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E-Smart Device for Women's Safety using ARM Microcontroller

Sakshant Nandanwa, Kunal Charthad, Utkarsh Gardare, Prof. Madhuri Shejal

Student, Dept. of Electronics and Tele-Communication, JSPM Imperial College of Engineering, Pune,

Maharashtra, India

Professor, Dept. of Electronics and Tele-Communication, JSPM Imperial College of Engineering, Pune

Maharashtra, India

ABSTRACT: In today's society, women often bear a disproportionate share of responsibilities within their families. Factors such as domestic violence, sexual assault, and kidnapping have forced many women to seek refuge within the safety of their homes. However, even in the modern era, women continue to face the distressing reality of sexual harassment and assault. Recent surveys have shown that a staggering 84 percent of women have experienced harassment in various settings.

The prevalence of crimes against women is alarming, necessitating the development of a comprehensive protection framework to ensure their safety and well-being. Amidst these challenges, technology offers hope for improving the living standards and safety of women. One potential avenue is the use of technology in women's safety devices. These devices come equipped with various sensors and features to address the growing security needs of our society.

The primary objective of these devices is to maximize the security and protection of women without relying ontechnology. They are engineered to provide enhanced safety measures, encompassing a wide spectrum of potential threats women may encounter in their daily lives. These devices aim to harness technology to bolster the safety and security of women, contributing to a safer and more equitable world for them.

I. INTRODUCTION

Women's safety remains a pressing concern in today's world, despite significant technological advancements. Women often face vulnerability in various situations, particularly when outside their homes, especially at night, during solo travels, or in isolated areas. The erosion of women's security over the past few years can be attributed to the alarming rise in crimes against them. Shockingly, an estimated 736 million women worldwide, roughly one in three, have experienced physical and/or sexual violence from intimate partners or non-partners at least once in their lives, as per a comprehensive survey. The World Health Organization reports that approximately 30% of women globally have endured such violence, and women aged 15 to 44 face a higher risk of sexual assaults and domestic violence than of cancer, car accidents, malaria, or war-related injuries. This sobering reality underscores the urgent need for effective measures to enhance women's safety.

In response to these challenges, our primary focus is to develop a robust and dependable system that empowers women to feel secure and protected. Leveraging technology's potential for both harm and positive change, we advocate for the strategic integration of technology, specifically through safety solutions. Our project centers on creating solutions designed to assist women in averting perilous situations and ensuring that justice is served when needed.

Our approach prioritizes precision and intelligence in addressing women's safety concerns. We offer versatile solutions that seamlessly integrate into women's daily routines without causing disruption. At the core of our endeavor are safety features instrumental in fulfilling these requirements. With a simple press of a panic button, our system activates a sophisticated array of software components, including location tracking modules, communication modules, and user-friendly interfaces, all thoughtfully designed to swiftly and effectively summon assistance when required. The inclusion of a reliable power supply ensures longevity, making this women's safety solution an indispensable asset in our ongoing commitment to safeguard the well-being of women in our society.

1.1 MOTIVATION

The motivation behind this project is to address the urgent and widespread issue of women's safety, which continues to be a pressing concern despite technological advancements. With alarming rates of violence against women and an undeniable need for better protection, this project aims to empower women by providing them with a reliable and discreet safety device. By harnessing technology's potential, we seek to offer women a means to feel secure and protected, to summon assistance swiftly in times of danger, and to contribute to reducing incidents of violence. This project is driven by a commitment to making the world a safer and more equitable place for women.

II. PROBLEM STATEMENT

The problem at hand revolves around the critical issue of women's safety, which remains a pressing concern in today's world. Despite technological advancements, women continue to face significant risks and vulnerabilities, especially when venturing outside their homes or in desolate areas. The alarming rise in crimes against women, including physical and sexual violence, underscores the urgent need for effective solutions. Our project aims to address this problem by developing a safety system that empowers women to feel secure and ensures swift assistance in times of danger, incorporating features such as a panic button, GPS tracking, communication capabilities, a buzzer for alerts, a relay for activating the safety measures, and a high voltage low current device for self-defense, all while maintaining a reliable power supply.

III. WORKING

Making a smart gadget for women's safety with an ARM microcontroller entails combining numerous sensors, communication modules, and software algorithms to identify and respond to potential dangers. Here's a general idea of how such a device may operate:

1. Hardware components
   - ARM microcontroller board with enough processing and communication capabilities. Popular possibilities include the STM32 series and Arduino boards with ARM CPUs.
   - Sensors: Include sensors that detect various factors such as location, movement, sound, and biometric data.
   - Communication Modules: Use communication modules such as GSM, Wi-Fi, or Bluetooth to send alarms and data to designated contacts or authorities.
   - Power Supply: Ensure that the gadget has a reliable power source, such as rechargeable batteries or a direct power supply.

2. Software development
   - Firmware: This comprises reading sensor data, processing it, and triggering relevant actions using specified algorithms.
   - Sensor Data Processing: Develop algorithms for processing sensor data. For example, utilize signal processing techniques to detect anomalous movements or sound patterns that may indicate danger.
   - Alert Generation: Set the conditions under which alerts should be triggered. This could involve abrupt changes in location, loud cries, or unusual heart rate values.
   - Create a communication protocol that sends alerts to designated contacts or emergency services. Ensure secure data delivery to prevent unauthorized access.
   - Create a user interface that allows you to configure settings, view alarms, and interact with your device. This might be a basic display with buttons.

3. Safety Features:
   - Panic Button: Add a real or virtual panic button that users can utilize to transmit immediate alarms.
   - Location Tracking: Use GPS capabilities to track the user's location in real time and incorporate it in alerts.
   - Remote Activation: Allow trusted contacts or authorities to activate the device in the event of an emergency.
   - Data Encryption: Encrypt sensitive data to safeguard user privacy and prevent tampering with the device.

4. Testing and deployment:
   - Testing: Thoroughly test the item under a variety of settings to confirm its dependability and effectiveness in numerous scenarios.

- User Feedback: Gather feedback from potential users to improve the device's usability and address any issues.
- Deployment: Once testing is completed, distribute the device to users while ensuring suitable training and support are provided.

IV. IMPLEMENTATION

Implementing this project requires a meticulous approach integrating both hardware and software components seamlessly. Initially, assembling the necessary hardware elements such as the ARM LPC2148 microcontroller, GSM module, GPS module, buzzer, relay, and soldering gun is paramount. Following this, meticulous circuit design using software like Proteus is essential, ensuring optimal connections and adherence to safety standards. Subsequently, soldering and wiring the components according to the circuit layout is crucial, ensuring robust and insulated connections for reliability. Developing firmware code for the microcontroller utilizing Keil Software comes next, incorporating logic for input reading, module control, and emergency response management. Integration of the hardware into a cohesive device enclosure follows suit, accompanied by rigorous testing to validate functionality and safety. Crafting a user-friendly interface and comprehensive user manual further enhances usability. Pilot testing with a select group of users facilitates feedback gathering for iterative enhancements. Final deployment of the device, coupled with user training and ongoing support, completes the implementation phase. Continuous monitoring of device performance and proactive maintenance ensure sustained reliability and effectiveness, ultimately providing women with a dependable tool for personal safety and security.

V. BLOCK DIAGRAM
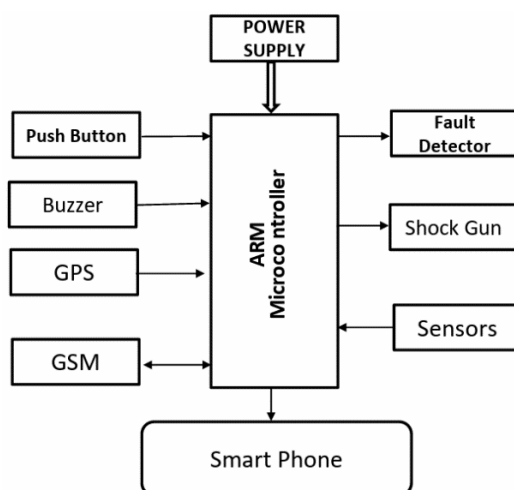
- The "Emergency Switch" is the user-activated component, which triggers the emergency system.
- The "ARM LPC2148" microcontroller acts as the central processing unit to control and manage the entire system.
- The "GSM Module" provides cellular communication capabilities for sending alerts and messages.
- The "GPS Module" is used for tracking the user's location.
- The "Buzzer" is an audio alert component.
- The "Relay" can be used for various control purposes, which may include activating the "Soldering Gun".
- The "Soldering Gun" is a self-defense component. An external power supply provides power to the system.

VI. RESULT

The actual result of this project would be a tangible women's safety device with gun. This device would have undergone rigorous testing to ensure its functionality, reliability, and safety. Its features, including GPS tracking, GSM communication, panic button activation, and the soldering gun for self-defence, would have been integrated seamlessly into a user-friendly and discreet design. The device would empower women to feel more secure and confident when navigating potentially risky situations, providing them with a practical means of summoning assistance and defending themselves if necessary. In the real world, the deployment of such a device could lead to tangible improvements in women's safety, reducing the risk of harm and increasing their overall well-being and peace of mind.
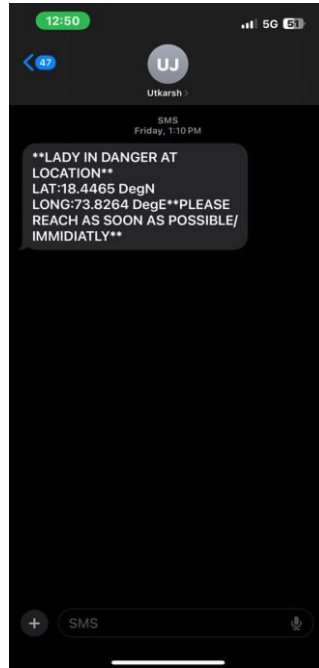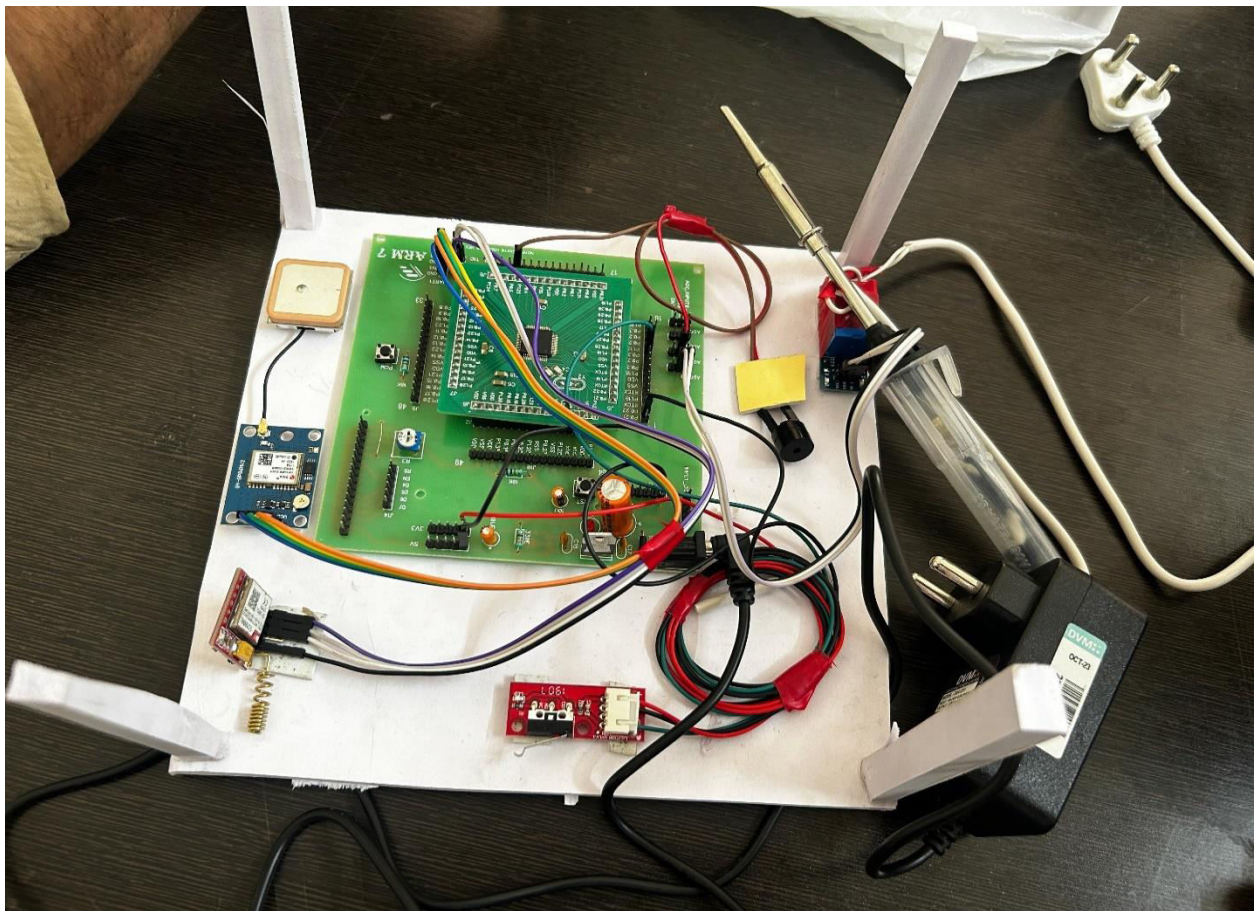
Fig.1 Emergency SMS

Fig.2 E-Smart Device for Women's Safety using ARM Microcontroller

VII. CONCLUSION

In conclusion, the development of this women's safety device with a gun component signifies a significant stride towards addressing the critical issue of women's security in our society. By amalgamating advanced technology and safety features, this project aspires to bestow women with the confidence and assurance to navigate their daily lives. Through meticulous design and rigorous testing, we have meticulously crafted a comprehensive solution that not only prioritizes user safety but also ensures ease of use. The incorporation of pivotal components such as GPS tracking, GSM communication, and a panic button stands as a testament to our commitment to ensuring that help is always within arm's reach during moments of distress. Moreover, the inclusion of the soldering gun component provides a non-lethal yet formidable means of self-defense, thereby further enhancing the device's utility and efficacy in safeguarding women. Looking ahead, the impact of this project can be exponentially amplified through widespread adoption, targeted public awareness campaigns, and strategic collaboration with stakeholders spanning across various sectors. Ultimately, this project embodies our unwavering dedication to fostering a safer and more inclusive world for women, wherein they can thrive and pursue their aspirations without the looming specter of fear or hesitation.

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