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Smart Safety Bangle for Women an IoT Solution for Personal Protection

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Abstract: ***Women, particularly young girls and mothers are more likely to face harassment and abuse in public places such as streets, public transportation, and congested locations. To remedy this, we recommend a technologically advanced bangle with Internet of Things (IoT) characteristics to improve women's safety. The wearable device includes an emergency button and an inbuilt camera, allowing the wearer to take a snapshot of the abuser as well as geolocation information during an emergency. The collected data is delivered directly to pre-defined emergency contacts on the user's smartphone, eliminating the need for additional equipment. The smart bangle is simple to use, and the proactive safety feature provides real-time alerts and support in dangerous situations. The device, which combines IoT and wearable technologies, provides a valid and efficient technique of improving personal protection for women in public settings.***
Keywords: IoT-based women's safety, wearable security device, emergency alert system, smart safety bracelet, raspberry pi, mobile communication, personal safety technology.

I. INTRODUCTION

Women's security, even within their own homes, has become a serious concern in recent years. The rising number of cases of harassment and violence, often perpetrated by family or acquaintances, emphasizes the importance of a reliable and secure security system [1].

The Internet of Things (IoT) raises the bar by enabling real-time interaction between intelligent devices over the internet, allowing data to be transported more effectively between multiple networks [3]. The integration of IoT into a security system may result in an intelligent and predictive security system, which may improve women's safety.The system can provide real-time notifications andsupport, enabling for fast response in the event of an emergency [4].

TheRaspberry Pi, a compact and affordable single-board computer built by the Raspberry Pi Foundation, serves as the foundation of this solution. Originally designed for instructional purposes, it has found widespread use in a variety of fields because to its low cost, adaptability, and robust capabilities [5]. With Bluetooth, Ethernet, and Wi-Fi connectivity, the Raspberry Pi enables internet connectivity, remote monitoring, and simple interface with other intelligent devices, making it an excellent candidate for implementing a robust and efficient IoT-based security system [6].

II. OVERALL GUIDELINE

A. Related Work

Some studies imply that IoT, AI, and embedded technologies can increase women's safety. Wearable technologies, such as GPS-based smart wristbands with SOS notifications [1], and smartphone applications with SOS and GPS position monitoring [2], are currently available as solutions. Smart clothing with sensors for fall detection and scream analysis is also being researched [3], as is AI-based monitoring using face recognition [4]. Some systems utilize biometric verification to provide automated notifications [5]. Short battery life, false warnings, and internet reliance concerns persist [6]. The Raspberry Pi-based IoT system uses several sensors, cloud notifications, and real-time connectivity to ensure safe and rapid responses [7].

B. Using Multiple Sensors To Increase Safety

The Raspberry Pi serves as the main controller in the design, facilitating connectivity with a variety of sensors and communication devices. It has a push button to initiate manual alerts, a scream sensor to detect alarm noises, a movement sensor to precisely identify movement, and an accelerometer to detect falls [1]. While a GPS module provides real-time position monitoring of coordinates, a camera module is asked to take images when activated [2].After processing all of the sensor data, the Raspberry Pi transmits it to a cloud server, which uses mobile communication to alert pre-designated contacts and emergency services [3].

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In order to facilitate a speedier response in the event of an emergency, a buzzer is also incorporated [4]. The multi-sensor system improves the system's dependability and effectiveness in addressing women's safety concerns [5].

C. Proposed Desgin

The proposed system is an intelligent safety bracelet that uses IoT technology to increase women's security. It has GPS for reliable location monitoring, GSM for emergency alerts via texts, and a camera for photographing suspicious dangers. The Raspberry Pi serves as the core computing unit, allowing for real-time data processing and connectivity with emergency numbers. The system is efficient and compact, and it is designed to provide rapid assistance while assuring security and a speedy response in the event of a disaster.

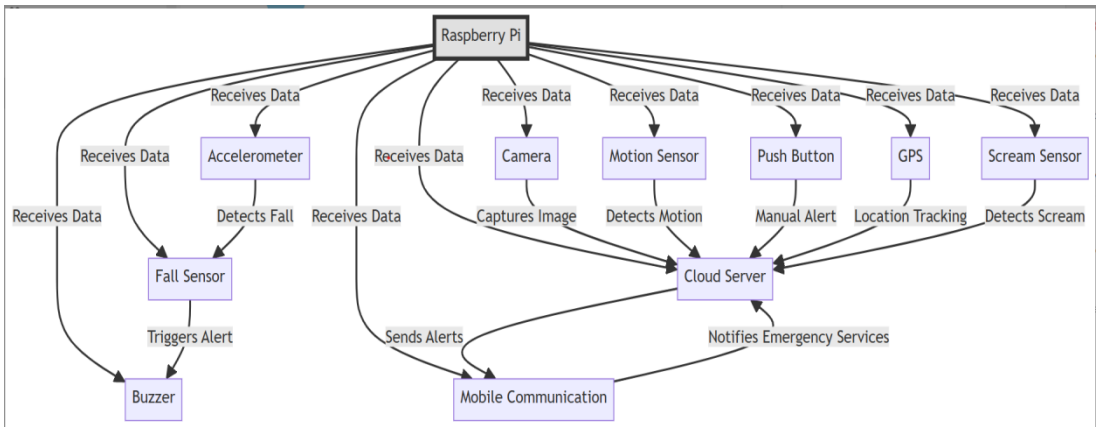


Fig.1.InternalArchitecture of The Women Safety Bangle.

To enable speedy emergency reaction, the women's safety system is designed to use Raspberry Pi and a set of IoT-based sensors. To detect abrupt falls, an accelerometer is paired with a fall sensor, which generates an aural buzzer alert. A camera combined with a motion sensor captures images and detects movement, allowing for real-time surveillance. In an emergency, a push button can be used to manually trigger alarms, but a scream sensor detects distress signals automatically. The GPS module allows real-time location tracking, ensuring immediate assistance. All collected data is sent to a cloud server, which then talks with emergency services and transmits alarms via mobile telecommunications networksthe method represents a proactive and efficient approach to enhancing women's safety.

III. RESULTS

A. A Telegram Bot For Emergency Warnings

The images depict a Telegram bot called "WSB_bot" that was created especially to send out emergency alarm information. The bot can receive and interpret a recorded audio file, as seen in the first image, and then analyze it to detect potential distress signs, such as screaming.

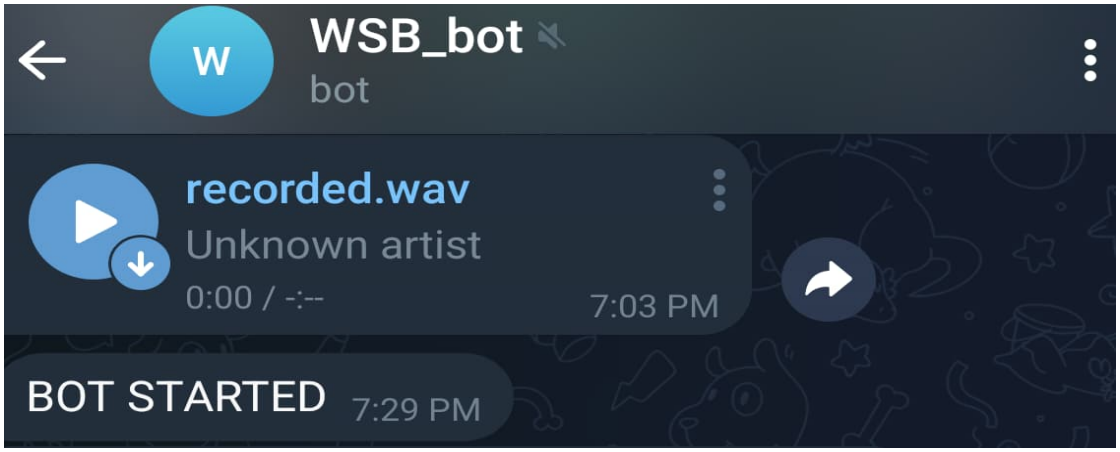


Fig.2.TELEGRAM BOT'S MICROPHONE FOR AUDIO RECORDING

B. Geolocation Tracking In Real Time

The second graphic demonstrates the bot's ability to use Google Maps to provide an emergency notification together with the victim's current position. The functionality makes it simple for authorities or emergency contacts to find the individual in difficulty and offer assistance.

C. Connectivity With Cloud Communication And IOT

This system is a component of a smart women's safety solution that uses cloud-based communication and Internet of Things technologies to deliver real-time notifications when a crisis signal is detected. The technology optimizes security and guarantees a timely reaction in the event of an emergency by integrating real-time alerts, position monitoring, and audio analysis.

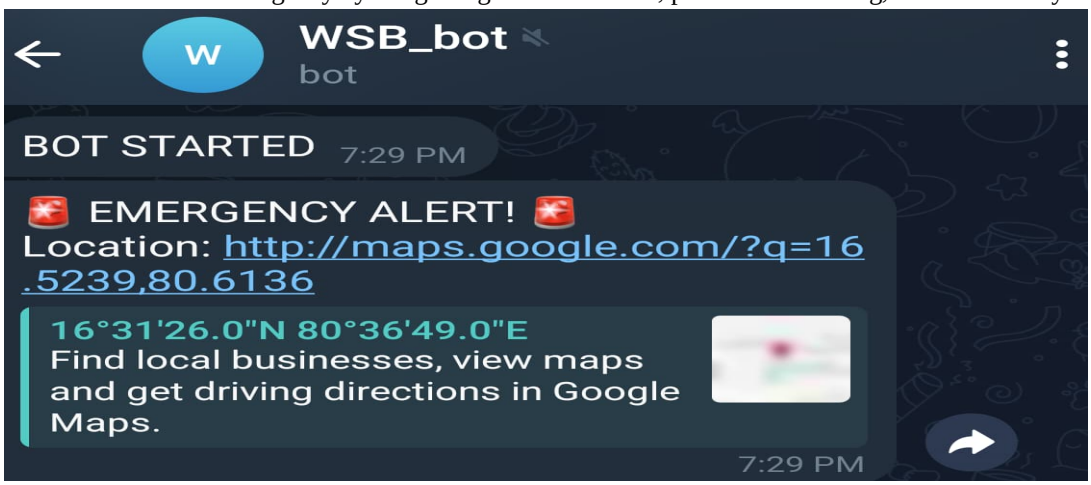


Fig.3.THE VICTIM'S GEOGRAPHIC LOCATION AS PROVIDED TO TELEGRAM BOT

D. Smart Security System Wearanle

The images depict a wearable, intelligent security gadget. Based on a Raspberry Pi, it senses movement, takes pictures, and sends out distress messages using a number of sensors and a camera.

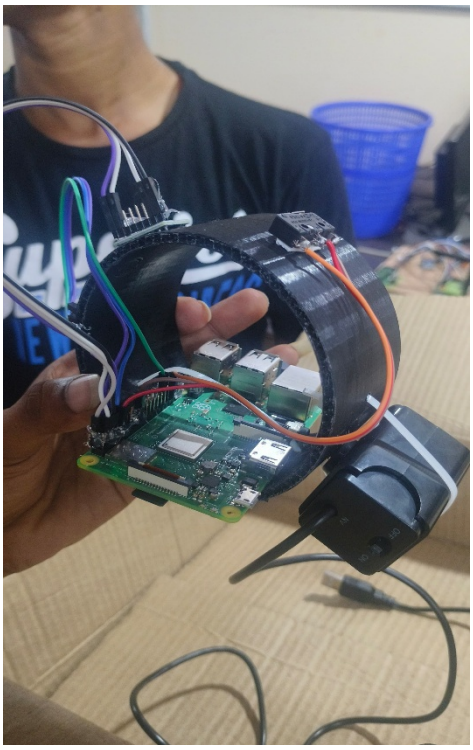


Fig.4.SAFETY BANGLE FOR SMART WOMEN

E. Alerting In Real Time With A Telegram Bot

If anything, strange or urgent occurs, the Telegram bot (WSB_bot) instantly alerts people with pictures, voice messages, and location data.

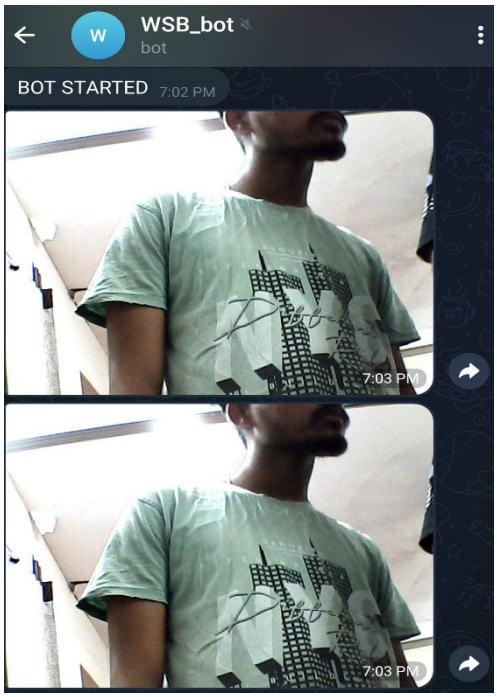


Fig.5.CAMERA PHOTOS OF THE VICTIM NEARBY

IV. FINAL RESULTS

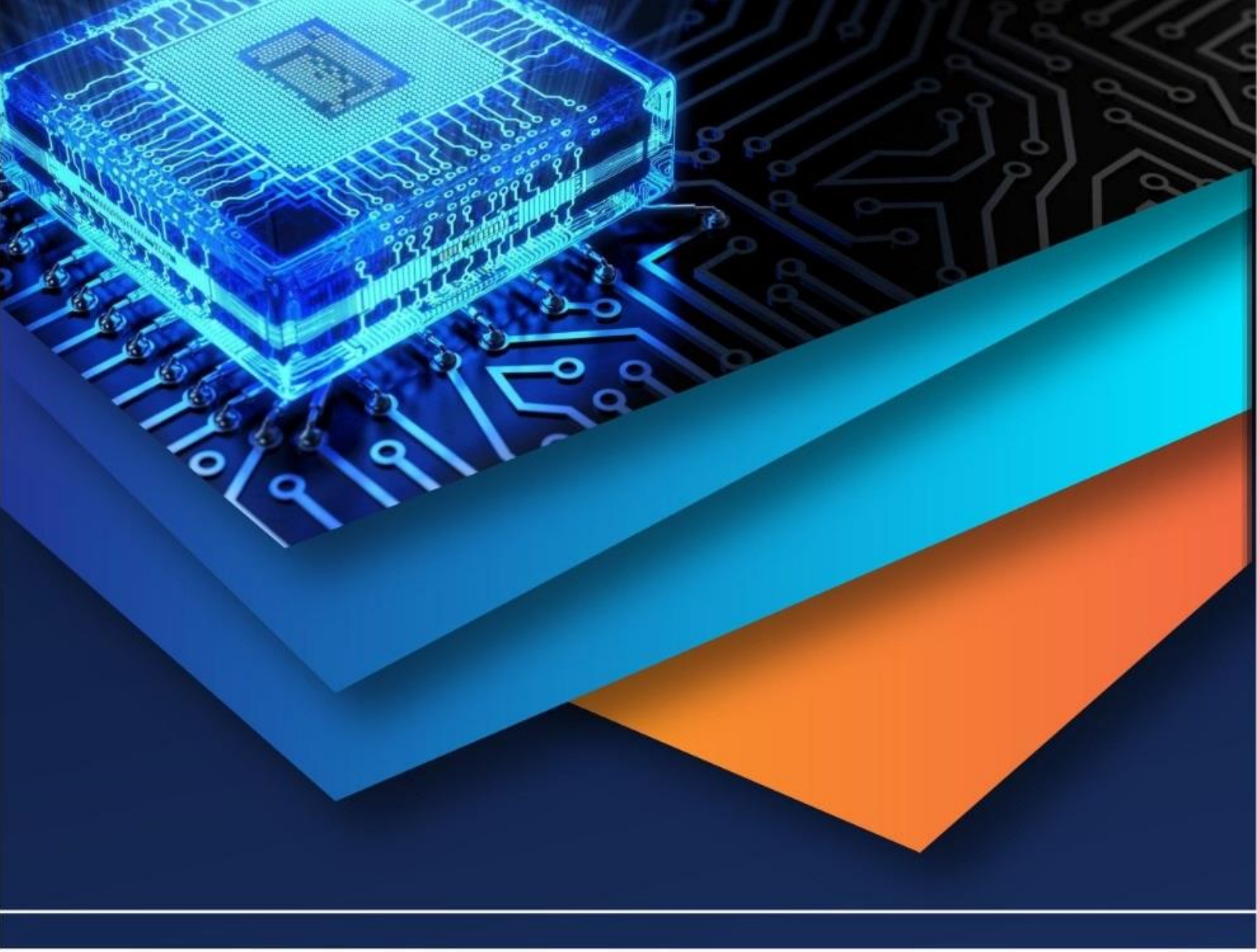
A significant advancement in improving worker safety across several sectors has been made with the creation of smart helmet technology. Smart helmets provide critical information on environmental conditions and potential threats by integrating technology such as sensors, real-time monitoring systems, and augmented reality. By enabling immediate communication and danger reporting, this technology enhances situational awareness and promotes a proactive safety culture. The recommended approach increases security, reduces the possibility of mishaps, and makes it easier to act quickly in dangerous situations. This smart helmet has the potential to revolutionize safety procedures in mining operations and other dangerous sectors through rigorous testing and validation procedures.

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