Smart Wearable Device for Women Safety using IBEACON Technology

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Abstract*: This paper presents a smart wearable device for women safety using IBEACON technology. The security of women is the most important concern these days and this device is to ensure a much safer environment for their protection and defend women in the event when they might face any danger. This proposed paper comprises of BLE- Wi-Fi supported Beacon module, AI controller and make use of MEMS accelerometer sensor to detect the abnormalities. In case of sexual harassment or an emergency situation, the accelerometer sensor detects shaking alert which is feed as a set threshold input. The device gets activated automatically by sending SMS alert as well as call alert to a predefined emergency contacts or authorities. The details of the affected person will be continuously transmitted to the beacon module interfaced with AI controller. Beacon module can scan and access any network connection irrespective of password protection so that the live location of the victim can be traced and monitored through the main cloud server without the Wi-Fi requirements of the victim in critical times. The proposed system with the help of panic switch, triggers buzzer which alerts the people around. The proposed framework is flexible, interoperable and without human interface results in improved accuracy effectively addressing the concern.*

Keywords: IBEACON Technology, MEMS Accelerometer Sensor, GPS, AI- Tensilica Controller

I. INTRODUCTION

Since women have major role in the bright future of the society,their safety is of utmost concern. The issue of women's safety has always been in the limelight, whether it's domestic violence, work, or street harassment. Many crimes against them are not being reported because of society's hypocritical point of view. In the past twenty years, increased Internet penetration has changed the dynamics of our society by creating awareness amongst the masses and ultimately encouraging women's empowerment. Women who used to stay at home attending to domestic duties are now actively participating in all sectors contributing to the economic development of a country. However, even after increased visibility of women in public and workplaces, women continue to experience physical and verbal harassment. The purpose of this project is to design a compact device to help any woman in danger. Our main focus is on designing a prototype so that the device can be easily integrated and carried around. This system is completely user-friendly, portable and quick-responding model as compared to already existing women security solutions. This proposed system makes an attempt to protect the woman in danger at the exact time, such that she can save herself.

In existing system Node MCU microcontroller, GPS and software application is used. The entire system depends on pressure, pulse-rate, and temperature sensors are being activated. When any of the two above mentioned sensor activates, the buzzer is activated to alert people around her that the woman is in a dangerous situation and then the location of the woman is detected using the GPS module and GSM is used to send the message to the relatives.

Section II: To describe the Objective of the project, Section III: Literature survey of the project, Section IV: Methodology of the project, Section V: Advantages of the project., Section VI: Verification and Results, Section VII: Conclusion and Future Scope and Section VIII: References.

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II. OBJECTIVE

This project aims to design and fabricate a gadget which is so compact in itself that provide advantage of safety system. The basic approach is to detect the safety of women and rescue them in the time of danger by tracking the live location of the person by extracting the longitude and latitude of that target person. And this proposed system conveys the instant location, distress message and emergency call to the registered emergency numbers, so that unfortunate incident can be averted and this provide real time evidence for the action against the committers of crime. The alert and tracking system is providing a highly reliable security system for women. This system is durable and provide consistent results.

i. Provide integrity, confidentiality and security to user's data through main cloud server which manage all synchronized data.

ii. To collect dataset containing their information of prime contacts and to alert them in case of danger.

iii. The emergency response system which is helpful for women in the incidents of crime and preventing atrocities against women.

III. LITERATURE SURVEY

Alrluu Kavya, Umamaheswari, Karmel, Shruthi - The paper titled as "Internet of Things Based Security Device for Women in Danger". This paper aims to defend the women in danger by using an electronic gadget to recognize the problem and caution the surroundings, saving them on time. This paper recommends another perspective to utilize innovation to ensure ladies assistance with smart phones with an incorporated component that alarms and gives location-based data. This paper presents a modeled gadget with Global Positioning System and Global System for Mobile Communication -based Women Security Device, which provides the blend of GPS gadgets just as a handheld device and "I am in trouble please help me!" message, is sent when a button is triggered. This application assistance is created in android with Graphical User Interface; it gives the degree of quality, accessibility, and similarity. The results provided in this paper show the customized message sent when the button is pressed with the exact location.

Tunggadewi, Elsyea, Eva Inaiyah, and Yunardi Riky Tri -The paper titled as "A Smart Wearable Device Based on Internet of Things for The Safety of Children in Online Transportation". The aim of this project is to build a device that can protect both women and children from violence. It uses Push Button, Raspberry Pi, camera, GPS, and GSM module. Whenever the woman or the child is in danger, they can activate the device by using a push button. The raspberry pi will activate the camera module which captures the image of the person who is assaulting the woman. The captured image is stored in the server which can be accessed in the mobile app by the family members and the people who have access to the server. For emergency purposes, the device will send both image and location. Which can be received through telegram and it can be accessed by family members.

Sunehra, Dhiraj, V. Sai Sreshta, V. Shashank, and B. Uday Kumar Goud - The paper titled as "Raspberry Pi Based Smart Wearable Device for Women Safety using GPS and GSM Technology". This project includes a Raspberry Pi 3 Model B+ board, a GPS module, a GSM module for SMS alerts, a USB camera, a buzzer, and a push button switch that serves as a panic button. The Raspberry Pi 3 Model B+ board is used to run programs and control other system components. The GPS module is used to locate the user, and the GSM module is used to send an SMS alert to an emergency contact and the police about the user's location. After pressing the panic button, the USB camera captures an image of the user and his surroundings and sends it as an E-mail alert to the emergency contact. Furthermore, the USB web camera captures images of the victim, the assault, and the surroundings and sends them to the appropriate authorities via email. The location link can also be used to access Google Maps.

Tejesh, B. S. S., Yarabarla Mohan, R. Sai Rishitha, and B. Purvaja Durga -The paper titled as "A Smart Women Protection System using IOT and Open-Source Technology". The aim of this project is to provide safeguards for women in all conditions of aspects of tracking, and recording, and to provide self-defense for women. The project uses Accelerometer, flex sensor, Fingerprint module, buzzer, ESP8266 nerve simulator, camera, GPS, GSM, Mic, and speaker, and Raspberry pi module. When the woman is in danger and holds her finger on the fingerprint module for a particular amount of time the device will be activated otherwise the device will be disabled. The Raspberry pi is activating the GPS, GSM, Mic, camera, and sensors. The GPS will locate the women and send a message to the

emergency contacts through the GSM module. The status of what's happening with the women will be recorded on the server. The nerve simulator is used to provide a shock to the attacker its acts as self-defense for the women.

Tejonidhi, M. R., Chaithra KS Aishwarya, M. K. Dayana, and H. Nagamma - The paper titled as "IOT Based Smart Security Gadget for Women's Safety". In this project author deals with IOT based smart security gadget for women's safety. To accomplish this, the device includes a pulse rate sensor, GPS, GSM ADXL Motion Sensor, ADC, and alarm buzzer. All of the sensors are linked to a Raspberry Pi, which serves as the central controller. When the button is pressed, if the preset threshold values are met, the alarm buzzer activates and emits a loud sound to alert people nearby. An emergency alert message containing the location will also be sent to the predefined numbers. When the smart band's button is pressed, the readings are continuously sent to the Raspberry Pi, which compares the values to the threshold values given to it then the following actions are triggered. The message and ring are sent to the GSM pre-programmed numbers.

IV. METHODOLOGY

The proposed system is based on AI- Tensilica Controller instead of using a Node MCU microcontroller. This project puts forward an approach to design a smart wearable device for the women safety which incorporates with IBEACON technology and MEMS Accelerometer sensor. When the accelerometer sensor detects shaking alert which is feed as an input then the device will be activate automatically by sending SMS alert as well as call alert to a predefined emergency numbers or authorities. And the users data will be continuously transmitted to the ibeacon module connected with AI controller, it helps to monitor and track the location of the victim through main cloud server which manage all synchronized data. This proposed system integrates with panic switch which triggers buzzer results loud alarm alert.
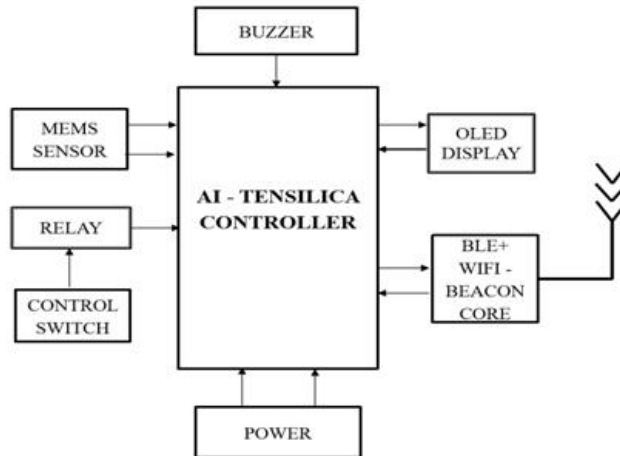

Fig:1 Block Diagram of the Transmitter

Fig:2 Block Diagram of the Receiver

AI- Tensilica Microcontroller: The AI-Tensilica's controller comes with an on-chip 32-bit microcontroller with supports Wi-Fi + Bluetooth + BLE features that targets a wide range of applications. It is a series of low-power and low-cost developed by **Espressif Systems.** It comes with 448 KB of ROM, 520 KB of on-chip SRAM, and 4MB of Flash Memory. On-chip Wi-Fi supports 802.11b/g/n standard and also supports Bluetooth v4.2 BR/EDR and Bluetooth LE specifications this dual mode of Bluetooth makes it even more versatile.

Fig:3 AI- Tensilica Microcontroller

IBEACON MODULE: An iBeacon is a radio transmitter on Bluetooth Low Energy. Bluetooth Low Energy is a wireless personal area network technology used for transmitting data over short distances. As the name implies, it's designed for low energy consumption and cost, while maintaining a communication range similar to that of its predecessor, Classic Bluetooth. An iBeacon broadcast has the ability to approximate when a user has entered, exited, or lingered in region. It can be used to monitor the location. IBeacon can transmit packets of data in regular intervals of time, and this data can be picked up by devices like smart phones having a particular app.
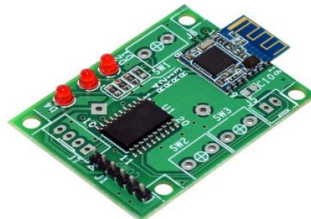

Fig:4 IBEACON Module

MEMS ACCELEROMETER SENSOR: MEMS Accelerometer is a device that measures the vibration, or acceleration of motion of a body. The force caused by vibration or a change in motion of the body causes the mass to squeeze the piezoelectric material which produces an electrical charge proportional to the force exerted upon it.
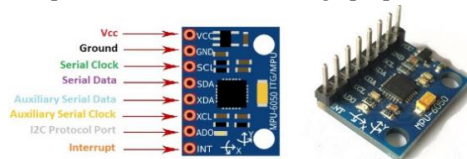

Fig:5 MEMS Accelerometer Sensor

OLED DISPLAY: The organic light-emitting diode (OLED), also known as organic electroluminescent (organic EL) diode, is a light-emitting diode (LED) in which the emissive electroluminescent layer is a film of organic compound that emits light in response to an electric current.

Fig:6 OLED Display

POWER SUPPLY: Linear regulated power supply having 5V output which will be useful for driving the other components in the circuit like microcontroller. A module should not be inserted or removed from a live circuit. The ground terminal of the power supply must be isolated properly so that no voltage is induced in it. The module should be isolated from the other circuits, so that stray voltages are not induced, which could cause a flickering display.
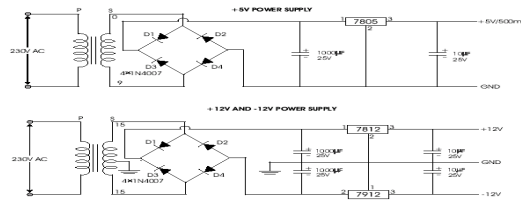
Fig 7 Power supply

BUZZER: Buzzer is a basic audio device that generates a sound from an incoming electrical signal. It is small PCB mountable and usually powered by DC voltage, works on 5V supply. It is widely used in alarms, computers, printers and other electronic products as sound devices.

Fig:8 Buzzer

CONTROL SWITCH: Control switch is an electronic device which is used in emergency situation to alert someone when the victim is in danger. This device gets activated when an individual call for help. It is a resistive sensor and cannot get stable data.

Fig:9 Control Switch

ANDROID PHONE: An Android cell phone is a cell phone running the Android OS. A typical Android cell phone is a smart phone with touch screen interface, multiple connectivity options, internet browsing capabilities.

RELAY: A type of relay that can handle the high power required to directly control an electric motor or other loads is called a contactor. Solid-state relays control power circuits with no moving parts, instead using a semiconductor device to perform switching. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called "protective relays".

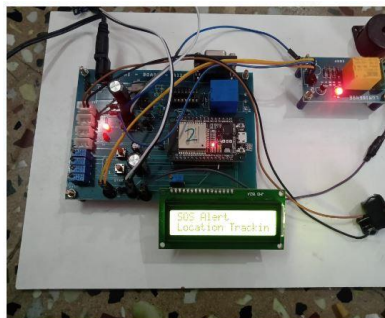

Fig:10 Relay Driver

V. VERIFICATION AND RESULTS

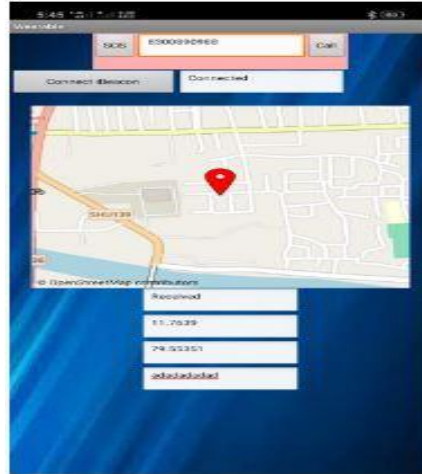
Fig:11 Hardware Prototype of Proposed System

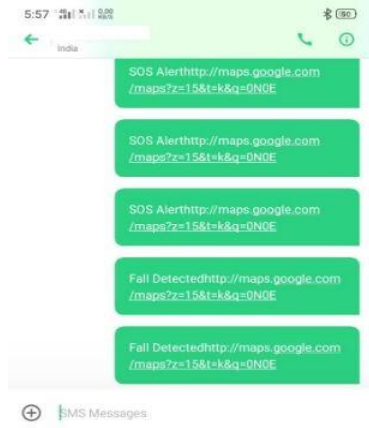**Fig:12 IBEACON Application**
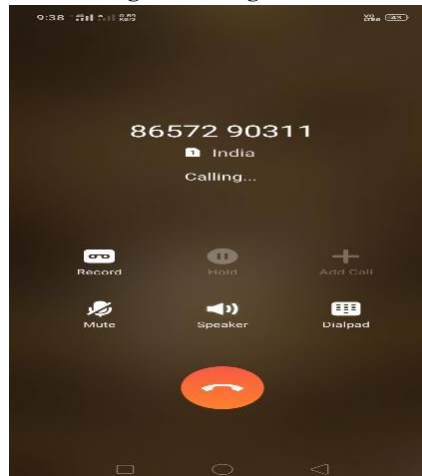

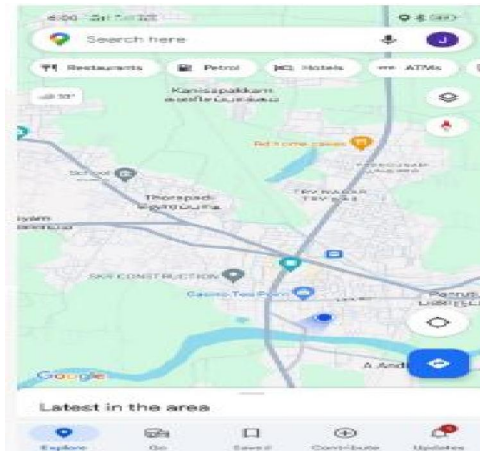**Fig:13 Message Alert**

Fig:14 Call Alert

Fig:15 Location Tracking

VI. ADVANTAGES

- The positioning is more accuracy in the system.
- Need not require active internet connection.
- IBEACON technology can scan and access any network connection irrespective of password protection.
- Able to track the victim even device is lost.
- User-friendly interface.

VII. CONCLUSION AND FUTURE SCOPE

By implementing a novel architecture for tracking and alerting women by an upgraded device, we can help women in distress situations. Thus, the proposed framework provides a smart safety device for women more portable and comfortable which safeguard and prevents damage in times of danger. iBeacon is used in many real time applications due to its low-cost consumption, high data rate and high-power efficiency that will accessorize and serve as a multifunctional device.

In future following features can be added to the project and enhance by including camera module, the video of the culprit can be produced as a piece of evidence in the court and developed with capabilities like sending group messages, audio recording and identifying nearby safe location in map. Also customizing this ibeacon app in nearby police stations, women help groups and nearby NGOs, they can be at the crime scene within minutes.

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