like pulse rate, temperature, and movement. By applying AI-based anomaly detection, these devices can identify irregular physiological patterns—such as rapid heart rate spikes or sudden jerks—indicating distress. Once detected, the device can autonomously activate alerts and record data for further analysis.

Keychain and Personal Alarms:

While simpler in design, keychain alarms and handheld sirens serve as reliable deterrents in emergencies. They emit high-decibel sounds that can startle attackers and attract public attention, offering an immediate, low-cost layer of protection.

SYSTEM OVERVIEW: The proposed method for a Women Safety System using the LPC2148 microcontroller aims to improve personal safety by integrating multiple technologies to detect danger and send emergency alerts. This method is an enhancement over existing models that may rely on manual alerts or single modules.

The system is built using the LPC2148 ARM7 microcontroller as the central controller

It integrates the following components:

- GSM Module
- Emergency Switch
- LCD Display
- EEPROM
- LED Indicator
- Buzzer

Working Principle:

The working principle of a women's safety system, whether it's a dedicated hardware device or a

mobile application, is fundamentally based on a three-step process: Sensing, Processing, and Alerting. The core idea is to provide a quick and effective way for a woman in distress to signal for help and for that help to be able to find her.

1. Working Principle of Hardware-Based Devices (e.g., a GPS/GSM-based system)

This is the principle behind many self-contained safety devices like smart bands, pendants, or keychain devices. **Sensing (The Trigger):** The system is activated by an input from the user. This is most commonly a dedicated panic button that the user can discreetly press in an emergency. Other systems may use a "pull-pin" mechanism or even an automated trigger, such as a "man down" sensor that detects an unusual lack of motion or a sudden fall. **Processing (The Microcontroller's Role):** Once the trigger is activated, the device's central processing unit (often a microcontroller like LPC2148, Arduino, or an AVR) takes over. It immediately commands the GPS module to get the most accurate and up-to-date latitude and longitude coordinates. It retrieves the pre-stored emergency contact numbers from its memory. It prepares a distress message, which typically includes a text like "HELP! I am in danger," along with the Google Maps link derived from the GPS coordinates.

Alerting (Communication): The microcontroller then uses the GSM module to transmit the alert.

It sends the prepared distress SMS message to all the emergency contacts.

Some systems may also be programmed to make an automated phone call to a primary contact or to an emergency helpline (e.g., 112 in India).

The device might also activate a loud buzzer or siren to attract immediate attention from people nearby and potentially deter an attacker.

2. Working Principle of Mobile Applications

Women's safety apps use the pre-existing hardware

on a smartphone to perform the same three-step process.

Sensing (The Trigger): The panic button is a virtual one within the app, but it's often designed to be activated discreetly. This can be done by:

- Tapping a panic button on the screen.
- Pressing the power button or volume key multiple times in quick succession.
- Shaking the phone vigorously.
- In some advanced apps, using a voice command or a simple phrase.
- **Processing (The Smartphone's Capabilities):** Once the app's panic feature is triggered, it uses the smartphone's built-in technology.
- It accesses the GPS receiver to get the user's precise location.
- It can also use the phone's camera and microphone to discreetly record audio and video of the situation, which can later be used as evidence.
- The app's software then bundles the location data, and any recorded media, into an alert package.

Alerting (Communication): The app uses the smartphone's internet connection (cellular data or Wi-Fi) to send the alert.

It sends SMS messages and/or in-app push notifications to the pre-selected emergency contacts. These alerts contain the user's location and a link to a live map where they can be tracked. Some apps can also automatically make a phone call to a designated contact or a dedicated emergency number. Many apps also have a "social safety" feature, where the user can share their live location with a group of friends or family for a specified duration, allowing them to be monitored during a trip or at a late hour.

Key Features of the Proposed System

- Real-Time Location Tracking
- Integrates a GPS module to fetch the user's exact location.
- Captures latitude and longitude coordinates in

real time.

- Location data is sent during emergencies to ensure quick and accurate tracking.
- Emergency SMS Alert
- Uses a GSM module to send SMS alerts.
- Sends a predefined alert message along with real-time location to emergency contacts (family, police, etc.).
- Multiple contacts can be stored and notified.
- Fast Response Mechanism
- A single emergency button allows the user to trigger an alert within seconds.
- Immediate action is taken without needing to unlock or use a smartphone.
- Helps minimize reaction time in critical situations.
- EEPROM-Based Storage (Optional)
- Stores emergency numbers and event logs.
- Useful for forensic purposes or system recovery.
- LCD Display Interface
- Shows system messages like "Alert Sent", "GPS Searching", etc.
- Enhances user interaction and confirmation.

Hardware Description

Introduction to LPC2148 Microcontroller

The LPC2148 is a widely used and well-regarded microcontroller, particularly popular in embedded systems development. It's a product of NXP Semiconductors (originally Philips) and belongs to the ARM7 family of microcontrollers.

Core and Architecture:

ARM7TDMI-S CPU: At its heart, the LPC2148 features a 16/32-bit ARM7TDMI-S processor core. "ARM" stands for Advanced RISC Machine, signifying its Reduced Instruction Set Computer architecture, known for efficiency and low power consumption. The "TDMI-S" denotes its features:

T (Thumb): Supports a 16-bit instruction set (Thumb

mode) in addition to the standard 32-bit ARM instruction set. This allows for reduced code size, which is crucial for memory-constrained embedded applications.

D (Debugger): Includes on-chip debug support (Embedded ICE RT), facilitating real-time debugging and instruction tracing.

M (Multiplier): Features a fast multiplier for efficient arithmetic operations.

I (ICE - In-Circuit Emulator): Provides integrated in-circuit emulation capabilities.

S (Synthesizable): Refers to its design as a synthesizable core, making it adaptable for various manufacturing processes.

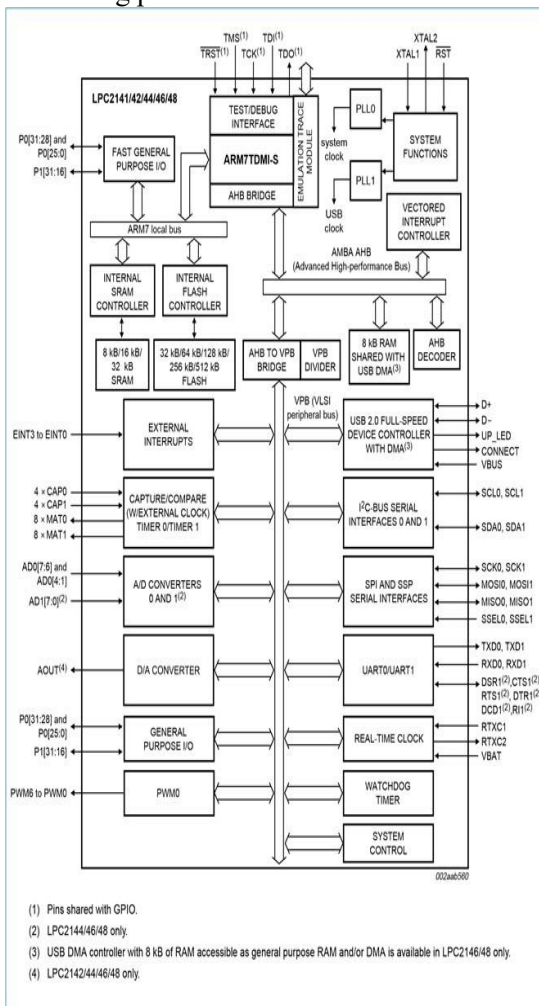


Fig 1 : LPC2148 Architecture

Block Diagram

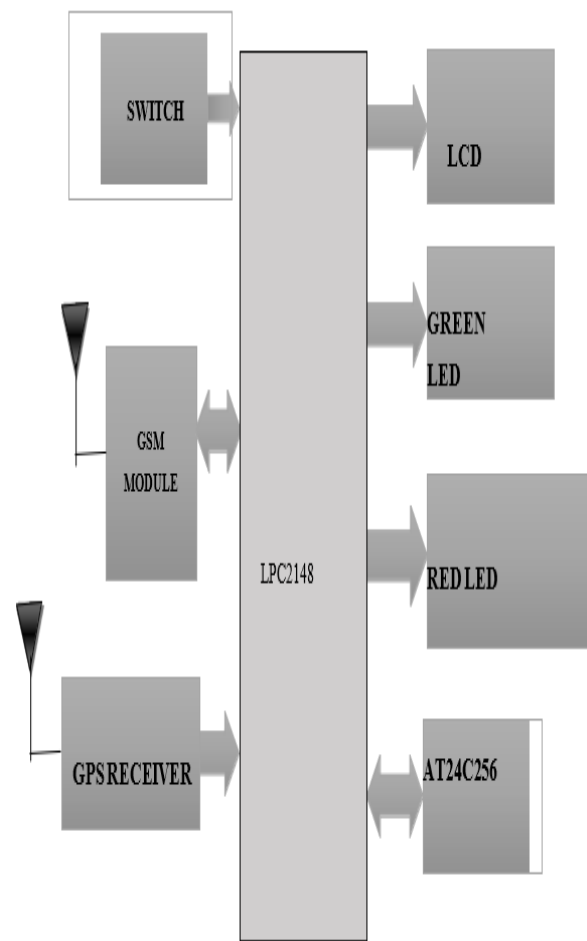


Fig 2 Block diagram of women safety system using LPC2148

Board Connections: In the Women Safety System, all components are interfaced with the LPC2148 microcontroller through proper board connections. The GSM module is connected to UART0 for serial communication, while the GPS module is connected to UART1, allowing the controller to receive and transmit data simultaneously. A 20x4 LCD display is interfaced with the GPIO pins using either 4-bit or 8-bit mode for displaying messages. The push button switch is connected to a digital input pin and configured to generate an interrupt or polled regularly. Power is supplied through a regulated 5V power supply, and in some cases, level shifters are used to match voltage levels between components. Proper grounding (GND)

is maintained among all modules to ensure stable operation and signal integrity.

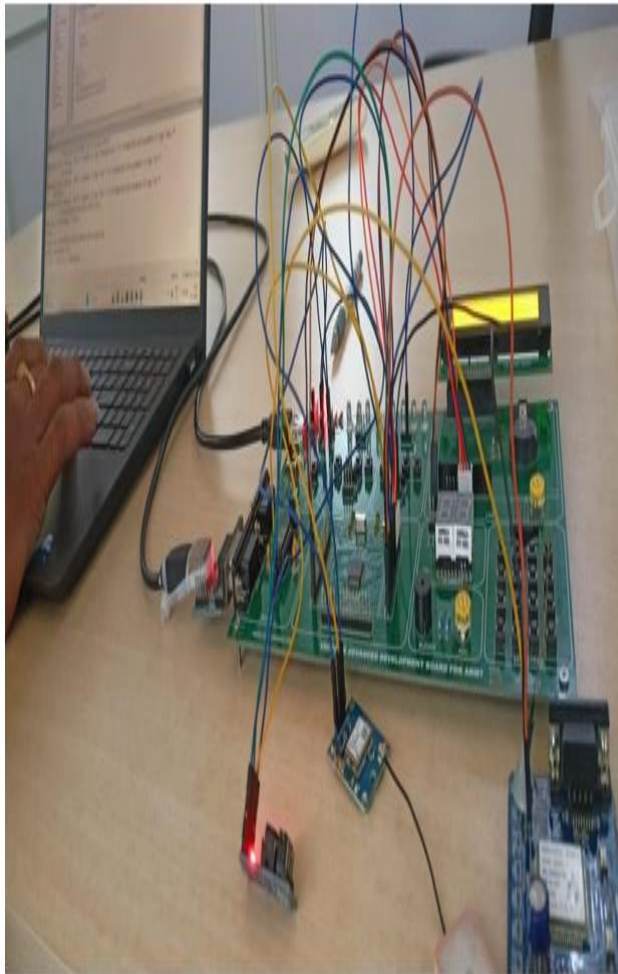


Fig 3: Board Connections

Initial system

The initial system setup involves preparing and integrating all the hardware components with the LPC2148 microcontroller and ensuring proper software configuration. Here's a step-by-step overview:

Power Supply Setup:

A regulated 5V power supply is connected to power the LPC2148 board and peripherals.

Use voltage regulators like 7805 and capacitors to

stabilize the input.

Microcontroller (LPC2148) Initialization:

Flash the embedded C program using Flash Magic via UART0.

Configure internal peripherals like GPIO, UART, and timers in the code.

GSM Module Interface: Connect GSM TX to UART1 RX of LPC2148 and vice versa.

Use AT commands in code for communication.

Ensure GSM module is powered with proper voltage (usually 12V or 5V depending on the model).

GPS Module Interface:

Connect GPS TX to UART0 RX of LPC2148.

Parse NMEA sentences to extract latitude and longitude.

Provide GPS module with open sky access for satellite signals.

LCD (20x4) Display Connection:

Connect RS, RW, E, and data pins (D4–D7) to GPIO pins of LPC2148.

Display messages like “System Ready”, coordinates, or status updates.

Emergency Push Button:

Connect to GPIO pin as input.

Pressing the button should trigger SMS sending with GPS location.

Code Upload & Testing:

Write and compile code in Keil μ Vision.

Upload via Flash Magic.

Test individually: GPS coordinates display, GSM SMS sending, LCD output, and push button triggering.

Debugging and Final Integration:

Check UART communication using serial monitor.

Ensure all modules respond properly when system is powered.

Results and Output: Working prototype:

The Women Safety System was successfully developed and tested using the LPC2148 ARM7 microcontroller. If Power ON the LCD display is ON it display the women safety system and press the switch its send the help message and phone call to give the saved mobile numbers.



Fig 4: working display

Output:

The output of the women safety system is to send the alert message or danger message will be send to the near police station and near women safety canters with live location(lat,lon) with update minute by minute and phone calls also.

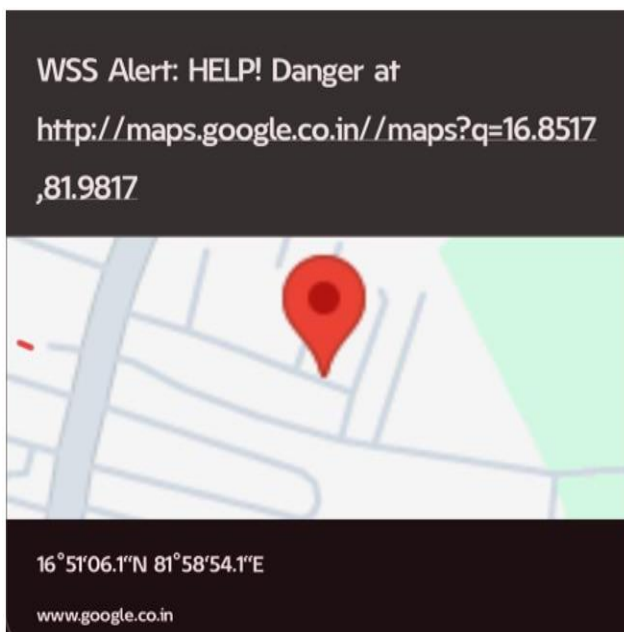


Fig 5 : output

If in case don't see the message and phone call with out any response in that number women will send the forward another number with some format()

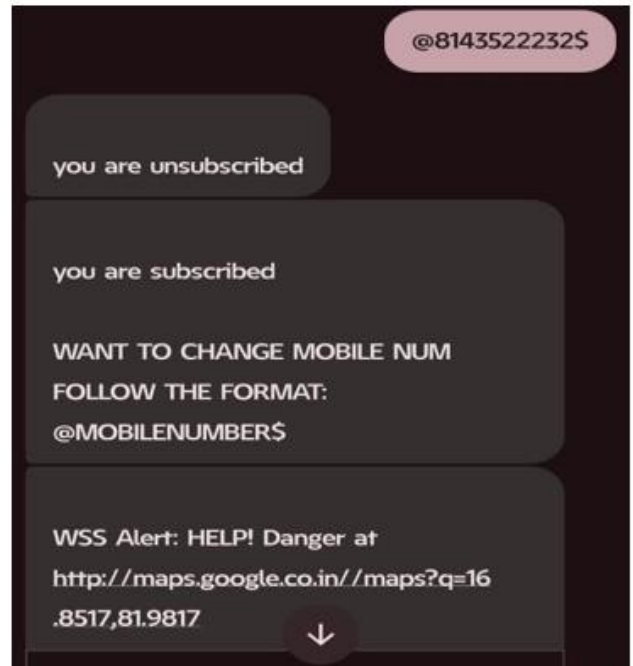


Fig 6: Output message

Conclusion: The Women Safety System project using the LPC2148 microcontroller successfully demonstrates a reliable and efficient solution for ensuring women's safety in emergency situations. By integrating a GPS module for real-time location tracking and a GSM module for instant SMS communication with emergency contacts, the system provides a rapid response mechanism. The use of an emergency push button allows users to trigger alerts easily. This compact, embedded system enhances personal safety and serves as a practical step towards addressing growing safety concerns for women in society.

Future scope: The Women Safety System project holds significant potential for future development and expansion. In the coming years, it can be enhanced by integrating with mobile applications, enabling real-time tracking, voice alerts, and direct communication with emergency services. Incorporating a camera module would allow the system to capture images or videos during critical moments, providing crucial evidence. IoT and cloud-based connectivity can further improve data accessibility and allow family members or authorities to monitor alerts in real time. The device

can also be redesigned as a compact wearable, such as a smart band or pendant, making it more user-friendly and discreet. Features like automatic calling, location sharing via Google Maps, and integration with local police networks can drastically reduce emergency response times. Moreover, adding biometric or motion sensors to detect panic situations without requiring manual activation would make the system smarter and more responsive. These advancements would greatly enhance the functionality, usability, and reliability of the women safety system, contributing to a safer environment for women.

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