WOMEN SAFETY WEARABLE DEVICE USING IOT

A PROJECT REPORT

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In partial fulfilment for the award of the degree

of

BACHELOR OF ENGINEERING

In

ELECTRONICS AND COMMUNICATION ENGINEERING

JEPPIAAR INSTITUTE OF TECHNOLOGY, SRIPERUMBUDUR, CHENNAI

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MAY 2024

BONAFIDE CERTIFICATE

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ACKNOWLEDGEMENT

We wish to express our sincere gratitude to parents for their valuable help, cooperation and encouragement during this project work.

Our sincere thanks to Managing Director **Dr.N.Marie Wilson ,B.Tech ,MBA .,PhD ,** Jeppiaar Institute of Technology for facilitating us do this project and we were grateful to him for being a source of inspiration.

We sincerely thank **Dr.Mannarsami ,B.E,** Principal, Jeppiaar Institute of Technology for encouraging our endeavours for this project.

We sincerely thank **Dr. W.Nancy,M.E.,Ph.D,** Professor and Head of Department , Department of ECE, Jeppiaar Institute of Technology for her support throughout the review.

We are grateful to our project coordinator and internal guide **Dr.D.Kumutha ,M.E.,Ph.D,** Professor, Department of ECE ,Jeppiaar Institute of Technology for her valuable suggestions for our project.

We also wish to extend our sincere thanks to all the committee members for their constant support throughout the review.

Last, but not least, we wish to express our sincere thanks to the entire teaching faculty and non -teaching staff for their support and suggestions in helping us successfully to complete this project.

ABSTRACT

This project aims the development of devices and systems that leverage the connectivity and data processing capabilities of IoT to enhance the safety of women in various scenarios. Women's safety is a pressing concern in today's society and the advancement of IoT technology offers a promising solution. The project is to design a system to detect potential threats, alert emergency services, measures blood pressure and temperature, provide real-time tracking for loved ones. It employs IoT sensors for environmental monitoring and wearable devices for individual tracking. A secure cloud infrastructure collects, stores and processes data, emphasizing data integrity and security. Machine learning algorithms analyze the data, identifying potential safety risks and detecting unusual patterns. The device features a versatile alert system communicating through SMS or email, ensuring swift responses in emergencies. The system is designed for scalability, integrating with existing safety structures, and undergoes rigorous testing for reliability. The wearable device offers a holistic safety solution and the integration of machine learning ensures proactive threat detection. A user-friendly interface enables easy monitoring and settings management. By combining IoT, cloud technology and machine learning, it aims to create a robust and adaptable safety system, fostering a safer environment for women in various scenarios.

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LIST OF ABBREVIATION

IOT - INTERNET OF THINGS

ESP32 CONTROLLER - ESPRESSIF SYSTEMS

ARDUINO IDE - ARDUINO INTEGRATED DEVELOPMENT ENVIRONMENT

WI-FI - WIRELESS FIDELITY

MCU - MICRO-CONTROLLER UNIT

PSC - POWER SUPPLY UNIT

AC - ALTERNATING CURRENT

DC - DIRECT CURRENT

IC - INTEGRATED CIRCUIT

HTML - HYPERTEXT MARKUP LANGUAGE

TX/RX - TRANSMITTER/RECEIVER

RX - RECEIVER

ACK - ACKNOWLEDGEMENT

TSF - TEMPORARY STORAGE FACILITY

SOFTAP - SOFT ACCESS POINT

BR/EDR - BLUETOOTH BASIC RATE

WSWD - WOMEN SAFETY WEARABLE DEVICE

GPS - GLOBAL POSITIONING SYSTEM

SOS - SAVE OUR SOULS OR SAVE OUR SHIP (EMERGENCY SIGNAL)

RFID - RADIO FREQUENCY IDENTIFICATION

GSM : GLOBAL SYSTEM FOR MOBILE COMMUNICATIONS

IMU : INERTIAL MEASUREMENT UNIT

BLE - BLUETOOTH LOW ENERGY

USB - UNIVERSAL SERIAL BUS

LCD - LIQUID CRYSTAL DISPLAY

NFC - NEAR FIELD COMMUNICATION

WAN - WIDE AREA NETWORK

LAN - LOCAL AREA NETWORK

SIM - SUBSCRIBER IDENTITY MODULE

EMI - ELECTROMAGNETIC INTERFERENCE

MEMS - MICRO-ELECTRO-MECHANICAL SYSTEMS

IP - INTERNET PROTOCOL

RF - RADIO FREQUENCY

CPU - CENTRAL PROCESSING UNIT

RAM - RANDOM ACCESS MEMORY

ROM - READ-ONLY MEMORY

RTOS - REAL-TIME OPERATING SYSTEM

CAD - COMPUTER-AIDED DESIGN

CAM - COMPUTER-AIDED MANUFACTURING

PCB - PRINTED CIRCUIT BOARD

AI - ARTIFICIAL INTELLIGENCE

ML - MACHINE LEARNING

SDIO - SECURE DIGITAL INPUT OUTPUT

SPI - SERIAL PERIPHERAL INTERFACE

UART - UNIVERSAL ASYNCHRONOUS RECEIVER - TRANSMITTER

SCO - SYNCHRONOUS CONNECTION ORIENTED

CVSD - CONTINUOUSLY VARIABLE SLOPE DELTA MODULATION

SBC - SAFE BEARING CAPACITY

MIPS - MILLION INSTRUCTIONS PER SECOND

KB - KILOBITE

SRAM - STATIC RANDOM ACCESS MEMORY

RTC - REAL TIME CLOCK

QSPI - QUAD SERIAL PERIPHERAL INTERFACE

RC - RADIO CONTROL/ REMOTE CONTROL

GPIO - GENERAL PURPOSE INPUT/OUTPUT

SAR ADC - SUCCESSIVE APPROXIMATION REGISTER - ANALOG TO DIGITAL CONVERTER

DAC - DIGITAL TO ANALOG CONVERTER

FS - FUNCTIONAL SPECIFICATION

FC - FLOW CONTROLLER

eMMC - EMBEDDED MULTIMEDIA CARD

MAC - MEDIA ACCESS CONTROL

DMA - DIRECT MEMORY ACCESS

IEEE - INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS TWAI - TWO WIRE AUTOMOTIVE INTERFACE

IR - INFRARED RADIATION

PWM - PULSE WIDTH MODULATION

OTP - ONE TIME PROGRAMMABLE MEMORY

AES(SHA-2) - ADVANCED ENCRYPTION STANDARD (SECURE HASH ALGORITHM 2)

RNG - RANDOM NUMBER GENERATOR

ECC - ERROR CORRECTION CODE MEMORY

RSA - RIVEST-SHAMIR-ADLEMAN

CPU - CENTRAL PROCESSING UNIT

DSP - DIGITAL SIGNAL PROCESSORS

JTAG - JOINT TEST ACTION GROUP

UNO - UNLESS NOTED OTHERWISE

USB - UNIVERSAL SERIAL BUS

MRI - MAGNETIC RESONANCE IMAGING

LED - LIGHT EMITTING DIODE

IRED - INFRARED EMITTING DIODE

PSU - POWER SUPPLY UNIT

SMPS - SWITCHED MODE POWER SUPPLY

WSDL - WEB SERVICES DESCRIPTION LANGUAGE

CHAPTER 1

INTRODUCTION

The emergence of women's safety patrolling wearable sensors signifies a significant technological advancement aimed at bolstering personal safety and security for women. These wearables harness the capabilities of Internet of Things (IoT) technology to furnish real-time monitoring and alert functionalities, ready to be activated in emergencies. Their introduction addresses the escalating necessity for women to feel secure in public domains, particularly amidst rising incidents of harassment and violence.

Key components integral to these wearable safety systems encompass:

1. **GPS Tracking**: Employing cutting-edge embedded systems equipped with GPS technology, these devices track the wearer's location, facilitating swift responses from emergency services when necessary.
2. **Messaging Functionality**: Integrated messaging features enable the transmission of alerts to nearby patrol systems and mobile phones, signaling distress and summoning assistance.

Designed with discretion in mind, these safety systems are inconspicuous, allowing women to wear them without attracting undue attention. Equipped with sensors adept at detecting unusual behavior or movements, the systems activate safety protocols autonomously. This automated response mechanism ensures prompt assistance delivery without the need for manual activation, a potentially daunting task in stressful or perilous situations.

The development and deployment of wearable safety systems for women epitomize broader endeavors to combat gender-based violence and harassment. By furnishing women

with tools to fortify their safety, these systems foster empowerment and contribute to fostering a safer environment for all individuals.

1.1 EXISTING SYSTEM:

In exist ,the recognition of women's wearable safety using IoT technology builds upon existing systems to enhance personal security. By integrating IoT sensors into wearable devices, real-time data on the user's surroundings and physical condition can be collected. This data is then processed using machine learning algorithms to recognize patterns indicative of potential threats or emergencies. Leveraging existing systems such as GPS trackers and communication networks enables swift alerting of authorities or designated contacts in case of danger. Additionally, incorporating features like voice recognition or biometric authentication adds layers of security to the wearable device. Overall, this recognition system augments traditional safety measures with IoT technology, providing women with an advanced and proactive means of personal protection.

CHAPTER 2

LITERATURE SURVEY

Hyndavi V. and Sai Nikhita N. **[1]** The number of crimes committed against women has been steadily increasing, and reports of molestation, eve-teasing, and rape incidents in public spaces are common. These days, women's security is the top priority, therefore creating a safety device that can save lives and shield people from damage in an emergency is vital, especially for women. This study proposes a smart device for women's safety that uses temperature, pressure, and pulse-rate sensors to automate the emergency warning system and use outlier detection to automatically identify a potential atrocity. Without requiring the woman, this method finds the women's location coordinates and sends alerts to her loved ones.

Divakara Rao and Koppula Srinivas Rao **[2]** The study tackles the growing problem of women's safety, especially in India, and suggests a wearable technology known as Smart Wearable Equipment (SWD) as a remedy. This gadget makes use of Internet of Things (IoT) technology, combining machine learning techniques with features like a GPS sensor and piezo buzzer. When turned on, the SWD notifies contacts of the user's location, phones relatives and law enforcement, and sounds a high-pitched alarm to warn those in the vicinity. It makes use of real-time datasets to increase accuracy and seeks to further improve efficacy through deep learning techniques. The ultimate goal of the SWD is to give women better safety precautions under trying circumstances.

Sunil Nayak and Dhruv Chand **[3]** In India and other nations, women's safety is becoming an increasingly pressing concern. Constraints that hinder law enforcement officials from promptly responding to distress calls are the main problem in the way they handle these cases. These limitations include the victim's lack of knowledge about the crime's location and its actual commission; it can be difficult for them to confidently and covertly contact the police. This study introduces a smartphone application called WoSApp (Women's Safety App), which gives women a dependable means to call the police in an emergency, in an effort to help remove these limitations. By subtly shaking her phone, the user can quickly and conveniently activate the calling feature.

Shwetambari and Athalbari Parbalkar [4] This study describes the development of a robust and trustworthy safety device that may notify family members and law enforcement in case of an emergency. The system tracks the user's location using GPS and GSM modules and sends a text message with the location to the relevant authorities. An RF module is further provided to reduce the overall size of the control circuitry. The main objective of this project is to provide an approachable personal security system to address significant safety concerns faced by women. Comparing this proposed system to existing ones that depend on internet-connected apps or car tracking, it is easier to use and more direct. When a user provides the latitude and longitude of their position, which can be monitored utilizing Google Maps, the system aims to reduce crime rates against women through real-time implementation.

Gholap P. S. and Saurabh Pansare, Dr. **[5]** In our society, are women incapable of leading independent lives? Every day, especially in big cities, there are a rising number of

reports of rapes, physical abuse, and other acts of violence against women. Despite the presence of CCTV, the attacker could not be identified at the time of the attack. The purpose of this article is to empower women to become self-sufficient through the use of technology, hence reducing the amount of crimes against Indian women and girls. The application concept reveals a practical, effective, and portable solution that can help women enjoy safe, independent lives. The Internet of Things uses force-sensitive resistors, impact sensors, LCDs, Bluetooth modules, SIM 800 GSM modules, and other components to bring everything that humanity has created and implemented together.

CHAPTER 3

PROPOSED SYSTEM

To propose a women's safety management system using IoT and a cloud server, several components and steps are typically considered. These include the utilization of a range of IoT sensors and devices such as GSM, and heart rate monitors to monitor both the environment and individual status. Additionally, establishing a cloud server is essential to collect, store, and process data from these devices, ensuring data integrity, security, and accessibility. Implementing machine learning algorithms aids in analyzing collected data, predicting safety risks, and detecting unusual patterns. Developing an alert and notification system is crucial to send alerts via SMS, push notifications in case of safety threats. Creating a user-friendly interface enables users to monitor safety status, control IoT devices, and manage safety settings. Scalability, easy maintenance, and updates are vital design considerations for accommodating growing user numbers. Integration with existing safety systems like emergency response services ensures a comprehensive safety solution. Thorough testing and validation are conducted to ensure reliable system functionality, with user training and support provided to ensure effective system utilization and response to safety alerts.

3.1 BLOCK DIAGRAM:

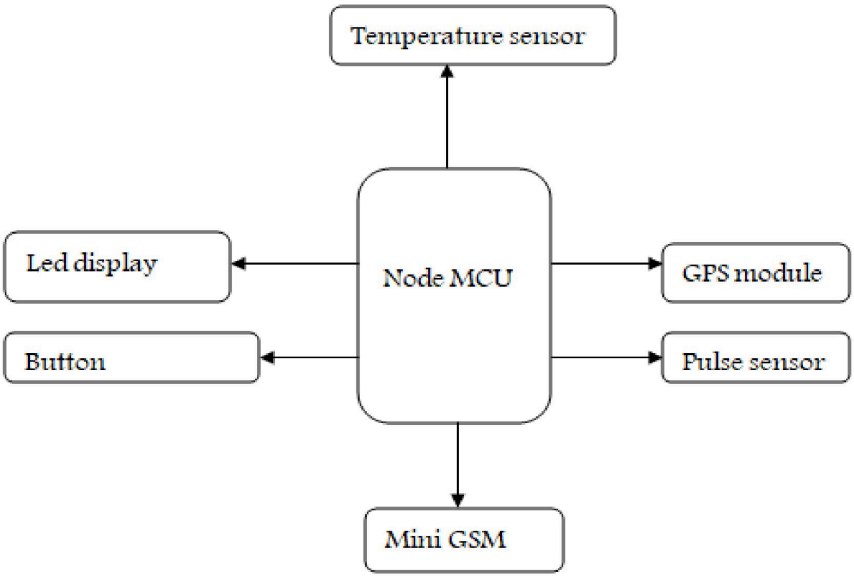

FIGURE 3.1 BLOCK DIAGRAM OF PROPOSED SYSTEM

3.2 HARDWARE REQUIREMENTS:

- Pulse sensor
- Node MCU
- Button
- Led display
- Mini GSM
- GPS module
- Temperature sensor

CHAPTER 4

HARDWARE DESCRIPTION

4.1 MICROCONTROLLER ESP32:

The ESP32 family of microcontrollers is a low-cost, low-power module that incorporates dual-mode Bluetooth and Wi-Fi. A dual-core or single-core Tensilica Xtensa LX6 microprocessor, a dual-core Xtensa LX7 microprocessor, or a single-core RISC-V microprocessor are used in the ESP32 series. Included are filters, power-management modules, RF baluns, antenna switches, power amplifiers, low-noise receive amplifiers, and filters. Based in Shanghai, China, Espressif Systems is the creator and developer of ESP32. TSMC uses their 40 nm technology to manufacture the chip.

FIGURE 4.1 MICROCONTROLLER ESP32

4.1.1 Features of ESP32:

- 32-bit, single- or dual-core LX6 microprocessor with a maximum clock frequency of 240 MHz .

- 520 KB of SRAM, 448 KB of ROM, and 16 KB of RTC SRAM.
- Capable of providing Wi-Fi connectivity at up to 150 Mbps using 802.11 b/g/n.
- Both BLE and Classic Bluetooth v4.2 are supported.

4.1.2 BLOCK DIAGRAM:

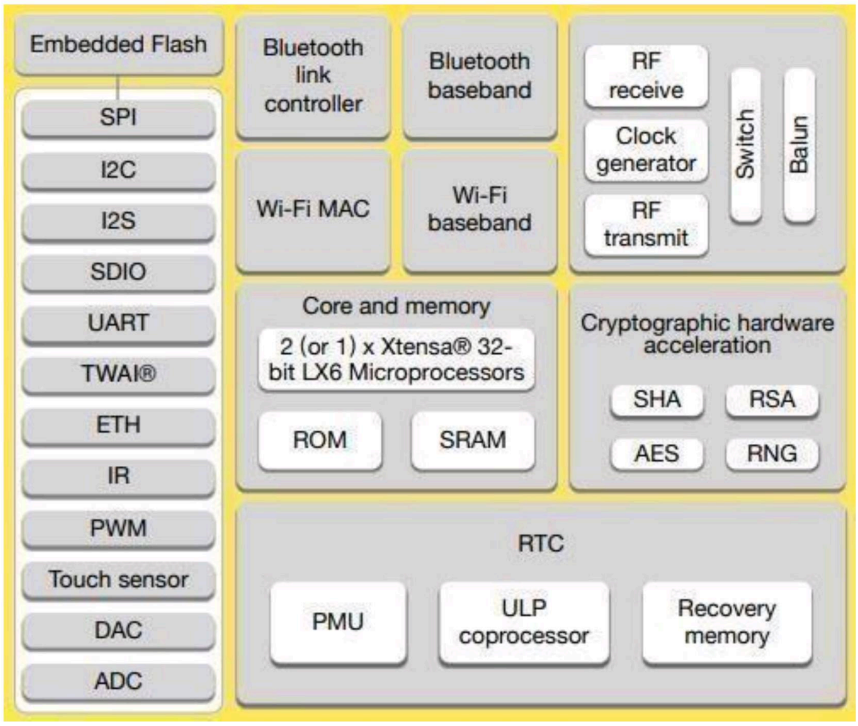

FIGURE 4. 1.2 BLOCK DIAGRAM OF ESP32

4.2 POWER SUPPLY - ADAPTER:

4.2.1 DESCRIPTION:

An electrical power adapter can facilitate the linking of a power plug, also known as a plug adapter, from one area to another by providing connections for the different contact

configurations, without altering the voltage. Often referred to as a "recharger," an AC adapter is a tiny power source that converts distribution voltage (the electricity used in homes) to low voltage DC that is appropriate for consumer devices. Some change the characteristics of power or signal, while others only change the physical design of an electrical connector. One type of serial port adapter allows connections between 25-contact and nine-contact connectors for computers and similar devices, although it has no effect on signaling or electrical power characteristics.

FIG 4.2.1 ADAPTER

4.2.2 FEATURES:

- Supply voltage: 220-230VAC
- Output voltage: 12VDC
- Value across front- and back-office functions increased
- Output current: 1A

4.2.3 APPLICATIONS:

- When purchasing order data needs to be sent to Oracle applications, back-end systems use the integration server client to deliver it to the integration service.

- SMPs applications.

4.3PULSE SENSOR:

4.3.1 DESCRIPTION:

The pulse sensor is a compact device that gauges heart rate by sensing the rhythmic blood flow in the body. Utilizing an optical sensor positioned on the skin, it detects variations in blood volume prompted by the heartbeat. These fluctuations are then converted into electronic signals, allowing for the calculation of heart rate, commonly displayed in beats per minute (BPM). Pulse sensors find applications in medical monitoring and wearable fitness trackers, aiding in the tracking of heart rate and overall health.

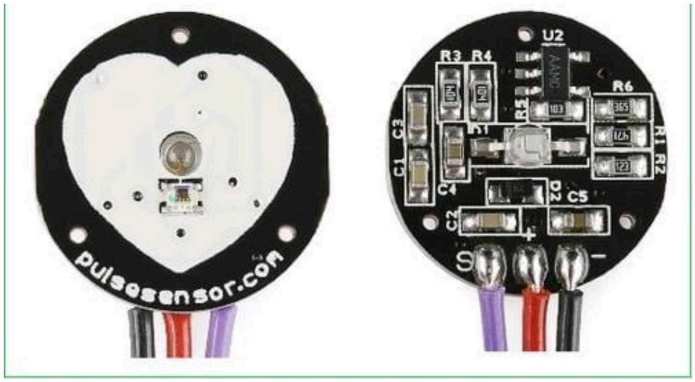

FIGURE 4.3.1 PULSE SENSOR

4.3.2. FEATURES:

- Operating Voltage: +5V or +3.3V
- Current Consumption: 4mA
- Inbuilt Amplification and Noise cancellation circuit.

- Diameter: 0.625”
- Thickness: 0.125” Thick

4.3.3 APPLICATIONS:

- Medical Monitoring
- Stress Management
- Sleep Monitoring
- Biofeedback Therapy

4.4 TEMPERATURE SENSOR:

A temperature sensor is a device used to measure the temperature of its surroundings and convert it into a numerical value. It typically consists of a sensing element that detects changes in temperature and a processing unit that converts these changes into a readable output. Temperature sensors are available in various types, including thermocouples, resistance temperature detectors (RTDs), thermistors, and semiconductor-based sensors like integrated circuit (IC) temperature sensors. They are widely used in industrial processes, environmental monitoring, HVAC systems, medical devices, automotive applications, and consumer electronics for precise temperature measurement and control.

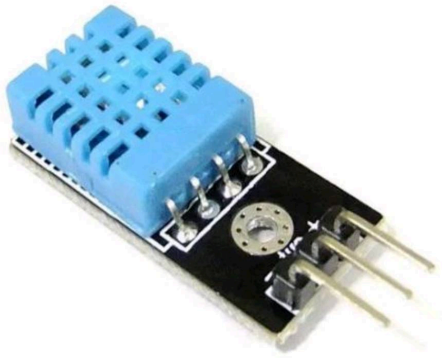

FIGURE 4.4.TEMPERATURE SENSOR

4.4.1 FEATURES:

- Temperature Range: -40°C to 125°C
- Accuracy: ±0.5°C
- Resolution: 0.1°C
- Response Time: <100 milliseconds
- Supply Voltage: 2.7V to 5.5V
- Output Interface: Digital (I2C, SPI) or Analog (Voltage or Current)
- Operating Current: 100µA to 1mA

4.4.2 APPLICATIONS:

- Industrial Processes
- HVAC Systems
- Automotive
- Environmental Monitoring
- Medical Devices

- Consumer Electronics
- Food Safety

4.5 GLOBAL POSITIONING SYSTEM:

Global Positioning System, is a satellite-based navigation system initially developed by the United States Department of Defense for military applications. It consists of a network of at least 24 satellites orbiting the Earth, each continuously transmitting signals that can be picked up by GPS receivers on the ground or in various devices.

These receivers calculate their precise location by triangulating signals from multiple satellites. With signals from at least four satellites, the receiver can determine its latitude, longitude, altitude, and time. This information allows users to pinpoint their exact location and navigate effectively.

FIGURE 4.5 GPS

4.5.1 FEATURES:

- Position accuracy: 2 to 10 m
- Number of channels : 12 to 15

- Update rate: 1 Hz to 10 Hz
- Power Consumption: 10 to 100 milliwatts

4.5.2 APPLICATIONS:

- Navigation Systems
- Mapping and Surveying
- Emergency Response
- Precision Agriculture
- Logistics and Fleet Management

4.6 GSM

Global System for Mobile Communications, is a standard for digital cellular networks used for voice and data services. It's one of the most widely used mobile communication technologies globally. GSM networks operate using a combination of frequency division multiple access (FDMA) and time division multiple access (TDMA) techniques to allocate channels and manage multiple users. GSM facilitates features like SMS (Short Message Service) and provides a platform for mobile internet access. It's a foundational technology for 2G, 3G, and some early 4G networks, offering improved voice quality, encryption for secure communication, and international roaming capabilities.

FIGURE 4.6 GPS

4.6.1 FEATURES:

- Power Supply: 3.3V to 5 V
- Frequency Band : 850MHz to 1900 MHz
- SIM card interface
- Support sleep mode to conserve power

4.6.2 APPLICATIONS:

- Mobile Communication
- Internet Access
- Location Tracking
- Remote Monitoring and Control
- Telemetry and Machine-to-Machine Communication (M2M)

CHAPTER 5

INTERNET OF THINGS(IOT)

The Internet of Things, or IoT, is a network of physical items, or "things," that are outfitted with sensors, software, and other technologies to facilitate easy communication and data sharing over the Internet. Real-time analytics, machine learning, commodity sensors, and embedded systems are some of the technological innovations that have come together to create this idea. IoT opens up a wide range of applications in several sectors by facilitating object-to-object communication and interaction through the integration of these technologies.

The ability of the Internet of Things to expand internet connectivity beyond conventional devices like desktop computers to a wide range of objects encountered in daily life is one of the main forces behind the expansion of IoT. These items can gather and exchange data in real-time because they are equipped with embedded technology, which allows them to interface with external systems and one other. Opportunities for improved functionality, automation, and monitoring across multiple industries are made possible by this capacity.

The domains of wireless sensor networks, control systems, embedded systems, and other traditional fields are where the Internet of Things originated. By creating technologies and protocols that enable seamless connectivity and data sharing, these sectors have been crucial in setting the foundation for the Internet of Things. IoT leverages the developments in these areas as it develops to allow for the smooth integration of various systems and devices.

IoT technology is probably most closely associated with the idea of the "smart home" in the consumer market. With the use of Internet of Things capabilities, smart home appliances, lighting fixtures, thermostats, security systems, and other gadgets may be remotely controlled using smart speakers or smartphones. Convenience, energy efficiency, and security in the house are all improved by this IoT integration.

FIGURE 5. INTERNET OF THINGS

5.1 WEB SERVER

FIGURE 5.1 WEB SERVER

Elegant and Well-Integrated: Espresso's ESP32 Transforms Wi-Fi SoC Solutions for Internet of Things

The Espresso ESP32 is a highly integrated Wi-Fi System-on-Chip (SoC) solution that responds to the ongoing demands of the Internet of Things (IoT) industry for power efficiency, small design, and reliable performance. It may operate independently or as a subordinate of a host MCU thanks to its self-contained Wi-Fi networking capabilities. ESP32 guarantees quick boot-up from flash memory while it is functioning as the primary application host or as a slave to another controller. This is made possible by its built-in high-speed cache, which improves system performance and memory utilization.

Additionally, the ESP32's versatility can be used to provide Wi-Fi adaptability via SPI/SDIO or I2C/UART interfaces for any microcontroller architecture. It helps to simplify PCB design and reduce the requirement for external circuitry by integrating key components such filters, power management modules, low-noise receive amplifiers, RF baluns, antenna switches, and power amplifiers.

Beyond Wi-Fi, the ESP32 has an improved 32-bit CPU from Tensilica's L106 Diamond family together with on-chip SRAM, which allows for smooth GPIO-to-external sensor and device interfacing. Furthermore, the Software Development Kit (SDK) offers a multitude of sample programs that address various application requirements.

The ESP32's capabilities are enhanced by Espressif Systems' Smart Connectivity Platform (ESCP), which makes it possible to use sophisticated features like spur cancellation, adaptive radio biasing for low-power operation, quick transitions between sleep and wake-up modes for energy efficiency, advanced signal processing, and mechanisms for reducing interference from common sources such as Bluetooth, DDR, LVDS, and LCD.

5.2 Channel Frequencies:

- In compliance with IEEE802.11b/g/n standards, the RF transceiver supports the following channels.

5.3 GHz Receiver:

- The 2.4 GHz receiver uses two high resolution, high speed ADCs to downconvert the RF signals into quadrature baseband signals before converting them to the digital domain.

- ESP32 incorporates RF filters, baseband filters, DC offset cancelation circuits, and automatic gain control (AGC) to adjust to changing signal channel circumstances.

5.4 GHz Transmitter:

A Better 2.4 GHz Transmitter with Integrated Calibrations to Increase Efficiency
Using a potent CMOS power amplifier, the 2.4 GHz transmitter boosts baseband signals and powers the antenna. Power amplifier linearity is improved by digital calibration, which results in transmissions of +16 dBm for 802.11n and +19.5 dBm for 802.11b.

These calibrations remove the need for specialized equipment and cut down on testing time by offsetting radio defects such as baseband nonlinearities and carrier leakage.

5.5 FEATURES:

- Automatic data updating: 30 seconds
- Digital output port Pins: +5V DC
- Power supply: DC +12v 1Amp
- Format of Message: *message or Data # (* for start and # for end)

Attached are three links.

Updating data for a certain website

- Device managing webpage Updating information on a social network

5.6 APPLICATION:

- Daily living and domestics
- Real-time transport and logistics monitoring
- Online traffic monitoring
- Online health monitoring

CHAPTER 6

EMBEDDED C

6.1 DESCRIPTION:

Embedded C is a set of language extensions developed by the C Standards Committee to address common challenges encountered in programming embedded systems. These extensions provide support for features such as fixed-point arithmetic, multiple memory banks, and basic I/O operations, which are essential for embedded applications.

Embedded systems are specialized computer systems with dedicated functions within larger mechanical or electrical systems. They often operate under real-time constraints and are integrated into complete devices alongside hardware and mechanical components.

Examples of embedded systems include microcontrollers and microprocessors, which control a wide range of devices used in everyday life. Despite their limited processing resources, embedded systems offer advantages such as low power consumption, small size, and ruggedness. Design engineers can optimize embedded systems to reduce size, cost, and increase reliability and performance. These systems can vary greatly in complexity, from simple devices like digital watches to sophisticated installations such as hybrid vehicles and medical equipment. By leveraging intelligence mechanisms and network connectivity, embedded systems can be enhanced to provide advanced functionalities beyond their basic capabilities.

Modern embedded systems are often based on microcontrollers, which integrate the CPU with memory or peripheral interfaces. Alternatively, ordinary microprocessors, utilizing external chips for memory and peripheral interface circuits, are also commonly employed, especially in more complex systems. The choice of processor depends on the specific

requirements of the application, ranging from general-purpose processors to specialized processors such as digital signal processors (DSPs).

6.2 Arduino Software (IDE):

The Arduino IDE is a comprehensive software platform for programming Arduino microcontroller boards. With a user-friendly interface, it enables writing, editing, and debugging code effortlessly. Users create sketches within the IDE's code editor, defining setup and loop functions. The Library Manager simplifies integrating pre-written code for various functionalities like sensor interfacing.

The Arduino Software, commonly known as the Arduino IDE (Integrated Development Environment), serves as a versatile platform for developing programs, or sketches, tailored for Arduino microcontroller boards. These sketches, saved with the .ino file extension, are the cornerstone of Arduino programming, allowing users to write code to control hardware and perform various tasks.At the core of the Arduino IDE is its text editor, providing essential features such as cutting, pasting, and searching/replacing text. This editor serves as the workspace where users craft their sketches, utilizing the Arduino programming language, which is based on C and C++.

Before uploading your sketch to an Arduino board using the Arduino Software (IDE), it's essential to correctly configure the Tools > Board and Tools > Port settings. The available board options and serial port names differ depending on your operating system. For example, on a Mac, the serial port might be identified as /dev/tty.usbmodem241 or /dev/tty.USA19QW1b1P1.1 for different Arduino boards or USB-to-Serial adapters. On

Windows, serial ports are typically labeled as COM1 or COM2 for serial boards and higher COM numbers for USB boards, which can be confirmed in the Device Manager. On Linux, ports are commonly named /dev/ttyACMx or /dev/ttyUSBx. After selecting the appropriate board and serial port, you can initiate the upload process by clicking the upload button in the toolbar or selecting Upload from the Sketch menu. Modern Arduino boards reset automatically during the upload, but older models may require manual reset just before initiating the upload process. The Arduino IDE will provide feedback during the upload, including indicating when it's completed successfully or if any errors occur.

CHAPTER 7

7.SOURCE CODE

```
//#include <SPI.h>
//#include <Wire.h>
#include <Adafruit_GFX.h>
#include <Adafruit_SSD1306.h>
#include <RH_ASK.h>
RH_ASK driver;
#include "MAX30100_PulseOximeter.h"
#define REPORTING_PERIOD_MS     1000
// PulseOximeter is the higher level interface to the sensor
// it offers:
//  * beat detection reporting
//  * heart rate calculation
//  * SpO2 (oxidation level) calculation
PulseOximeter pox;
uint32_t tsLastReport = 0;

String Rvalue;
#define SCREEN_WIDTH 128 // OLED display width, in pixels
#define SCREEN_HEIGHT 32 // OLED display height, in pixels

// Declaration for an SSD1306 display connected to I2C (SDA, SCL pins)
```

```
// The pins for I2C are defined by the Wire-library.
// On an arduino UNO:       A4(SDA), A5(SCL)
// On an arduino MEGA 2560: 20(SDA), 21(SCL)
// On an arduino LEONARDO:   2(SDA),  3(SCL), ...
#define OLED_RESET     4 // Reset pin # (or -1 if sharing Arduino reset pin)
#define SCREEN_ADDRESS 0x3C ///< See datasheet for Address; 0x3D for 128x64, 0x3C for 128x32
Adafruit_SSD1306 display(SCREEN_WIDTH, SCREEN_HEIGHT, &Wire, OLED_RESET);

unsigned long oldtime3;

void setup() {
  Serial.begin(9600);

  // SSD1306_SWITCHCAPVCC = generate display voltage from 3.3V internally
  if(!display.begin(SSD1306_SWITCHCAPVCC, SCREEN_ADDRESS)) {
    Serial.println(F("SSD1306 allocation failed"));
    for(;;); // Don't proceed, loop forever
  }

     if (!driver.init())
    Serial.println("init failed");
```

```
if (!pox.begin()) {
        Serial.println("FAILED");
       // for(;;);
    } else {
        Serial.println("SUCCESS");
    }

     display.clearDisplay();
  display.display();
}

void loop() {

pox.update();

//  if (millis() - oldtime3 > 4000) {
  readRF433();
//  oldtime3=millis();
//  }



   if (millis() - tsLastReport > REPORTING_PERIOD_MS) {
```

```
    // Clear the buffer.
// display.clearDisplay();
 display.clearDisplay();
 display.display();
 // Display Text
 display.setTextSize(1);
 display.setTextColor(WHITE);
 display.setCursor(0,0);
 display.print("BPM= ");
 display.println(pox.getHeartRate());
 display.setCursor(0,8);
 display.print("SpO2= ");
 display.println(pox.getSpO2());
 display.setCursor(75,0);
 display.print("Intake");
 display.setCursor(80,8);
 display.println(Rvalue);
 //display.print(" ml");
 display.setCursor(20,21);
 display.setTextSize(1);
 display.print("Recom=");
```

```
  display.println("1.5 lit ");
  display.display();
 // delay(200);
 // display.clearDisplay();
  display.display();
  Serial.print("Heart rate:");
        Serial.print(pox.getHeartRate());
        Serial.print("bpm / SpO2:");
        Serial.print(pox.getSpO2());
        Serial.println("%");

      tsLastReport = millis();
    }
}

String convertToString(char* a, int size)
{
    int i;
    String s = "";
    for (i = 0; i < size; i++) {
        s = s + a[i];
    }
    return s;
}
```

```
  void readRF433() {
  uint8_t buf[12];
  uint8_t buflen = sizeof(buf);
  String val;

  if (driver.recv(buf, &buflen))
  {
    Rvalue =convertToString(buf,4);
Serial.print("rval incoming: ");
    Serial.println(Rvalue);
    Serial.print("Message: ");
    Serial.print((char*)buf);
    Serial.print(" ,");
    Serial.println(buflen);
    val = String((char*)buf);




   // Rvalue=val;
```

```
    Rvalue  = val.toInt();
      Serial.print("rval: ");
    Serial.println(Rvalue);
    String msg = getValue(Rvalue, ',', 0);
String msg2 = getValue(Rvalue, ',', 1);
String zval = getValue(Rvalue, ',', 2);
      Serial.print("rval: ");
    Serial.println(msg);
//      Serial.print("rval2: ");
//    Serial.println(msg2);
//    Rvalue="";
//    display.clearDisplay();
//  display.display();
//   display.setTextSize(1);
//  display.setTextColor(WHITE);
//  Serial.println("coming2");
//  display.setCursor(0,0);
//  display.print("Rec= ");
//   display.print(Rvalue);
//  display.print(" ml ");
//  display.display();
//    oldtime1=millis();
  }
}
```

```
String getValue(String data, char separator, int index)
{
    int found = 0;
    int strIndex[] = { 0, -1 };
    int maxIndex = data.length() - 1;

    for (int i = 0; i <= maxIndex && found <= index; i++) {
        if (data.charAt(i) == separator || i == maxIndex) {
            found++;
            strIndex[0] = strIndex[1] + 1;
            strIndex[1] = (i == maxIndex) ? i+1 : i;
        }
    }
    return found > index ? data.substring(strIndex[0], strIndex[1]) : "";
}
```

CHAPTER 8

8. FINAL PROTOTYPE

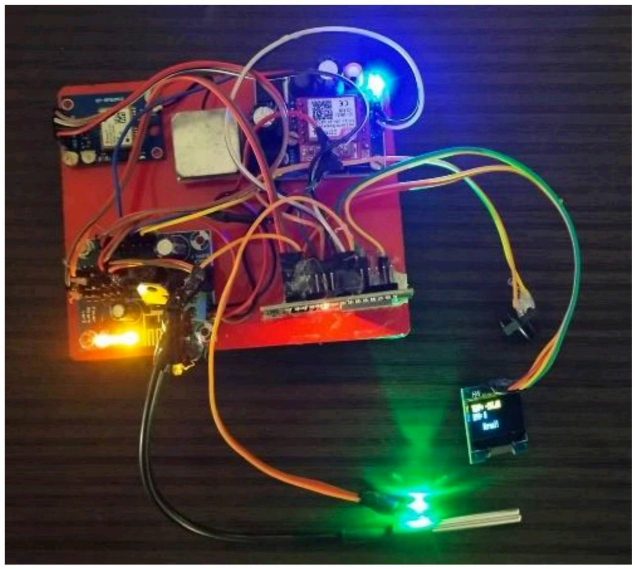

FIG 8.1 FINAL INPUT

FIG 8.2 DISPLAY INPUT

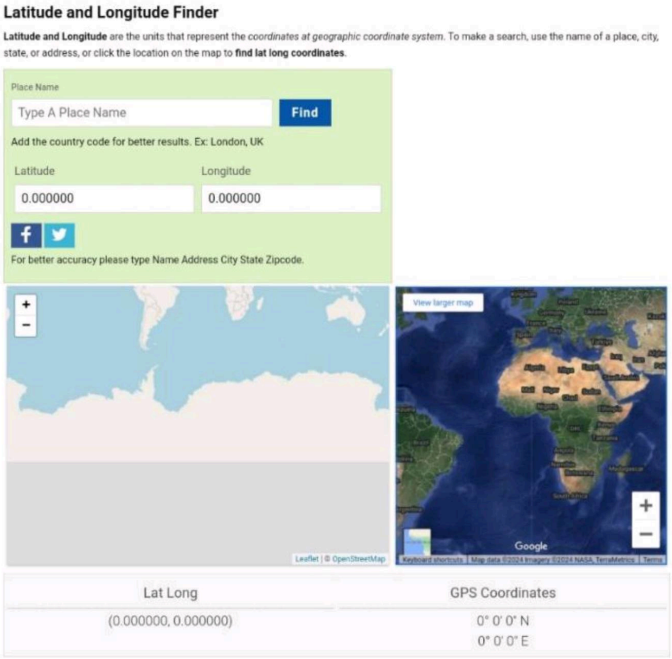

FIG 8.3 FINAL OUTPUT OF TRACKING

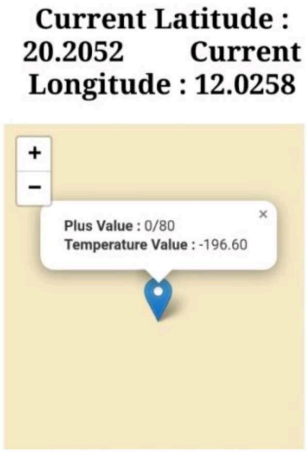

FIG 8.4 LIVE LOCATION

CHAPTER 9

CONCLUSION

Empowering Women's Safety: IoT and Machine Learning in Wearable Safety Devices

Wearable safety devices tailored for women are leveraging IoT and machine learning technologies to significantly bolster personal safety measures. These gadgets utilize IoT connectivity to link wearable sensors to the internet, facilitating real-time monitoring and alerting capabilities. By identifying abnormal behavior or conditions that may signal potential threats, they offer discreet and non-intrusive safety monitoring solutions. Integration with machine learning enables continuous monitoring and swift responses to potential dangers.

Looking ahead, further advancements could concentrate on refining machine learning algorithms, enhancing integration with smart home systems, extending battery life and durability, and optimizing user interfaces for a seamless experience. In essence, these devices hold great promise for augmenting women's safety, with ongoing potential for improvements to strengthen their role as indispensable safety aids.

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LIST OF PUBLICATION:

Adhiyamaan N S , Gugan R , Gokulnath V , "Women Safety Wearable Device using IOT", May2024

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International Conference on Role of Artificial Intelligence and IoT in Engineering, Technology & Science
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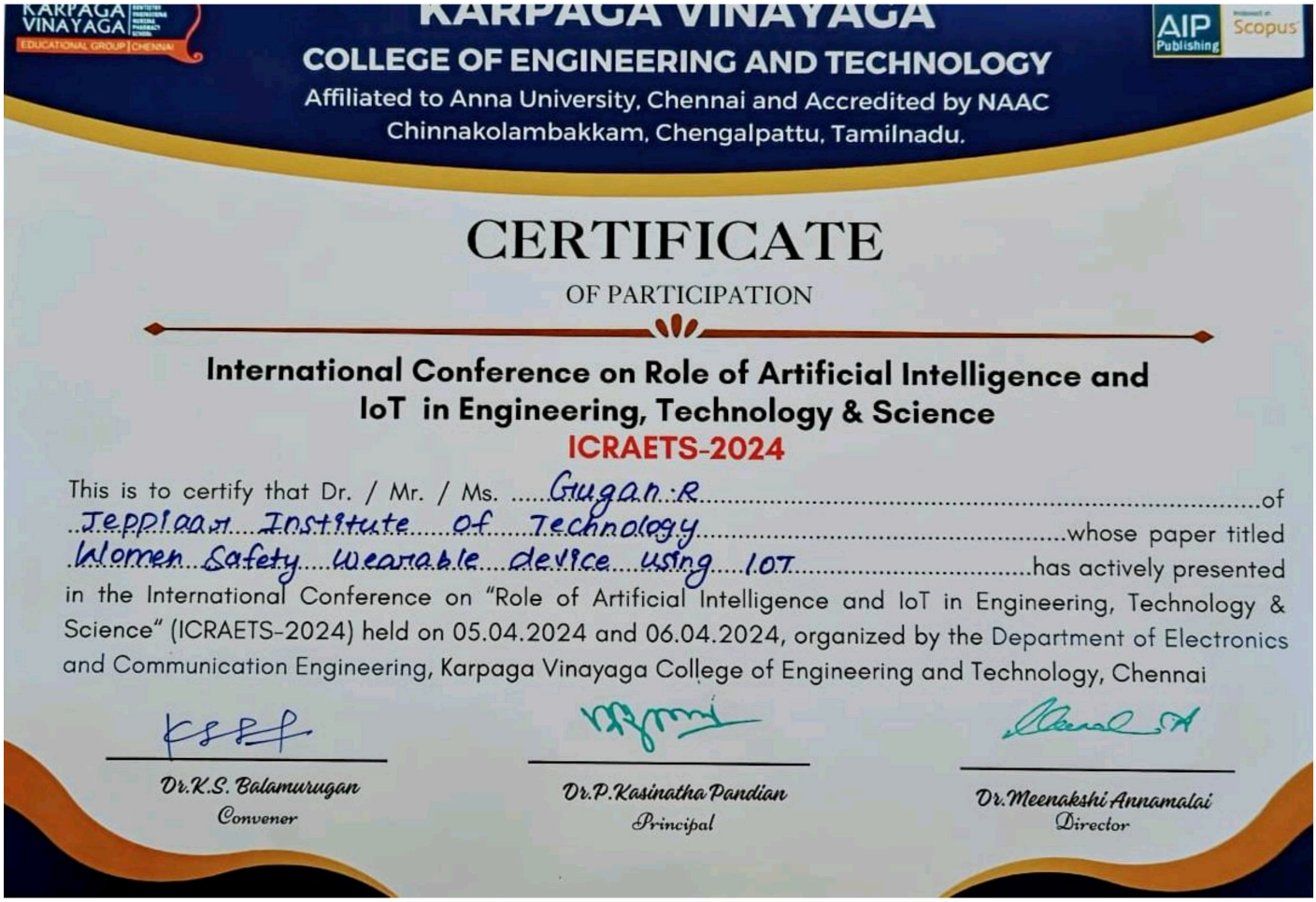
ISBN No : 978-93-340-3458-5



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