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Article Title: IoT Based Child and Women Safety Band System Using Arduino

IoT Based Child and Women Safety Band System Using Arduino

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ABSTRACT

In the current society the security of child and women is a major issue. Today's media news at least contains one woman rape/attack cases. The main problem is that the victim will be unable to call for help (if it is a rural place). In this system, we create a Smart band by using ARDUINO board to protect women's from the harassment which acts as brain of the system, because the entire system program instruction stored in it. Here we have heartbeat sensor to know the abnormal condition of women even women can manually trigger the device to notice other that she is at an emergency situation. The GPS module which we use here to know the exact location of the person therefore the location send to respective person and also public service organization to take immediate action against women attacks using RF based wireless module call Wi-Fi Module. The IOT can send message to desired person whom the women want to. The system has Shocking Mechanism for women at the time of emergency to attack back all though we have also used an alarm device to let other know about the emergency situation. This device is a wearable smart band, which can be ware by women. The device could be used for children as a tracking device, thus parents can monitor their children's location remotely.

Keywords: Arduino Board, Pulse Sensor, Wi-Fi Module, Power Supply, LCD Display, GPS Module, Heartbeat.

1. Introduction

In recent years, with the rapid advancement of technology, there has been a growing concern for the safety and security of women and children. To address this issue, innovative solutions leveraging Internet of Things (IoT) technology have emerged. One such solution is the IoT-based women and child safety system using Arduino controller. This system aims to provide a comprehensive safety net by utilizing the capabilities of IoT and Arduino microcontrollers. By integrating various sensors, communication modules, and actuators, this system can detect potential threats and trigger appropriate responses to ensure the safety of women and children in various environments, such as homes, schools, or public spaces. Violence against women occurs throughout the life cycle from pre-birth, infancy, childhood, adolescence, adulthood to senescence. Most of the data are believed to be unreliable as many cases go unreported. Cases of violence against women are steadily increasing in the country.

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According to the National Crime Record Bureau, India there is one act of sexual harassment every 59 min, one rape every 34 min, one act of torture every 12 min and almost one in every three married women experienced domestic violence. Studies from India reported violence in 19– 76% of women (75%–76% in lower caste women; 42–48% in Uttar Pradesh and 36–38% in Tamil Nadu; and 19% in an urban slum community of childless women). The proposed device is more like a safety system in case of emergency. The emergency push button is held to one of the buttons of the watch. The main purpose of this device is to intimate the parents and police about the current location of the women**.** Women play a major role in society as equal to men. It is pathetic that in this modern era too, there is still a threat to women's safety in most of the countries in the world. [20]. Although with the strong criminal punishing laws, it's sad that the safety measures taken are not hundred percent effective. Adding to this, we can't change the mentality of all humans. To build confidence and a sense of safety in women, an effort has been made to build a project that creates a safer environment for women wherever she wishes to perceive. A tool created to assist women in need is a women's safety system.

It is a wearable gadget that tracks the woman's whereabouts and, in the event of an emergency, sends a message to a saved emergency number using electronic components such GPS modules, microcontrollers, sensors, and wireless communication modules. The gadget can be started by either pressing a button or using an app on a smart. The device's GPS module uses satellite signals to pinpoint the woman's whereabouts, and it can also connect to the mobile network to exchange extra location-related data. In the present era, ensuring the safety of women has emerged as a critical concern due to the prevalence of physical and sexual abuse. This unfortunate reality creates an atmosphere of fear and restricts their ability to freely navigate public spaces. Despite notable technological progress, women and girls in numerous locations still encounter a range of challenges, with a distressing number becoming victims of physical and sexual violence on a daily basis. A wearable security device designed for women's blazers contains an embedded microcontroller, emergency switch, GPS receiver, GSM modem, buzzer, shock circuit, and voice recorder. The device can alert parents and police of the user's current location via text message in case of an emergency. The device captures GPS location information, which is then used to generate a message containing location information and sent to the police and a pre-programmed mobile number**.**

The GPS location can also be tracked on Google maps, allowing users to feel safe and secure [20] when a woman feels unsafe, she can activate the system by using the fingerprint sensor. This triggers the system to send the woman's real-time location and a message to her registered contacts to inform them that she is in danger. To avoid triggering the system and alerting the police and family, the victim needs to make sure to sense her finger on the sensor at least once a minute. The use of IFTTT applets guarantees the automatic sending of SMSs in response to a triggered IF condition. Additionally, the micro-controller activation allows the camera to take pictures. By utilizing these technologies, we can improve the safety of women.[17] One of the

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most prevalent criminal offenses in the country currently is sexual harassment, which is increasing at an alarming rate. Women are known for their ability to mobilize people from different backgrounds, such as ethnic, religious, political, and cultural, for a common goal of promoting freedom.

2. Literature Survey

The following survey helped us in finding the right set of sensors and modules for building our proposed model.

[1] This paper suggests a security system that can ensure the safety of women and provide the necessary security measures. In this paper they suggested the use of various modules like GSM shield (SIM900A), Atmega328 board, Arduino Board, GPS(GYGPS6MV2) module, Screaming alarm (ADR 9600), Pressure sensor and power supply unit.

[2] This paper portrays wearable sensor nodes with solar energy harvesting. This paper contains records about distinct sensors that are applied for the checking of the health data of an individual. Additionally, they've created one online application to monitor the sensor's node information.

[3] In this paper they are building one wearable health monitoring system which is valuable to check the health of patients. They are giving data about sensors and the working range of sensors and Bluetooth.

[4] This paper proposes one Smart Watch with GPS. Also, this system contains an electric shock generator module, a screaming alarm module, a voice recognition module that is useful for women's security. The smart band contains three sensors that are a temperature sensor, pulse rate sensor, and motion sensor. The system can perform real-time monitoring and detect the situation of women in a critical situation. This system can detect the location and health condition of a person that will help to take action accordingly.

3. Existing Project

Node MCU is used to generate a local WIFI network. Receiver section: The receiver section consists of, Arduino nano, GSM module, GPS module, microphone, buzzer, switch, battery, and node MCU. Arduino nano: We are using Arduino nano as a controller to the project which will control all input and output devices and will make decisions according to data which is received from input devices. We are using the GSM module to send SMS in emergency situations to the family members and police control room. Its output device to the Arduino nano. We are using a GPS module to get live location coordinates of the device to identify the location, its input device to the Arduino nano.

Node MCU is serially connected to the Arduino nano. It is used in receiving section to receive signal strength and identify the percentage of the signals using RSS that is received signal strength indicator.

Node MCU will continually communicate with Arduino nano using the serial protocol and

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provide RSSI data to the controller. Microphone: Microphone is used as an input device to Arduino which is used to record voice in emergency situations on live call on SIM card on GSM module.

The buzzer is an output device to Arduino nano which is used to notify users in emergency situations. The RSSI value comes below the threshold then the buzzer will get turn on.

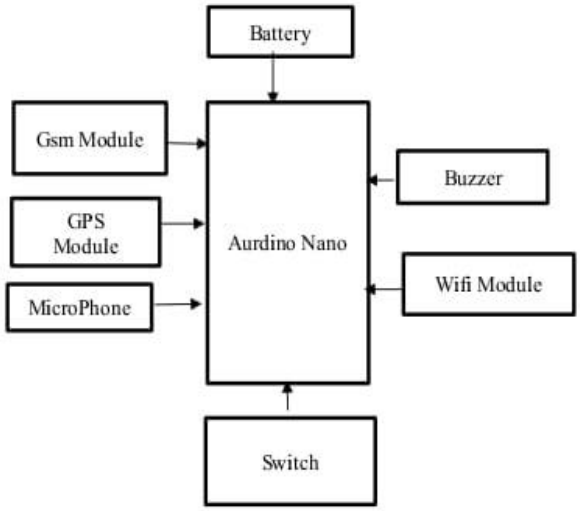

Figure 1: *Block diagram of IOT based women and child system using Arduino controller.*

4. Proposed Work

The proposed system is intended to alert the authorities to take immediate action, whenever a woman is get attacked. This design will deal with most of the critical issues faced by women and will help them to be secure. This system helps to decrease the crime rate against women.

The system can be divided into different modules, this device uses a heartbeat sensor for monitoring the heartbeat, a GPS modem for identifying the location of the person in trouble, a Lilypad Arduino micro-controller for controlling the whole process, an LCD display for display, pushbutton and a rechargeable battery for power source.

4.1 System Design

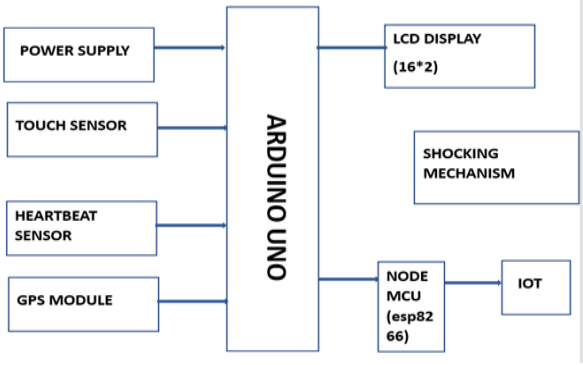

Figure 2: *Proposed system block diagram*

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4.2 System Description

The proposed system consists of various blocks for different methodologies that is discussed below.

Arduino UNO

Arduino UNO is a microcontroller board based on the ATmega328P. It contains everything needed to support the microcontroller; we can simply connect it to a computer with a USB cable.

Arduino is a device for appearing well and good and controlling a greater amount of the physical world than your desktop PC. It's an open-source physical registering stage in view of a straightforward microcontroller board, and an improvement domain for composing programming for the board.

Specifications

- Operating Voltage: 3.3V.
- Input Voltage: 7-12V.
- Digital I/O Pins (DIO): 16.
- Analog Input Pins (ADC): 1.
- UARTs: 1
- SPIs: 1.
- I2Cs: 1.

Figure a: *Arduino Microcontroller*

Node MCU

The Node MCU (**N**ode Microcontroller **U**nit) is an open-source software and hardware development environment built around an inexpensive System-on-a-Chip (SoC) called the ESP8266. The ESP8266, designed and manufactured by Espressif Systems, contains the crucial elements of a computer: CPU, RAM, networking (Wi-Fi), and even a modern operating system and SDK. That makes it an excellent choice for the Internet of Things (IoT) projects of all kinds.

However, as a chip, the ESP8266 is also hard to access and use. You must solder wires, with

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the appropriate analog voltage, to its pins for the simplest tasks such as powering it on or sending a keystroke to the "computer" on the chip. You also have to program it in low-level machine instructions that can be interpreted by the chip hardware. This level of integration is not a problem using the ESP8266 as an embedded controller chip in mass-produced electronics. It is a huge burden for hobbyists, hackers, or students who want to experiment with it in their own IoT projects.

Specifications

- Microcontroller: Ten silica 32-bit RISC CPU XtensaLX106.
- Operating Voltage: 3.3V.
- Input Voltage: 7-12V.
- Digital I/O Pins (DIO): 16.
- Analog Input Pins (ADC): 1.
- UARTs: 1.
- SPIs: 1.
- I2Cs: 1

Figure b: *Node MCU*

GPS MODULE (global position system)

Ground-based equipment receives signals from the satellites that make up the Global Positioning System. GPS units do not transmit; instead, they passively receive satellite signals. GPS receivers need They are only utilized outside due to their unhindered vision of the sky, and they frequently struggle in places with dense vegetation or close to big structures. Atomic clocks on board supply an extremely precise time reference, which is essential to GPS operations. Every GPS satellite sends out information about its location and the time of day.To ensure that these repeating signals are sent at the same time, all GPS satellites coordinate their activities. Due to varying satellite distances, signals traveling at the speed of light arrive at a GPS receiver at somewhat various times. The different time it takes for a GPS satellite's signal to reach a receiver can be used to estimate the satellite's distance. The receiver can determine its three-dimensional position once it has estimated the separation from at least four GPS satellites. There are always several spare GPS satellites in addition to at least 24 active ones. The U.S. Department of Defense operates satellites that orbit at a height of approximately

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11,500 miles every day, traveling at a speed close to 2,000 mph, for a duration of 12 hours (two orbits per day).Each satellite's orbit is precisely tracked by ground station.

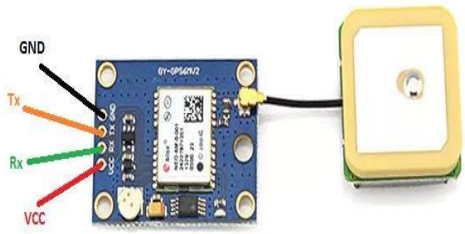

Figure c: *GPS Module*

WI-FI Module (ESP8266)

Computer game consoles, smart TVs, tablets, phones, computerized cameras, cutting-edge sound players, andmodern printers. Devices with Wi-Fi perfection can connect to the Internet. via a remote passageway and a WLAN. A passage like this, also called a hotspot, can extend up to 20 meters (66 feet) inside and out to a more noticeable distance. Hotspot inclusion can be as little as a solitary stay with dividers that square radio waves.

Figure d: *Wi-Fi Module*

Pulse Oximeter (Max 30100)

The MAX30100 is a coordinated heartbeat oximetry and pulse screen sensor arrangement. It joins two LEDs, a photo detector, enhanced optics, and low-commotion simple flag preparing to identify beat oximetry and pulse signals. The MAX30100 works from 1.8V and 3.3V power supplies and can be shut down through programming with unimportant backup current, allowing the power supply to stay associated consistently.

The MAX30100 is an integrated pulse oximetry and heart rate monitor sensor solution. It combines two LEDs, a photo detector, optimized optics, and low-noise analog signal processing to detect pulse oximetry and heart-rate signals. The MAX30100 operates from 1.8V and 3.3V power supplies and can be powered down through software with negligible standby current, permitting the power supply to remain connected at all times.

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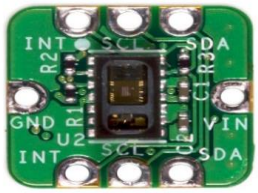

Figure e: *Pulse Oximeter (max 30100)*

Shocking Kit

A "shocking mechanism" can refer to various devices or systems designed to produce an electric shock. A shocking mechanism for defence typically refers to a non-lethal device or method designed to incapacitate or deter potential threats. This mechanism often involves delivering an electric shock to the target, either through direct contact or via a projectile such as a taser. The shock temporarily disrupts neuromuscular function, causing pain and muscle contractions, thereby incapacitating the individual without causing permanent harm. These devices are commonly used by law enforcement, military personnel, and civilians as a means of self-defense or crowd control.

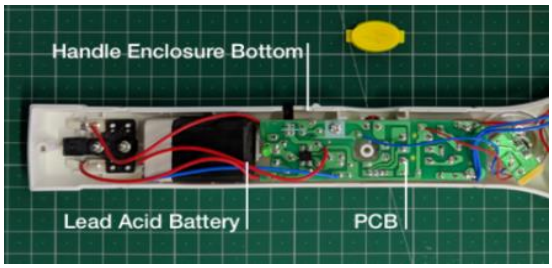

Figure f: *Shocking kit*

Liquid Crystal Display

LCD remains for Liquid Crystal Display. LCD is finding far reaching use supplanting LEDs (seven fragment LEDs or other multi section LEDs) as a result of the accompanying reasons:

1. The declining costs of LCDs.

2. The capacity to show numbers, characters, and design. This is rather than LEDs, which are constrained to numbers and a couple characters.

3. Incorporation of an invigorating controller into the LCD, in this manner alleviating the CPU of the assignment of reviving the LCD. Interestingly, the LED must be revived by the CPU to continue showing the information.

4. Ease of programming for characters and design. These are utilized for indicating particular messages on a little scale LCD.

All LCDs have the following pins.

- 8- Data pins

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- VCC (apply 5V here)
- GND(Ground)
- RS (Register select)
- RW(read-write)
- EN(Enable)
- V0(set LCD contrast)

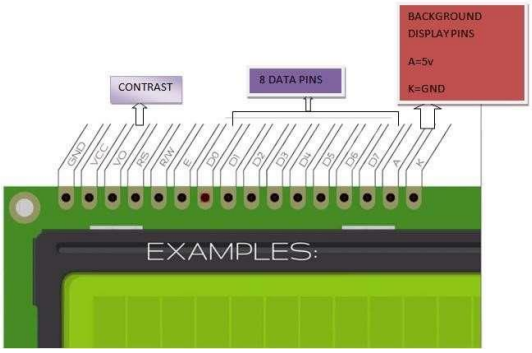

Figure g: *LCD Display*

5. Result and Discussion

The result of an IoT-based child and women safety system using Arduino would depend on the specific functionalities and features implemented in the system.

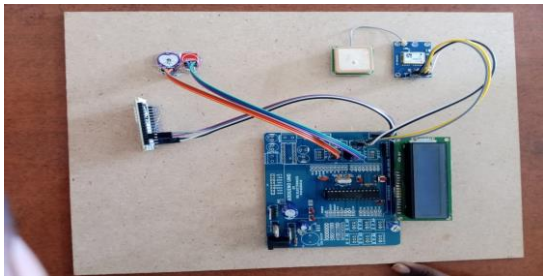

Figure 3: *System Implementation*

Input

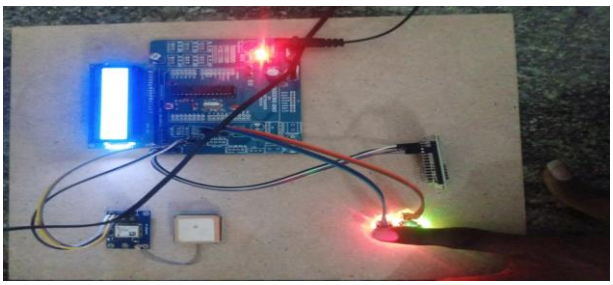

Figure 4: *Input of proposed system*

The power supply activates the circuit, enabling it to function. The touch sensor and heartbeat sensor serve as inputs, detecting the victim's condition during critical situations. These sensors

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provide crucial information about the victim's state, facilitating appropriate responses or interventions.

Output

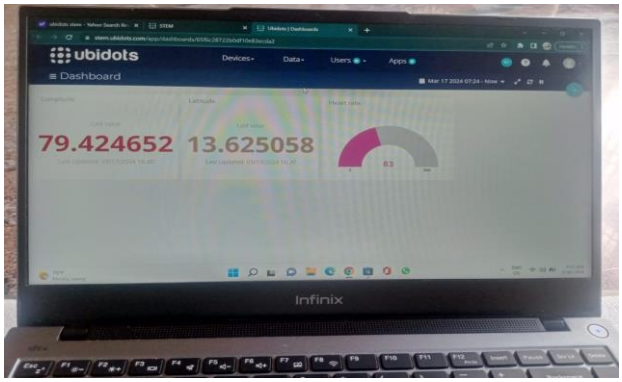

Figure 5: *Output proposed system*

The output of the safety system can be viewed on various devices such as computers, laptops, or mobile phones. Users can access the data on the Ubidots platform by logging in with the victim's ID. This allows them to monitor and analyze real-time readings from the sensors, providing crucial information during critical situations.

Alerting Message:

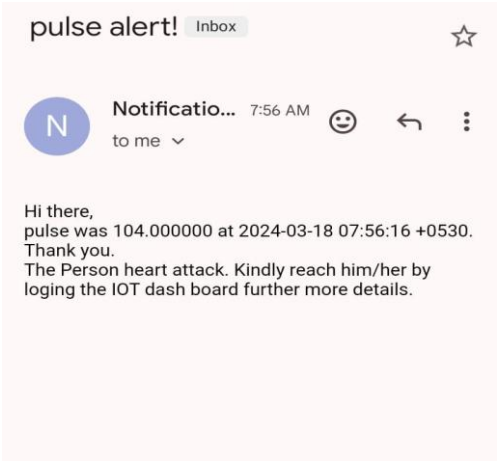

Figure 6: *Alerting message for heartbeat pulse*

The alerting messages will be sent to individuals who have logged into their Gmail accounts on the respective devices. Once the alert is triggered, it will be sent to their devices, such as smartphones or computers, allowing them to monitor the situation easily. This setup ensures that the relevant individuals receive timely notifications and can take appropriate actions to address the situation promptly.

6. Conclusion

Being safe and secure is the demand of the day. Our effort behind this is to design and fabricate a device that provides the advantage of personal security system. The merit of this application

is even when the location of the root device is changing rapidly; we can identify the exact location. This design will deal with most of the critical issues faced by women and will help them to be secure. This system helps to decrease the crime rate against women. Women's security is a critical issue in the current situation. These crimes can be brought to an end with the help of real-time implementation of our proposed system. An easy way to comply with the conference paper formatting requirements is to use this document as a template and simply type your text into it.

7. Future Scope

The Arduino board holds significant potential for innovation and impact. Here are several areas of potential growth and development. Sensor integration, Machine learning and AI, Cloud computing, Community Engagement, develop educational materials and training programs to raise awareness about women and child safety issues and empower individuals to protect themselves and others. This could include workshops, seminars, and online courses on topics such as self-defense, conflict resolution, and bystander intervention by exploring these avenues of growth and development, a women and child safety system using an Arduino controller can continue to evolve and make a meaningful impact in promoting safety, security, and well-being for vulnerable populations.

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