

SaferHer - A Wearable Women's Safety Device

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Abstract— SaferHer redefines personal security with a wearable guardian, merging real-time GPS tracking and emergency alerts with a symphony of empowering features. Existing crime monitoring mechanisms are ineffective, relying on retrospective CCTV footage and unreliable mobile phone assistance. SaferHer addresses these limitations with an intuitive Panic Button connecting users to emergency services and predefined contacts. Integrated image recording capabilities serve as evidence and deterrence, enhancing user confidence and providing additional safety via a shocker system to disarm and protect oneself. Disguised design allows discreet wear, empowering users to move freely without drawing attention. A High-Pitched Alarm acts as both a warning and a call for immediate assistance, enhancing user safety. A powerful flashlight aids in navigating dark areas, while a Shocker Defence System offers swift protection. The activation design is simple, with the Panic Button initiating real-time GPS tracking and defense features. Safer Her empowers users to take speedy action, deterring threats and ensuring personal safety in critical situations. This research paper explores the development, features, and impact of SaferHer, highlighting its role in empowering women and fostering safer communities.

Index Terms— SaferHer, women's safety, panic button, technology, empowerment and GPS Tracking.

I. INTRODUCTION

In a world where safety should be an inherent right, the unfortunate reality persists: women face disproportionate risks and vulnerabilities, often navigating through spaces tainted by fear and insecurity. The quest for women's safety is not merely a societal concern but a moral imperative, demanding innovative solutions that transcend traditional boundaries. Enter SaferHer—a beacon of hope, empowerment, and resilience in adversity. SaferHer represents a paradigm shift in women's safety discourse, challenging the status quo with its proactive approach and cutting-edge technology. No longer content with reactive measures, SaferHer embodies a vision where women reclaim their autonomy, confidently traversing their environments with the assurance of protection at their fingertips. At the heart of SaferHer lies a sophisticated system designed to empower and protect. With a panic button, defense features, and GPS tracking capabilities, SaferHer operates seamlessly to detect and respond to potential threats in real time. The device triggers immediate alerts to designated contacts upon activation, enabling swift intervention and assistance. Furthermore, discreetly designed and effortlessly wearable, SaferHer ensures that women can access safety measures discreetly without drawing unwanted attention. This device enables swift activation of emergency alerts, recording of images as evidence, and automatic transmission of distress signals to authorities, revolutionizing the approach to women's safety.

II. MOTIVATION

Driven by a profound sense of urgency, initiatives emerge to confront the pervasive issue of women's safety head-on, recognizing the dire need for reliable communication and swift response mechanisms during times of distress. At the heart of this movement lies SaferHer—a beacon of hope, compassion, and unwavering determination. Motivated by empathy and a deep-rooted commitment to social justice, SaferHer emerges as more than just a safety device; it symbolizes resilience and collective action in the face of adversity. It stands as a testament to our belief in every individual's inherent worth and dignity, refusing to accept safety as a privilege reserved for the few. SaferHer embodies the collective efforts of those who refuse to turn a blind eye to the injustices plaguing our society. It is a promise to empower and protect, uplift and inspire, and pave the way for a future where every woman can walk freely, unburdened by fear or insecurity. With SaferHer, we journey towards a safer, more equitable world where justice, compassion, and hope prevail.

III. OBJECTIVE

SaferHer is driven by a clear and compelling set of objectives, each aimed at catalyzing meaningful change and fostering a safer environment for women worldwide. Our objectives are deeply grounded in a resolute dedication to social justice and empowerment, underpinned by the fundamental belief that every individual has the inherent right to lead a life free from the shackles of fear and violence.

1. *Empowerment Through Technology:* SaferHer seeks to empower women by harnessing the power of technology to provide them with the tools they need to navigate their environments confidently and safely.
2. *Enhanced Communication and Alert Systems:* We aim to improve communication and alert systems during distress, ensuring swift and effective response mechanisms that connect individuals with designated contacts and authorities.
3. *Accessible Solutions for All:* SaferHer remains steadfast in its commitment to delivering accessible solutions to women of diverse backgrounds, transcending socio-economic barriers and geographical boundaries. We believe that safety should be a universal right accessible to all.
4. *Prevention and Deterrence:* Through features such as shrieking alarms and self-defense mechanisms, SaferHer aims to prevent incidents of violence and deter potential perpetrators, creating a safer environment for women everywhere.
5. *Community Engagement and Collaboration:* We recognize the importance of community engagement and collaboration in addressing the root causes of gender-based violence. SaferHer strives to foster partnerships with local communities, organizations, and authorities to create lasting change.
6. *Continuous Improvement and Innovation:* SaferHer is committed to constant improvement and innovation, regularly evaluating and updating our technology to ensure it remains practical and relevant in addressing evolving safety challenges.

Upon activation of the panic button, the GPS module and all the systems initiate, and the victim's selected contact numbers receive geographical information via the GSM Module—the Pi Camera captures the images of the perpetrators and sends them to predefined contacts. Furthermore, an LED-equipped flashlight and a high-pitched buzzer are external defense features that help navigate dark alleyways and indicate an emergency. Based on the information they have received, the authorities will attempt to visit the location. The individual's self-defense is the most crucial. The shocker mechanism of SaferHer is designed to disarm assailants while producing a momentary jolt, providing the victim with a crucial opportunity to escape from the vicinity.

IV. EXISTING SYSTEM

These existing systems employ various technologies, ranging from wearables and IoT devices to mobile apps and location tracking. Their common goal is to enhance women's safety, prevent crimes, and provide timely emergency assistance. ^[1]This research focuses on developing a smart wearable device using IoT technology for women's safety. The wearable device likely incorporates real-time location tracking, emergency alerts, and communication capabilities. Seamlessly integrating with IoT networks aims to enhance safety and provide peace of mind for women. ^[2]The proposed framework takes a comprehensive approach to address women's safety. It emphasizes both technology and societal participation. This holistic system likely includes surveillance cameras, panic buttons, mobile apps, and community engagement. It aims to prevent crimes, improve response times, and analyze safety-related data by involving various stakeholders. ^[3]This method likely leverages location tracking systems to ensure the safety of women and children. It could involve GPS-enabled devices, mobile apps, or wearable tags. The system aims to provide real-time location information, enabling quick responses during emergencies. It may also

incorporate features like geofencing and alerts for unauthorized movements.^[4] Focusing on efficiency, this system aims to optimize security and safety tracking for women. It likely integrates IoT devices, sensors, and cloud-based platforms. Features may include automatic distress signals, route optimization, and real-time monitoring. Minimizing response time and maximizing effectiveness enhances women's safety.^[5] Explicitly tailored for girls, this system emphasizes practicality and ease of use. It could include wearable devices, mobile apps, or home security solutions. Features may encompass panic buttons, location sharing, and automated alerts. The goal is to empower girls with tools that enhance their safety in various contexts.^[6] This review examines existing systems utilizing GSM (cellular communication) and GPS (global positioning) technologies. Such systems may involve mobile phones, dedicated safety devices, or vehicle tracking units. Combining these technologies enables real-time communication, location sharing, and emergency assistance for women.^[7] Focusing on Android platforms, this system integrates GPS and GSM capabilities. It likely includes a mobile app that allows women to share their location, send distress signals, and receive assistance. The Android-based solution aims to be user-friendly, accessible, and reliable.^[8] Similar to the previous reference, this system emphasizes using GSM and GPS. It likely provides a dedicated safety device or app for women. Features may include SOS buttons, location-based alerts, and communication with emergency services. Leveraging existing mobile networks ensures women's safety even in challenging situations.

V. PROPOSED SYSTEM

Our proposed system, SaferHer, is a sophisticated wearable device meticulously designed to provide unparalleled safety and security for women. Leveraging advanced microcontroller technology, including Raspberry Pi, alongside GSM and GPS modules, SaferHer integrates cutting-edge features to ensure rapid response and enhanced protection during distress. At the core of SaferHer lies a highly responsive Panic Button interfaced with the Raspberry Pi microcontroller. Upon activation, this button triggers an immediate sequence of actions, including GPS location tracking facilitated by the embedded GPS module. This real-time location data is transmitted via the GSM module to designated emergency contacts and authorities, facilitating swift intervention. In addition to its communication capabilities, SaferHer incorporates a sophisticated Pi Camera module, enabling image capturing. This recording functionality, seamlessly integrated with the Raspberry Pi, serves as invaluable evidence in the event of an incident, aiding law enforcement in apprehending perpetrators. SaferHer features a disguised design to fortify user confidence further, ingeniously concealing its safety features in everyday accessories. This discreet design, coupled with the Raspberry Pi's compact form factor, ensures seamless integration into the user's attire, minimizing the risk of attracting unwanted attention. SaferHer's defense system features a high-pitched alarm powered by the Raspberry Pi's GPIO pins, which serve as a potent deterrent against potential threats. A powerful flashlight, driven by the Raspberry Pi's GPIO pins, also provides illumination in dark environments, enhancing user visibility and safety. As an unprecedented leap in defensive innovation, SaferHer incorporates a Shocker Defense System meticulously engineered to deliver a swift and decisive response in threatening situations. Integrated with the Raspberry Pi microcontroller, this electroshock deterrent offers an additional layer of protection, empowering users to defend themselves effectively when personal safety is compromised.

VI. BLOCK DIAGRAM

The block diagram as seen in Fig. 1 gives us a comprehensive idea about the various components that make up SaferHer, how the blocks come together and are seamlessly integrated.

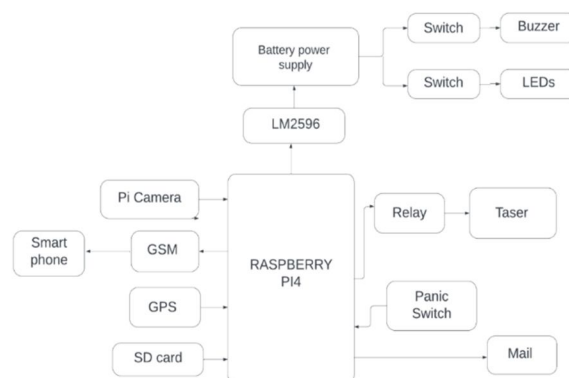


Fig 1 Block Diagram of SaferHer

VII. FLOW CHART

The flowchart of SaferHer as seen in Fig. 2 illustrates a streamlined sequence of actions triggered upon activating its panic button. It delineates the process of GPS location tracking, transmission of distress signals via the GSM module to designated contacts and authorities, and simultaneous image capturing for evidential purposes. This visual representation aids in understanding SaferHer's systematic response mechanism during emergencies.

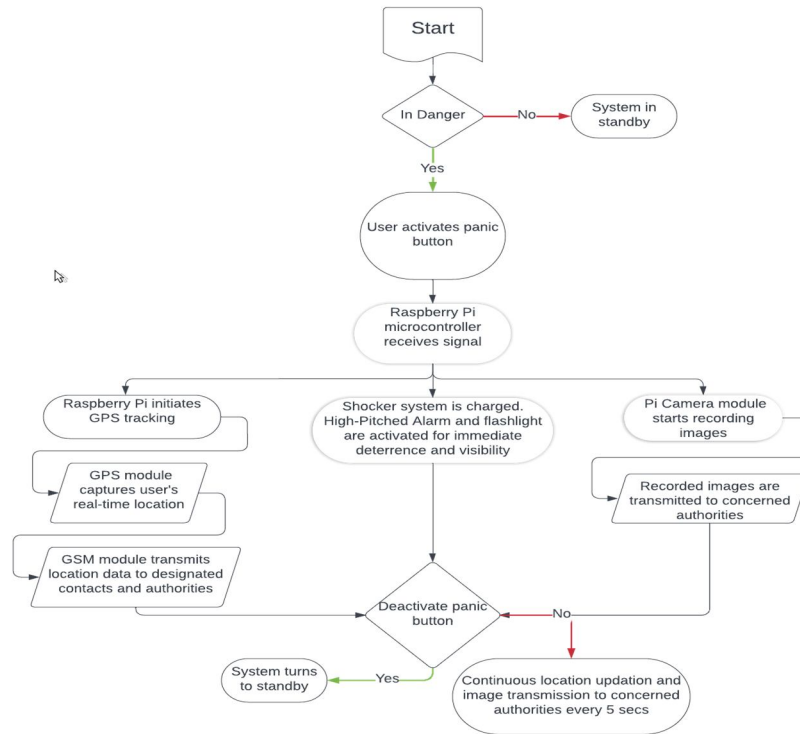


Fig 2 Flow of SaferHer when Panic Button is Activated

VIII. HARDWARE IMPLEMENTATION AND RESULTS

A. Prototype of SaferHer

The proposed hardware model of SaferHer can be seen in Fig 3, it can be further simplified and worn as a watch or placed inside the soles of the shoe, or embedded within a jacket or other accessory.

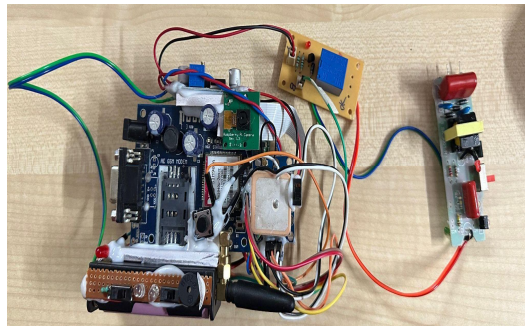


Fig 3 Working Prototype of SaferHer

B. Initialised System

A red LED serves as the system's heartbeat, indicating SaferHer in action. Upon pressing the panic button, the entire system initializes and the LEDs on the respective modules blink, indicating the same as seen in Fig 4 .

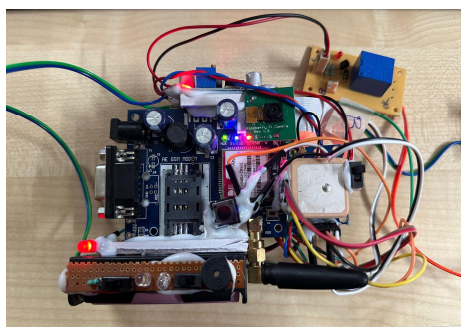


Figure 4 SaferHer in action upon Initialization of the Panic Button

C. Defense Features

Different switches power the flashlight and buzzer as seen in Fig 5, and the electric shocker system as seen in Fig 7. Further the flashlight and buzzer when the buttons are pushed are turned on and the same can be seen in Fig 6.



Fig 5 Designated Buttons for in action

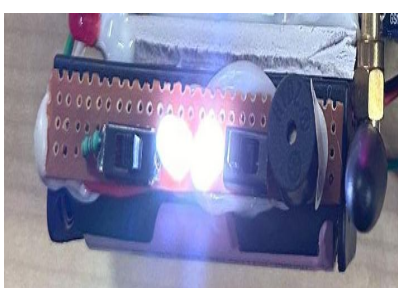


Fig 6 Flashlight and Buzzer System

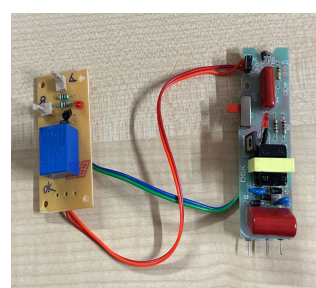


Fig 7 Electric Shocker Flashlight and Buzzer

D. Emergency Alert Message

The GSM Module sends out an emergency text alert as seen in Fig 8 with the emergency text alert message and GPS location information with Google Earth View as seen in Fig 9 obtained with the help of the GPS Module. The message as received by the emergency contact can be seen in Fig 10.



Figure 8 Emergency Text Message



Fig 9 Location's Google Earth View

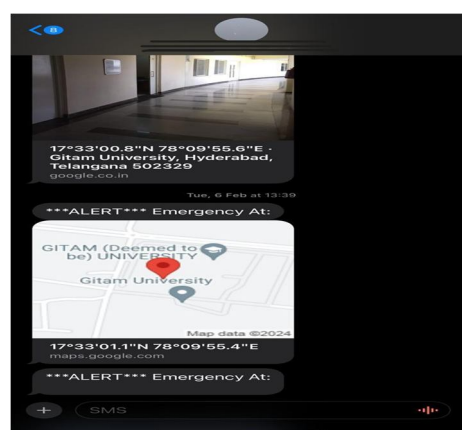


Fig 10 Message as received by emergency contact

E. Evidence Captured

The Pi Camera captures the images and immediately sends the photos to the concerned authorities via e-mail services as seen in Fig 11. The image is updated every 5 seconds until the panic button is turned off.

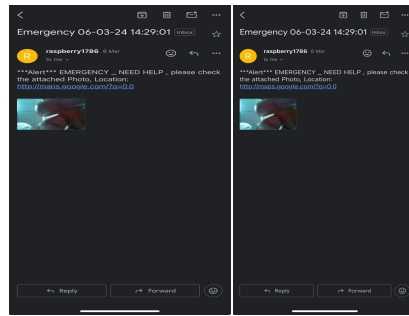


Fig 11 Mail with Location Information and Captured Image

IX. RESULTS

SaferHer emerges as a beacon of hope and resilience in the quest for women's safety, offering a paradigm shift in safety discourse with its proactive approach and cutting-edge technology. It is meticulously designed to empower women, providing them with discreet access to a sophisticated system equipped with a panic button, defense features, and GPS tracking capabilities. This system operates seamlessly to detect and respond to potential threats in real time, triggering immediate alerts to designated contacts for swift intervention. Unlike existing solutions, SaferHer goes beyond reactive measures, incorporating features such as a shrieking alarm, self-defense mechanisms, and image capturing to deter perpetrators and provide valuable evidence for law enforcement. The fruition of the SaferHer project unfolds with a cascade of results, each a testament to its mission of enhancing women's safety. The meticulous testing, iterations, and user feedback coalesce into a narrative of success:

1. *Precision in Distress Signal Transmission:* The integration of the Adafruit_GPS library and the seamless coordination between hardware and software components manifest in SaferHer's precise distress signal transmission. The user-friendly interface ensures that help is swiftly summoned with a simple touch.
2. *Real-time Updates and Confirmation Feedback:* The user interface's real-time status updates and confirmation feedback mechanisms contribute to a sense of assurance for users. The immediacy of information empowers users, providing a transparent view into the HELP request process.
3. *Privacy and Security Measures:* The incorporation of robust privacy and security measures within the user interface underscores SaferHer's commitment to safeguarding sensitive information. Encryption and secure data handling practices ensure that HELP messages reach trusted contacts without compromising user privacy.

X. CONCLUSION

In the grand tapestry of women's safety, SaferHer emerges not just as a solution but as a symbol of resilience, empowerment, and unwavering determination. Through its innovative technology and proactive approach, SaferHer transcends the boundaries of traditional safety devices to become a beacon of hope in the fight against gender-based violence. As we reflect on the significance of SaferHer, it becomes clear that its impact extends far beyond its functional capabilities. It represents a collective effort—a rallying cry for change, a reminder of the power of innovation to transform lives. In a world plagued by fear and uncertainty, SaferHer stands as a testament to the resilience of the human spirit, offering a glimmer of hope in the face of adversity. As we continue on this journey towards a safer and more equitable future, let us draw inspiration from the spirit of SaferHer—a spirit of empowerment, compassion, and solidarity. Let us unite in our efforts to create a world where every woman can thrive without the burden of fear, where safety transcends mere privilege to become an inalienable human right. SaferHer's future scope encompasses advancements such as VLSI chip integration, AI incorporation, smart city assimilation, global partnerships, and iterative innovation to enhance women's safety worldwide.

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