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Smart Wearable Device for Women Safety Using IoT

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Abstract

Due to the increased in violence against women in recent years, women's safety has become a major concern. There is currently no good solution to this dilemma. Existing apps and devices are ineffective because they need a lot of human interaction to function. These devices currently in use read the human temperature and pulse in order to trigger an alert in the event of an emergency. When a person runs, every human has a different body temperature and pulse pattern, so using a set threshold to detect an emergency situation and then generating an alarm is not the best method, and this is where existing systems fail to produce an alarm in an emergency. As a result, the aim of this paper is to create a wearable women's safety system that reads and creates patterns such as body temperature and pulse rate while running. If the readings are higher than usual, it will automatically call and message several people, as well as the venue, so that appropriate action can be taken.

Keywords— Internet of Things (IoT), Women safety.

I. INTRODUCTION

Women are the most important part of any country and have a major role in the country's bright future. Because of society's hypocritical attitude, various crimes against them are not recorded. Victims who attempt to report their assaults to society are subjected to a variety of humiliations and abuse. In India, only one out of every four cases results in a conviction. To construct the finest answer to this situation, proper safeguards should be taken. This study suggests a smart wearable based on the Internet of Things for women's safety. The device detects such circumstances automatically and alerts the appropriate people. It not only assists women in escaping dangerous situations but also ensures that women are treated fairly by assisting them in times of need. It also collects the evidences of the unfortunate situation faced by the victim.

II. LITURATURE SURVEY/BACKGROUND

S. A. More's research [1] describes the use of temperature and pulse rate sensors to automatically detect the possibility of an emergency and warn family and friends via a mobile app.

[2] shows how to use image processing to detect any potential risk and offers a variety of options to defend herself. The authors of [3] created a gadget that used a PIC16F876A microcontroller and a SIM808 module with GPS, GSM, and GPRS capabilities to alert friends and family when the emergency button was hit. A face features-based system is created in [4].

A complaint is made if the facial expression is threatening in nature. GSM and GPS are utilized to create a

secure gadget in [5]. The message is delivered to pre-stored cellphone numbers in this system, and it includes the victim's body position as well as her location. With the use of synchronized Bluetooth connections, [6] allows for separate triggering of the android application and the arm device .The audio and video that have been captured, as well as the position, are transmitted to the phone numbers that have been pre-set in the App in the form of a call and a message to notify them. An android app is developed in [7] that provides the geolocation of the female in jeopardy by providing fake phone calls, video forwarding, location, and first-aid information. [8] uses sensors to detect body vibrations, heart rate, and body temperature with the use of a trustworthy security device that includes an ATMEGA8 controller with Arduino tool and smart sensors. [9] employs three sensors: heartbeat, temperature, and accelerometer. These sensors are utilized to identify any irregularities, and a message is delivered to the loved ones by GPS and text message.

III. PROPOSED WORK/SYSTEM

Our proposed system is a wearable gadget for women that includes pressure, pulse-rate, and temperature sensors, as well as Node MCU, GPS and software application, to identify a probable atrocity and send a message identifying her whereabouts to her friends and relatives. Provide a button on the wearable that may be used to manually send a notice if the victim is able to react. The sensor is Node mcu compatible. It aids in the rapid acquisition of accurate pulse measurements.

A. Block Diagram

The block diagram of the system in Fig. 1 depicts all of the device's components. Three sensors, including pressure, temperature, and heart rate sensors, are employed to automatically identify any atrocities. The pressure sensor detects whether any pressure is being applied on the lady that is excessive. The temperature sensor is used to detect temperature variations. The pulse-rate sensor is used to identify irregularities in the woman's pulse rate. These three sensors' readings are combined to identify any critical scenario. The gadget also has a push button that the lady may use if she feels threatened. When one of the two events listed above occurs, the buzzer sounds to inform anyone around that the lady is in danger. The lady's location is then determined using the GPS module, and using iot the message is delivered to her family.

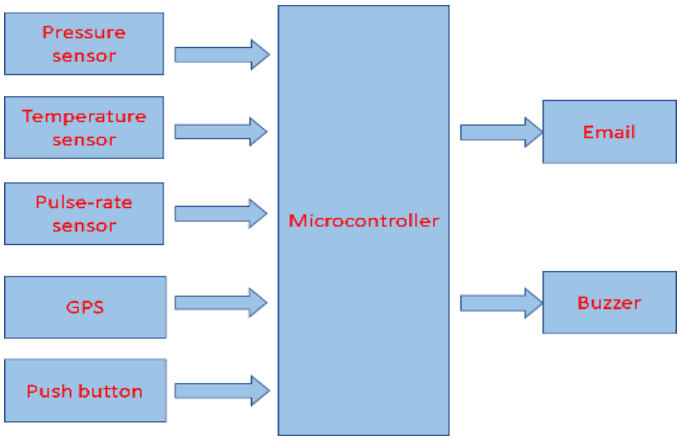

Fig. 1. Block diagram of proposed system.

B. Components

The prototype uses the following components

1) **Pulse-rate Sensor**: The Pulse Sensor (see Fig. 2) is a plug-and-sense heart rate sensor that is very tiny in size and affordable in cost.

2) **Pressure Sensor**: This is a force-sensitive resistor (see Fig. 3) with a sensing region that is circular and has a diameter of 0.5″. The force sensitive resistor will change depending on how much pressure is applied. The force exerted has an inverse relationship with resistance.

Fig. 2. Pulse-rate sensor.

Fig. 3. Pressure sensor

3) **Temperature Sensor:** The NTC Thermistor temperature sensor module (shown in Figure 4) is a compact, low-cost sensor that is extremely sensitive to ambient temperature. This sensor is used to detect the temperature of the surroundings. Temperature detection ranges from 20 to 80 degrees Celsius.

4) **Push Button**: When the push button is pressed, two points are contacted, activating the alert mechanism (see Fig. 5.)

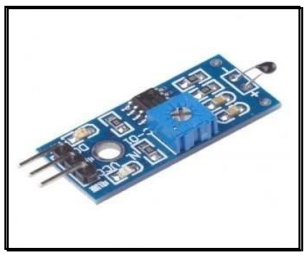

Fig. 4. Temperature sensor

Fig. 5. Push button

5) **GPS module**: GPS is a real time location tracking device. In our project we have used GPS to track victims real-time location. The GPS module consists of 4 pins namely 5V, TX, RX, GND.

6) **Buzzer**: This is a 5V passive buzzer that may be mounted on a PCB (see Fig. 7.). It's utilized in electrical designs to include Audio Alert. The coil element produces an audible tone and operates on a 5v supply.

Fig.6.GPS module

Fig.7.Buzzer

7) **Microcontroller**: The microcontroller is used in our project is Node MCU to manipulate the serial operation based the program present in the output is taken from one of the four ports. NODE MCU has the ability to perform WIFI related activities. That's the reason it is widely popular as WIFI module.

8) **Power supply**: The controller is powered by a 12 V rechargeable Li-ion battery (see Fig. 9), which then delivers the appropriate power to all sensors and modules linked to it

Fig. 8. Arduino Uno.

Fig. 9. 12V Battery

C. Manual Mechanism

The process flow that happens when the ladies are in a position to respond is called the manual mechanism (see Fig. 10). It has a button that the lady may touch when she feels threatened. The buzzer activates when the button is hit, making a loud noise to warn anybody around who can assist her. The alarm mechanism is then activated.

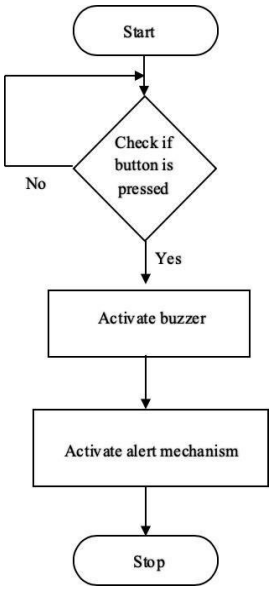

Fig. 10. Flow chart of manual mechanism

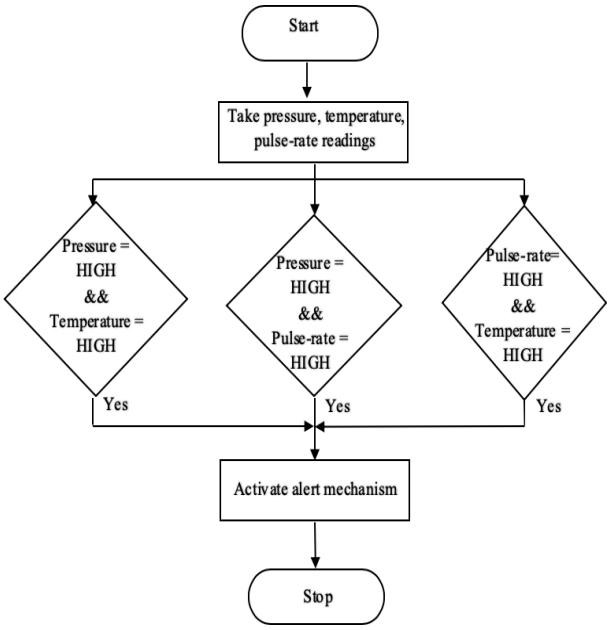

Fig. 11. Flow chart of automated mechanism

D. Automated mechanism

The women may not be able to react and operate the manual mechanism in the majority of instances. To avoid false positives, automate the process with pressure, temperature, and pulse-rate sensor (see Fig. 11.) and combine the values of these sensors. The alarm mechanism is initiated when any of the two sensors detects an irregularity.

The pressure sensor is a force sensing resistor-based sensor. The resistance diminishes rapidly with a slight increase in force. The resistance value is transformed into an analog voltage between 0 and 5 volts.

After taking the normal and abnormal data for all three sensors, a trial and error procedure was used to determine the sensor thresholds. When the sensor readings exceed the threshold levels, they are considered HIGH. During this procedure, the voltage output of the pressure sensor was monitored for various sorts of actions such as regular touch, pressing, and so on. About 4V analog output was shown at a force that might be regarded as harmful, which is roughly 5N force.

The ambient temperature is determined by the temperature sensor. As a person gets closer to the victim's personal space, the temperature around her rises. So, when the temperature surrounding the lady rises suddenly, a temperature sensor is incorporated in such a way that it gets high. When the heart rate exceeds 90 beats per minute, the pulse-rate sensor becomes high.

E. Alert mechanism

During a dangerous incident, one of the foregoing processes triggers the warning mechanism. When the alarm mechanism is activated, GPS and Node MCU are utilized to send a message to family and officials with the victim's position. For easier access, the location is given as a Google Maps link.

Figure 12 depicts the alert mechanism's system architecture. Whenever the alarm mechanism is activated, the GPS module sends the position coordinates. The GPS receives the satellite's position coordinates. Because these coordinates are difficult to decipher, the location coordinates have been transformed into a Google Maps link for easier access. Following the receipt of the coordinates, a google link containing the victim's location is created. With the use of NODE MCU and software application, this link is delivered to the registered phones.

Fig12.Prototype

IV. RESULT AND DISCUSSIONS

The components and modules used to build the module are shown in Figure 12 below. The three sensors for the automatic mechanism, namely pressure, temperature, and pulse rate sensors, are shown on the top of the model, along with the other hardware required, such as GPS, Node MCU and buzzer which are all present inside the model. When the victim presses the button and is in danger, an alarm message is sent to the pre-programmed cellphone numbers When pressure and temperature sensors become HIGH, temperature and pulse-rate sensors become HIGH, or pulse-rate and pressure sensors become HIGH, the automated mechanism is initiated.

The suggested system has the benefit of being adaptive, in that it permits triggering the warning mechanism with a simple button in situations when it is humanly feasible to reach the device, and it detects the threat using the sensor in situations where it is not feasible to react The proposed system is also portable,

lightweight, and cost-effective. It is simple to comprehend and apply. The usage of the internet is not required. The sole stipulation is that the WIFI be able to receive signals in the region.

V. CONCLUSION

The major goal of creating a woman safety device is to function as a rescue and prevent any harm to women in the case of a hazard. A smart gadget for women's safety is built using the suggested approach, which automates the emergency alarm system. This device recognizes and sends notifications to loved ones with the women's position coordinates without requiring her input in emergency situations. It instantly sends an emergency message to the family members and the nearest police station. The prototype may be carried in a variety of bags, including purses and laptop bags. It is recommended that the prototype be carried in these bags since the person attempting to hurt may not discover the device within the bag. This prototype may be transformed into wearables like smartwatches, bracelets, and necklaces through the customization process. The key benefit of our suggested system is that it includes both automatic and manual mechanisms. It is also cost-effective and simple to use When the alarm is received, the suggested system can be enhanced with features such as recording audio and video of the culprit when the mechanism is activated which can be produced as a piece of evidence in the court.

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