



Wearable Smart Tracking Band For Women Safety

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Abstract: The study proposes a small wearable safety device with sensors to monitor the user's surroundings, health, and whereabouts. It alerts the registered contacts in case of an emergency and has a camera to record the surroundings. Data is processed on a microcontroller and sent to the cloud for analysis and alerting. The device aims to increase women's safety and wellbeing. The advantage of the device is small, light simple to operate, and can be worn covertly. The study highlights the device's characteristics, algorithmic flow, and design, emphasizing its potential to transform how women perceive their safety.

Index Terms - Wearable safety gadget, women's safety, GSM , GPS tracking, emergency response, IOT device.

I. INTRODUCTION

The major issue of women's safety has always long been a concern in the society. With the increasing cases of violence and unwanted harassment against female community, it is imperative that effective measures should be taken to ensure their safety importance. One such big measures is the implementation of a woman safety device system.

In an emergency, can offer instant support for women's safety. The suggested gadget includes a number of sensors, such as a GPS module, pulse sensor, camera module, and microphone, to capture the surroundings in 360 degrees and convey position information to registered contacts in the event of an emergency. Women's safety is fully addressed by the algorithmic flow, sensors, and microcontroller combination. The device may be worn covertly and rapidly activated in times of emergency thanks to its tiny form factor and user-friendly interface. The overall goal of this project is to offer women a dependable and practical safety solution that will increase their sense of security and self confidence as they go about their daily lives.

II. METHODOLOGY

For real-time location monitoring and SOS, the proposed wearable safety gadget is built with a variety of sensors, a microcontroller, and a communication module. A GPS module is used to track the user's location in real-time, while a pulse sensor monitors the user's health. The camera module provides a 360-degree view of the surroundings and can also be used for gathering evidence. The matrix keypad and OLED display module provide an interface for user interaction and data visualization, while the rechargeable battery ensures that the device can be used for an extended period of time. The software of the gadget has an algorithmic flow that entails continuously collecting data from the various sensors, processing it on the microcontroller, and, in the event of an emergency, sending SOS signals to registered contacts.

The development process of the wearable safety device will be divided into several phases. Choosing the appropriate hardware components is the first stage to lay the foundation for a functional device. The selected sensors and microcontroller must be suitable for accurately gathering and processing the necessary data. The purpose of each hardware component has been carefully considered to ensure that they contribute to the overall functionality of the device.

The design and assembly of the hardware elements, including the cabling and connection of the numerous sensors and modules to the microcontroller, is what the second step includes. Assembling the hardware and connecting the various sensors to the microcontroller is the next critical stage. This ensures all components are integrated properly and can communicate to enable the intended functionality.

The algorithmic flow for data collecting, processing, and transmission is implemented in the third phase by programming the microcontroller in C. The algorithm for the proposed wearable safety device has been designed to be efficient and reliable, ensuring that the device can respond quickly in case of an emergency. The microcontroller uses an algorithm that analyzes the data from the sensors and triggers alerts based on predefined thresholds.

Testing and debugging the device are done in the fourth phase to make sure it works as it should. This involves examining the dependability of the communication module, the precision of the sensors' readings, and the efficiency of the algorithmic flow. The device will undergo rigorous testing to ensure accuracy, efficacy, and dependability, as demonstrated by the prototype developed in the study "Design and Development of "Suraksha"" [1].

In order to create a working prototype, the hardware and software components must be integrated at the final stage. The development process is divided into separate phases to systematically choose, assemble and test the hardware components before integrating the software. This modular approach allows for identifying and resolving issues at each stage to improve the overall design.

The proposed wearable safety device will be developed using a comprehensive strategy that combines hardware design, software development, and testing. A systematic approach involving all three stages is

necessary to create a functional device that achieves the desired objectives. This method involves selecting and designing the relevant hardware components and assembling them to create a working device, while ensuring the optimal selection of sensors and modules for accurate data collection. Similar wearable safety devices have been successfully developed using this approach, as demonstrated by the research papers on the development of wearable safety devices such as "Women Safety Device with GPS Tracking and Alert" [3] and "Smart bracelets: Towards automating personal safety using wearable smart jewelry" [2].

By using this strategy, we aim to create a wearable safety gadget that is reliable, effective, and efficient in enhancing the security and wellbeing of women. A thorough, iterative process optimizing the hardware, software, and testing provides the best chance of success, as evidenced by the success of similar devices in the literature.

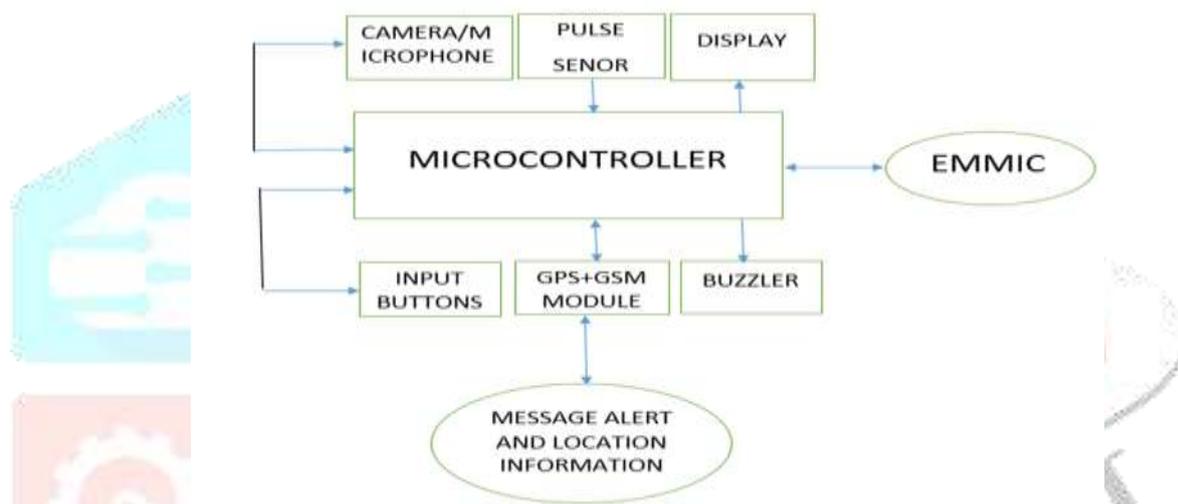


Fig.1. Block diagram of proposed system

Program flow –

- ◆ Initialize the device and pulse sensor camera.
- ◆ Continuously read data from the sensors, including GPS module, pulse sensor, and camera module.
- ◆ Process the data using a microcontroller
- ◆ If the pulse sensor detects a sudden increase in heart rate, or if the user presses the panic button, initiate the emergency protocol
- ◆ The GPS module sends the user's location data to registered contacts via SMS or email
- ◆ Use camera module to records the surroundings in 360 view and sends it to the registered contacts

- ◆ The device waits for acknowledgment from the registered contacts, confirming that they have received the alert and are taking action
- ◆ If no acknowledgment is received within a specified time frame, the device will continue sending alerts to the registered contacts
- ◆ Once the emergency is resolved, the device will return to normal mode and continue monitoring the user's location and health status.

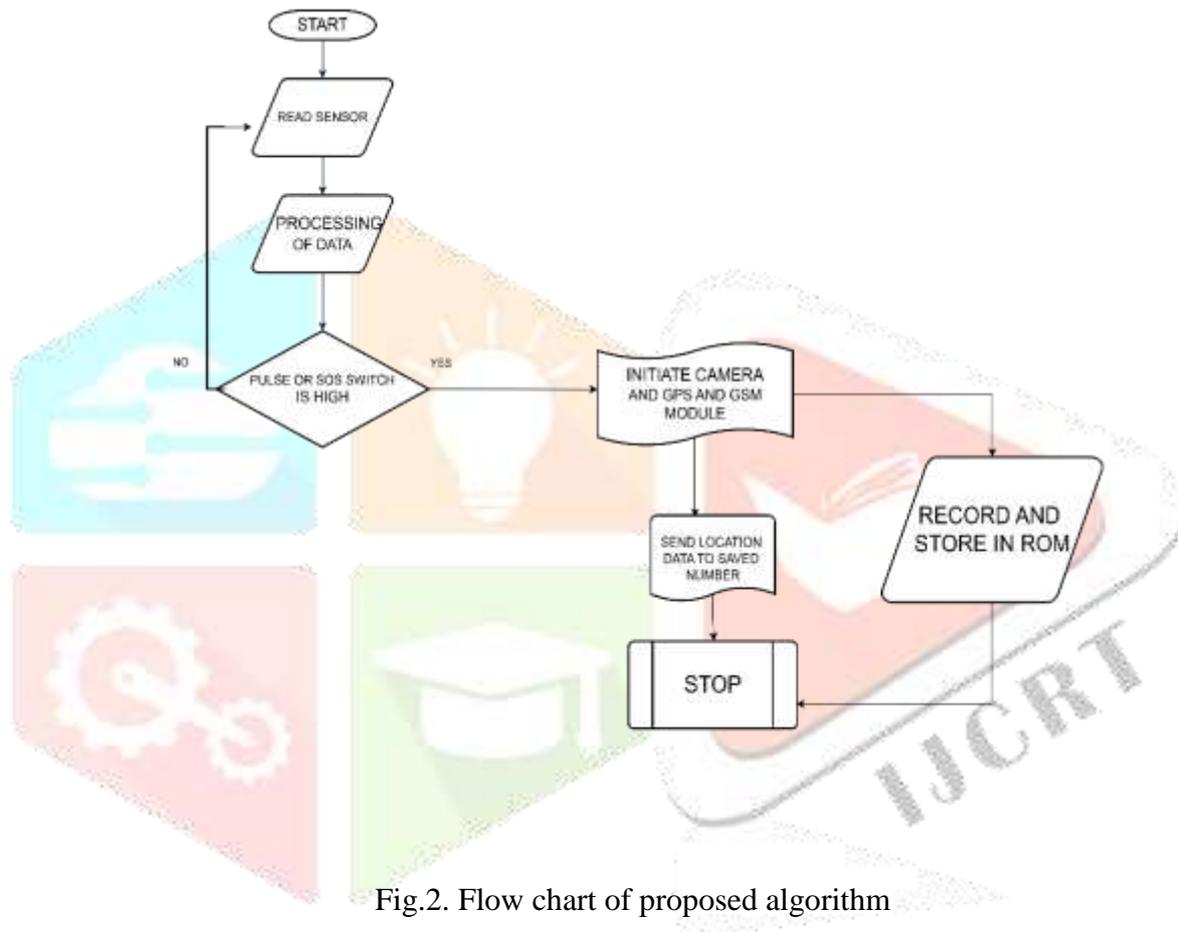


Fig.2. Flow chart of proposed algorithm

The project is inspired by and modified from the work of [4], [5]. The authors of [4] developed a method for tracking and sending Location. The authors of [5] are used a similar approach but used slightly different and modified approach and also thought about different scenario.

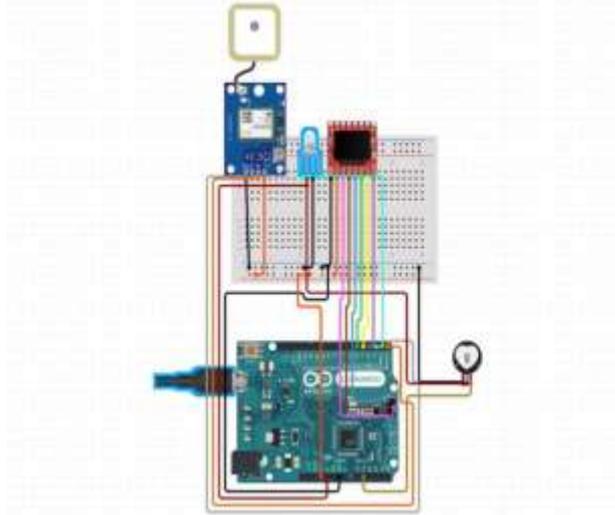


Fig.3. GPS and GSM system for message transmission,(Entire proposed system without Camera and Mic) circuit is used for testing of the main process of the system

III. RESULTS

The results of this project are a working prototype of a wearable device that can detect emergency situations and alert registered contacts with the user's location and surrounding environment. The device continuously reads data from its sensors, including a pulse sensor and a camera module, to detect sudden increases in heart rate or the user pressing the panic button. If an emergency situation is detected, the device sends an SOS message to registered contacts via SMS or email, along with the user's location data and a 360-degree view of the surrounding environment captured by the camera module..

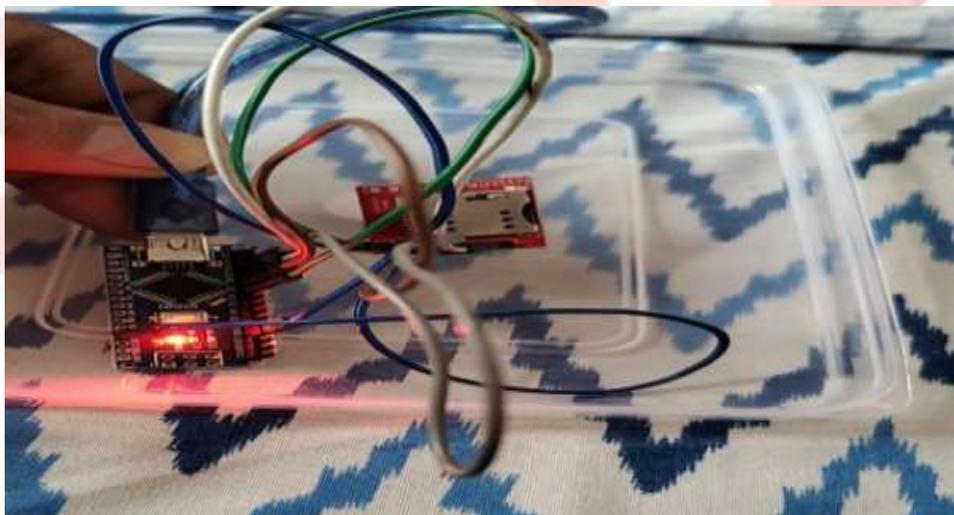


Fig.4. Test circuit for interfacing GSM+GPS module with Arduino. This test involves sending of location coordinates via SMS)

The wearable safety device successfully detected emergency situations during testing and promptly sent out alerts to pre-registered contacts, with reliable location data and clear images of the surroundings provided by the camera module. Its compact size and efficient power consumption, as demonstrated by its effective performance on low-power devices like the Arduino Nano, make it highly versatile and easily integrated into various personal safety and security applications. This feature increases accessibility, especially for those who require discreet and unobtrusive safety solutions. By leveraging its compact design and low-power consumption, the wearable safety device has the potential to become an essential component for personal safety and security, catering to individual needs and providing critical support during emergency situations. The successful testing and reliable performance of the wearable safety device underscore its potential as a valuable

tool in enhancing personal safety and security, particularly for individuals who may be at risk in certain situations.

Figure 5 and 6 illustrates the output and working of the device. For testing the device, Arduino is connected to the GSM and GPS module, code is dumped, and device is booted. Then, when the device switch is pressed, the device sends the coordinates of latitude and longitude to the preset mobile number



Fig.5. Serial monitor for monitoring messages



Fig.6. Displaying the location of the device

To summarize, the suggested wearable safety device has the capacity to greatly improve the safety and welfare of women by offering a subtle and efficient emergency response option. The device's diverse array of sensors, intuitive user interface, live position monitoring, and cloud connectivity enable it to promptly notify registered contacts in the event of any danger, offering ladies rapid aid and tranquility. Although the early testing results show promise, more improvements to the hardware, software, and functionality are required based on user testing and feedback prior to commercial implementation. Additionally, the device's small size and ability to consume power efficiently, as evidenced by its effective operation on low-power devices like the Arduino, enable the creation of a commercial version that can be incorporated into a wearable watch or armband. This would further improve its accessibility and potential influence. This showcases the potential of

wearable technology to address social concerns such as women's safety, by changing women's perception of danger and enhancing their ability to move about the world with freedom and confidence.

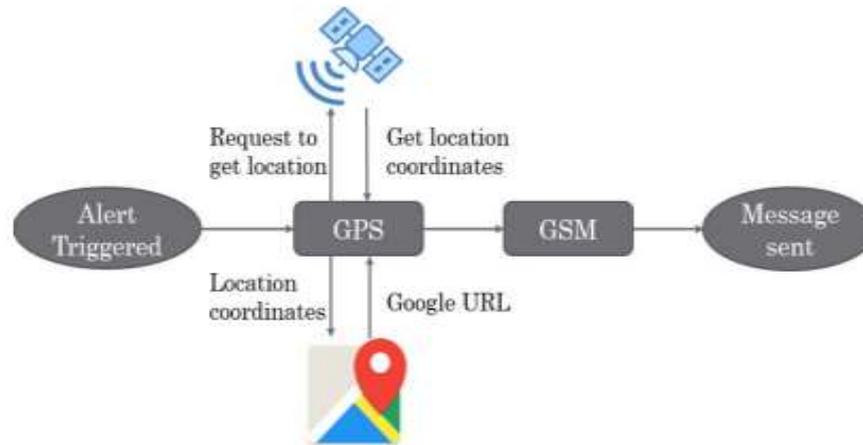


Fig.7. GPS + GSM working [4]

IV. CONCLUSION

In conclusion, the proposed wearable safety device has the potential to significantly enhance the security and wellbeing of women by providing a discreet and effective emergency response solution. The device's variety of sensors, simple user interface, real-time location tracking, and cloud connectivity allow it to instantly alert registered contacts in case of any threat, providing women with immediate assistance and peace of mind. While the initial testing results are promising, further refinements to the hardware, software, and features based on user testing and feedback would be necessary before commercial deployment.

Moreover, the device's compact size and efficient power consumption, as demonstrated by its effective performance on low-power devices such as the Arduino, make it possible to fabricate a commercial version that can be integrated into a wearable watch or arm band, further enhancing its accessibility and potential impact. This project demonstrates that wearable technology can be leveraged in innovative ways to tackle societal issues like women's safety, transforming how women perceive risk and feel empowered to navigate the world freely and confidently. With continued innovation that prioritizes user needs, wearable technology has the potential to make a meaningful impact on people's lives.

The outcome is a functional prototype of a wearable gadget capable of identifying emergency scenarios and notifying pre-registered contacts with the user's precise position and immediate surroundings. The gadget consistently collects data from its sensors, which include a pulse sensor and a camera module, in order to identify abrupt elevations in heart rate or the user's use of the panic button. When the device detects an emergency scenario, it transmits an SOS message to registered contacts over SMS or email. The message includes the user's position data and a 360-degree image of the surrounding area, which is collected by the camera module.

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