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IOT based: Women Safety with Audio Video Surveillance

Dr. Arvind T V, Ramesh B E, Afifa Taj, Archana Y M, Madiha Sheikh

Professor & Project Guide Department of CSE, SJMIT, Chitradurga, Karnataka, India

Associate Professor & Project Coordinator, Department of CSE, S.J.M.I.T, Chitradurga, Karnataka, India

7th Semester BE, Department of CSE, SJMIT, Chitradurga, Karnataka, India

7th Semester BE, Department of CSE, SJMIT, Chitradurga, Karnataka, India

7th Semester BE, Department of CSE, SJMIT, Chitradurga, Karnataka, India

ABSTRACT: Today, we often hear about unfortunate incidents affecting women's safety. Women face challenges in various situations, including harassment and the lack of effective protection. Issues like teasing and neglecting women's personal lives, which have existed for ages, still persist. In the modern world, the internet and cyber space have introduced new ways for people to exploit and harm women, often taking advantage of the anonymity it provides. To address these issues, we propose a device that combines multiple technologies: a wearable "Smart Band" that works with a smartphone connected to the internet. The smart band continuously monitors and detects signals based on human behaviors, such as anger, fear, or anxiety, and sends these signals to the smartphone. The smartphone app, which has access to GPS and messaging services, is programmed to respond during emergencies. When the smart band detects a distress signal, the app sends an alert with the victim's location to the nearest police station, family members, and people nearby who have the app. This system enables quick help from both authorities and the public, ensuring that assistance reaches the victim accurately and promptly.

KEYWORDS: women safety; IoT device; sensors; Arduino; GPS; micro camera; Google lens.

I. INTRODUCTION

This paper concentrates on security system that can be deployed to provide security to women under situations where they don't feel safe enough. An advanced system can be built that can detect the location and health condition of person that will enable us to take action accordingly based on electronic gadgets like GPS receiver, body temperature sensor [1], GSM, Pulse rate sensor. We can make use of number of sensors to precisely detect the real time situation of the women in critical abusive situations. The heart rate(a normal heart rate for adults ranges from 60 to 100 beats per minute) of a person in such situations is normally higher which helps make decisions along with other sensors like motion sensors to detect the abnormal motion of the women while she is victimized. The idea to develop a smart device for women is that it's completely comfortable and easy to use as compared with already existing women security solutions such as a separate garment, bulky belts and infamous mobile apps that are just very abstract and obsolete. The Smart band integrated with Smart phone has an added advantage so as to reduce the cost of the device and also in reduced size. The GPS and the GSM can be used of a smart phone [5]. This also enables in reduced power use and that the watch can be installed with Bluetooth 4.0 BLE (Bluetooth Low Energy) which comes in handy for several days on a single shot of charge.

II. MAIN OBJECTIVE OF THIS PAPER

- 1. Design and Functionality:** To describe the design and operational features of the wristband, including its sensor technology, GPS tracking, real-time alert system, and integration with mobile apps or emergency services.
- 2. Enhancing Women's Safety:** To explore how the wristband provides a proactive solution to ensure women's safety in potentially dangerous situations by enabling them to discreetly send distress signals or alerts to emergency contacts, authorities, or family members.
- 3. User-Centric Approach:** To evaluate the wristband's usability and comfort for women in various environments, considering factors such as wearability, ease of use, and user-friendly interface.

4. **Real-Time Monitoring and Response:** To highlight how the wristband integrates with real-time monitoring systems that can track the wearer's location and detect distress signals, ensuring swift action by law enforcement or emergency responders.
5. **Technology Integration:** To analyze the role of the wristband's connectivity (Bluetooth, GPS, mobile app integration, etc.) in facilitating rapid communication between the wearer and safety networks, including the potential for AI-driven risk detection.
6. **Impact on Social Behavior and Crime Prevention:** To investigate how the presence of such a safety device can act as a deterrent to potential offenders and alter societal perceptions regarding women's safety in public spaces.
7. **Privacy and Security Concerns:** To discuss the security measures in place to protect the privacy of the user, the potential challenges of data security, and how the system ensures that only authorized parties can access distress signals and personal data.
8. **Implementation and Scalability:** To examine the feasibility of implementing the wristband system on a wider scale, considering factors such as cost, accessibility, and potential for adoption by different demographics, including urban and rural populations.
9. **Impact on Women's Empowerment:** To explore the emotional and psychological impact on women, empowering them with a sense of security and independence, and promoting safer environments in public and private spaces.
10. **Future Innovations:** To discuss the potential for evolving the wristband with advancements in technology, such as integration with wearable biometrics, AI-based threat detection, or collaboration with other safety initiatives.

III. LITERATURE SURVEY

B.Vijayalakshmi in [1] proposed a scheme to improve the women safety by using GPS and gsm model. A small device with a buzzer and microcontroller is designed, and it can be placed on band or watch. When any insecure situation, the woman can make use of this device to send alert SMS by pressing this buzzer to predefined numbers(5 members). But this scheme cannot generate automatic alert SMS. Instead, it requires the human interaction during a panic situation.

Rameshkumar.P in [2] described a scheme to identify the location of the individuals by using image metadata. A device GPS mapper is used to identify the location of a person using image and video by utilizing background metadata. With the help of GPS mapper, it can identify the altitude, longitude and position of a person who has uploaded their images to social media. But this scheme cannot generate the image of a person who has not uploaded the image in the social media.

Charranzhou in [3] proposed a mechanism to find the trip ends while travelling or not - travelling by using the smartphones based on GPS tracking system. The author modelled a device using PR (Promoted Recall) technology and data-driven machine language to find the speed, distance, heading direction. These features are used to characterize the smart phone holders and identify the travel point identification. The author has tested PR technology in the random forest and accurately tracked the distance of trip ends. This scheme will take many days to find the location of trip ends. Jakuryamaekawa in [4] proposed a scheme to determine user's current location preference using user's coordinate point, user's location information is disclosed to external providers even if this is not user's wish. A local Wi-Fi network is used to detect a user's location privacy preference. This enables to save energy and protect a user's private location. The disadvantage is Wi-Fi won't be available at everywhere and will be limited in space.

Humnguyen in [5] developed the system called ambulatory based on the inertial sensor to observe and detect the person's behaviour in daily life with PD (Parkinson disease) and facilitate early treatment. It will identify the disease in short time. From the free environment, observe the disease and take treatment. The limitations of measuring the device will be fixed in objects. If the person away from the object can't be predicted.

Ignore in [6] proposed a scheme to determine Detection Of Global And Local Motion Changes In Human Crowds which may arise in sporting events, function etc. A Groups Are Detected Based on location, velocity and tracked the time using association algorithm. The behaviour changes of people can be detected by using holistic approaches and video surveillance by representing in the 2D histogram. But it can't be able to detect the motions changes in human crowds in 3D histogram representation.

Dawei fan in [7] proposed a scheme to monitor, record, analyse the person psychological, the behaviour characteristics

of a person and environmental change in indoor and outdoor actions. A wireless sensor device is used to analyse the data. The information of body area network obtained from the wireless sensor is stored in Sdcard. It is mainly designed to check the behaviour changes of human

JG Lourens in [8] has formulated a technique to Detect and logging advertisements using its sound. The technology uses Pattern matching approach and Time warping sensitivity for detecting the sound of each advertisement played in radio frequency. Once the correlation between the broadcasted advertisement and signature formulated has been determined, this correlation value has been compared to a threshold to find matching advertisements. The performance of the system is based on the false alarm and miss rate of each sound frequency.

HasmahMansor in [9] proposed a scheme for measuring Body Temperature using Remote Health Monitoring System. A device temperature sensor and the wireless sensor is used for measuring body temperature and heart rate. The temperature sensors will send the readings to a microcontroller using XBee wireless communication. To send the real-time data to health monitoring database, wireless local area network(WLAN) has been used. Arduino with Ethernet shield based on IEEE 802.11 standard has been used for this purpose. Test results from a group of voluntary shows the real-time temperature reading successfully monitored locally (at home) and remotely (at doctor's computer), and the readings are comparable to the commercial thermometer.

Mr. Amar Saraswat in [10] proposed a model to sense the heart beat and body temperature using Arduino .LM35 is used for the sensing the body temperature which is a basic parameter for monitoring and diagnosing human health. Heart beat sensor was used for sensing heart rate. This device will allow one to measure their mean arterial pressure (MAP) in about one minute and the accurate body temperature will be displayed on the Android. Though the system can be used to measure physiological parameters, such as Heart rate (Systolic and Diastolic), Pulse rate, It is not possible for a doctor to observe a patient's heart rate per minute and body temperature all the time.

Yanbozhao in [11] proposed a wireless home security system with low cost, low power consumption. The system contains a GSM/GPRS gateway and three kinds of wireless security sensor nodes - door security nodes, infrared security nodes and fire alarm nodes. The nodes are easy for installing. The system can respond rapidly to alarm incidents and has a friendly user interface including an LCD (Liquid Crystal Display) and a capacitive sensor keyboard. The wireless communication protocol between the gateway and the nodes is also suitable for other home appliances.

A.H. Ansari in [12] proposed new technology for a women safety with one touch system using GSM & GPS so that women never feel helpless while facing such social problems or challenges. A device using raspberry pi, GSM, GPS and force sensor ensures the protection of women. Anytime when women sense danger the only button is to be pressed on the device. In such case, GPS tracks the location of the women & sends an emergency message using GSM to saved contacts & police control room.

[13] Women's Security : It is a mobile application developed for women safety, the user has to save their email address, message to be sent and recipient numbers, this app is initialised in the home screen, when women touch the app, it automatically initiates a service that records audio of the environment for seconds and sends it along with the mobile location to the recipient numbers, if the network coverage is not available, it used SOS service to send text message.

[14] Safetipin: It is a personal app for safety that helps user to take safer decisions, a safety score is provided for each area , based on the safety score of an area. The location is termed as safe or unsafe. When user enters an unsafe location, it alerts them to a warning message, as long as the application is in the background, a user can also invite their friend and family to track their location. This app also provides alternate route to the destination; the user can check the safety and choose the route based on it.

[15] Life360: It is a family locator mobile application enables the user to share location with their family members. The user can create a group with their friends and family members; it alert the user when the group members come near them, this app also helps in emergency situations for girls when they are in danger situation, it sends the location to the group members.

[16] Vithu: This mobile application is used to alert the women's guardians when she is in danger by pressing the

buzzer button for twice, this process initiates a cycle that sends the location of the mobile to the designated contacts for every 2 minutes. The location is sent in SMS(short message service). This application also provides updates of crime scene happened in India with tips feed; those updates can also be done by the user of this application.

IV. METHODOLOGY

The user on asserting any one of the pre-loaded voice commands can start operating the device. On acknowledgement of the voice command of the user and user’s voice verification, the device turns on. On pressing a button, a message regarding the threat can be sent to the nearest police station and the family members whose contacts have been preloaded. The police station receives the message and user location tracking is been provided by GSM, GPS and GPRS modules. Along with the message, the user can also capture and send the image of the assailant to the police station with the help of miniature camera in the device. Additionally, to add more safety in cases where GSM network operators are not available, a built in shock generator produces shock waves which harms the attacker and the buzzer which produces an alarming sound in the surrounding location. The user can also just press a button to send a message to the police station which will be unaware to the assailant.

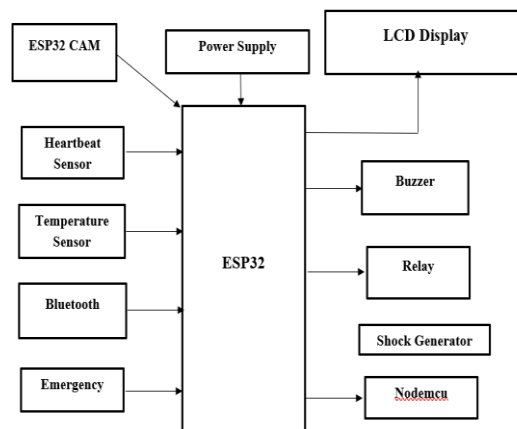


Fig 1: Architecture

V. EXISTING SYSTEM

Having this concern in mind many developers have come up with creative applications. Some of such applications are: Codes like *91# is used to provide emergency services, which will alert police control. Free mobile application 'Help me on mobile' to ensure safety of women was launched to assist those who need emergency .These applications need a single click to do this task. But when a girl is in trouble, there can be times that the girl is not capable of taking the phone and pressing button.

A. **SHE (Society Harnessing Equipment):** It is a garment embedded with an electronic device. This garment has an electric circuit that can generate 3800kV which can help the victim to escape. In case of multiple attacks it can send around 80 electric shocks [4].

B. **ILA security:** The co-founders of this system, have designed three personal alarms that can shock and disorient potential attackers and hence safeguard the victim from perilous situations.

C. **AESHS (Advanced Electronics System for Human Safety)** It is a device that helps track the location of the victim when attacked using GPS facility.

D. **VithU app:** This is an emergency app initiated by a popular Indian crime television series “Gumrah” aired on Channel [V]. When the power button of the Smartphone is pressed twice consecutively, it begins sending alert messages with a link of the location of the user every two minutes to the contacts.

E. **Safetipin:** This is one of the good options when it comes to safety apps for women. The app is designed keeping in

mind the concept of personal safety. It incorporates all the essential features such as GPS tracking, emergency contact numbers, directions to safe locations etc. The app also pins the safe areas along with their safety scores to go at the times of any problem. It also enables the users to pin unsafe areas and help others. Safetipin is Hindi, Bahasa and Spanish, besides English [9].

F. Smart Belt: This system is designed with a portable device which resembles a normal belt. It consists of Arduino Board, screaming alarm and pressure sensors. When the threshold of the pressure sensor crosses, the device will be activated automatically. The screaming alarm unit will be activated and send sirens asking help [3].

VI. PROPOSED SYSTEM

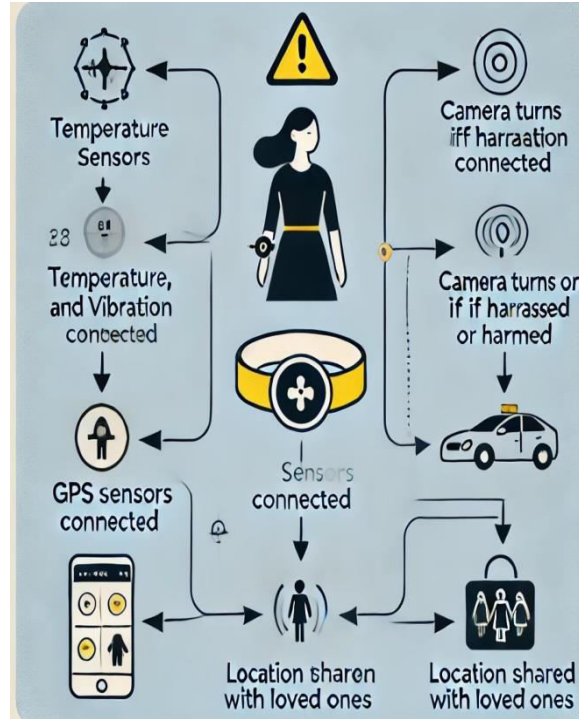
The block diagram of the conceptual system is shown in above figure. The microcontroller acts as an Embedded computing system and controls the activities of all the subsystems. It is interfaced with Emergency Switch, Voice recognition module, GPS Receiver, Wifi Modulator demodulator (MODEM), High Voltage Shock Circuit, LCD display, Buzzer, and Wireless camera. The microcontroller periodically monitors the status of all the devices and also keeps on checking for any incoming SMS message from the parents or any caretakers. When there is no Wifi network, on pressing the Emergency Switch, the processor activates the speech circuit to make loud shouting sound to catch the attention of the nearby people for help. Thus, when the user asserts the voice command the buzzer will automatically turn on. It also prepares the High Voltage Electric Shock Circuit to be ready to give a non-lethal shock to the attacker. If the help is not available and if the system is not reset within the stipulated time, the system obtains location information from the GPS and prepares a text SMS containing the present location information and sends a SMS through the nodemcu modem to the police control room and a distress message to the pre-programmed mobile number[3]. The design is implemented using an embedded microcontroller, in a modular form to be adaptable to different types of location tracking. Based on the total design of the system, the hardware and software of the system is designed to be near Realtime monitoring of the women and immediate help.

The lady can protect herself by electric shock to the person harassing her. The software developed in assembly language Demonstrate the system capability in providing real-time response. Using the location information supplied by the system, the location can be tracked and traced using GPS and Google Maps. Thus, the lady will be safe and she feels protected. At the product level it can be as compact as a smart watch.

Implementation

Women's safety is a major issue and a widely discussed topic today. The crime rate is on the spike. Women's safety is a big concern and must be addressed here. The main goal of the paper is to improve women's safety and security. We use multiple components for the project like pulse sensor, temperature sensor, vibration sensor, ESP32 cam and GPS modules.

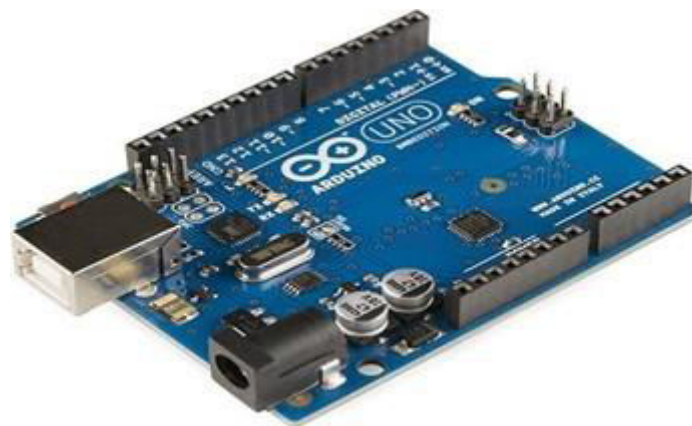
The temperature sensor is used to measure temperature (the temperature becomes high or low). The pulse sensor measures pulse waves. The temperature is being measured in two types which are FAHRENHEIT and CELCIUS.



BLYNK app is configured in the well-wisher's device so that the user's information gets updated on their device. The data (Pulse, Temperature) gets updated whenever the concerned person opens the app. The location of the user is also updated using google maps. The Vibration sensors are responsible for measuring the vibration acting on a body (if anytime the victim is getting forced and pulled by a culprit). The vibration sensor has some threshold set up in it. If the vibration rate is abnormal, the well-wishers get notification on the phone, by clicking that link they can see the live incident happening through the Blynk app as shown in Fig.1. The advantage is all the sensors are very small in size and portable to handle in any condition. They are user-friendly and affordable at cost.

A. Arduino:

It is Open-source Arduino Uno microcontroller board as shown in Fig.2. A Microchip ATmega328P microprocessor is used, resulting in a 74cc microchip. Besides 14 digital I/O pins (6 of which are capable of generating PWM output), the board also provides 6 analog I/O pins that can be programmed via a type B USB cable with the Arduino IDE (Integrated Development Environment).



B. ESP 32 Cam:

A video camera and socket for a microSD card are built into the ESP32-CAM, which is a full-featured microcontroller. With this camera, you can create IoT devices that can perform image tracking and recognition. It's inexpensive and easy to use. There are a variety of IoT applications that can be implemented.



C. **LCD** : LCD is one kind of electronic device used to display messages and information. The term LCD full form is Liquid Crystal display. The display is named 16×2 LCD because it has sixteen Columns and 2 Rows. it is able to be displayed (16×2=32) 32 characters in general and every person could be made of five×8 Pixel Dots as shown in Fig

**D. Temperature Sensor**

A temperature sensor is a device which measures an object's temperature. This could be the temperature of the air, a liquid, or a solid as shown in Fig.

**E.GPS:**

The global positioning system (GPS) is a comprehensive navigation system based on satellites that uses at least 24 satellites. With no subscription fees or setup charges, GPS operates in every weather condition, anywhere within the international, 24 hours a day, seven days a week. It gets data from satellites in the form of an NMEA string, which includes latitude, longitude, altitude, UTC time, and so on. This text wishes to be parsed in order to get the records we need.

F. Pulse Sensor

It is an Arduino heart charge sensor that is well- designed and easy to use. With a few jumper cables, the sensor clamps onto a fingertip or earlobe and connects directly to Arduino. It's also a free monitoring app that displays your pulse in real time. It is shown in Fig



G. Arduino IDE

An Arduino IDE (Integrated Development Environment) includes a text editor for writing code, a message space, a text console, buttons for basic capabilities, and a series of menus. Adding packages and communicating with them is done through the Arduino hardware. As part of the Arduino software program (IDE), the console presents textual content, including all error messages and different statistics. It is shown in Fig.



VII. APPLICATIONS

1. Emergency Alert System

Function: The wristband can have a built-in button or sensor that sends an immediate distress signal to predefined contacts (family, friends, or local authorities) when activated.

Features: GPS location sharing.

Customizable message for emergency alerts (e.g., "I'm in danger, please help!").

Real-time tracking to monitor the user's whereabouts.

2. Personal Safety Monitoring

Function: The wristband can monitor the user's physiological data (heart rate, body temperature, or stress indicators) to detect signs of distress or panic.

Features: Alert notifications to emergency contacts if abnormal readings are detected (e.g., rapid heart rate or extreme temperature change).

Integration with mobile apps to display real-time data to emergency responders.

3. Location Tracking and Geo-fencing

Function: Using GPS technology, the wristband can track the user's location in real-time.

Features: Geo-fencing allows users to set safe zones (e.g., home, workplace) and get alerts if the wristband leaves the defined area.

Historical tracking for reviewing movements if an incident occurs.

4. Voice Activation and Hands-Free Communication

Function: The wristband could have a built-in microphone and speaker, allowing the wearer to speak directly to an emergency operator or designated contact if hands-free communication is needed.

Features: Voice-activated commands to trigger alerts, even if the wearer is unable to press a button.

Integration with AI assistants for emergency conversations or action.

5. Battery Life and Charging Features

Function: Ensuring the wristband has long-lasting battery life or an efficient charging system.

Features: A small solar panel for emergency charging.

Low-power modes when not in active use to extend battery life.

6. Discreet Communication

Function: The wristband could offer a discreet means of communication, allowing the wearer to send an alert without anyone knowing.

Features: A silent vibration or light signal when an emergency alert is sent. Hidden buttons or sensors that can be activated without drawing attention.

7. Integration with Local Emergency Services

Function: Direct integration with local law enforcement or emergency response systems.

Features: Direct dial to local emergency services with location data. Pre-programmed responses to certain types of alerts (e.g., police or medical assistance).

8. Tracking and Notification for Mental Health Support

Function: The wristband can help monitor mental health indicators and send notifications if the user needs help.

Features: Stress level detection through biometric sensors. Integration with mental health services or emergency contacts for urgent support.

9. Social Awareness and Community Support

Function: The wristband could be linked with a community network where other women in the area can assist each other during emergencies.

Features: Community-based alerts to nearby individuals who are part of a safety network.

The ability to send anonymous distress signals to other women in the vicinity.

VIII. ADVANTAGES

The proposed system for vitamin deficiency detection using image processing and neural networks offers several advantages:

1. It is an all-in-one system. Hence no need to carry multiple devices.
2. GPS tracking feature tracks the user lively when you are the move after triggering the emergency button.
3. It records audio, which can be used for further investigations.
4. When the battery is running low, it automatically sends the location the pre-stored contacts.
5. The second distinct feature is, it also detects the hidden cameras which help in our privacy.
6. This device works without internet connectivity

IX. CONCLUSION

Our primary goal of this project is to ensure every woman in our society to feel safe and secured. According to the survey in India 53% of working women are not feeling safe - Women is working in night shift (Bangalore-56%, Chennai-28%, Hyderabad-35%, Mumbai-26%). In Overall 86% of working women in India, women facing hurdles are high in Delhi, Mumbai, Hyderabad, Kolkata and Pune comparatively to other places. FEMME can play a major role by providing women a safe environment in all situations for example (detecting hidden camera, physical threatened, harassed, robbery, stalked). Implementing real time application and a device, we can solve the problems to an extent. With further research and innovation, this project is used as a small wearable device like watch, pendent etc.

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