

# Smart Band For Women Safety using Internet of Things (IoT)

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**Abstract:** In today's day to day life, we hear many unfortunate incidents taking place in women's case. The popular inference is that women's are not safe, as there are many drawbacks on both the sides of a coin-the victims and the law enforcers. An ages old practice is still continuing today in the form of harassment, blackmailing etc., Today cyber world or virtual world has opened up new ways to reach out the women attacked. The use of cyber space and its attendant anonymity that continues to influence negatively the social and cultural aspects of society. We propose to have a device which is the integration of multiple devices, hardware comprises of a wearable "Smart band" which continuously communicates with Smart phone that has access to the internet. The application is programmed and loaded with all the required data which includes Human behaviour and reactions to different situations like anger, fear and anxiety. This generates a signal which is transmitted to the smart phone. The software or application has access to GPS and Messaging services which is pre-programmed in such a way that whenever it receives emergency signal, it can send help request along with the location co-ordinates to the nearest Police station, relatives and the people in the near radius who have application. This action enables help instantaneously from the Police as well as Public in the near radius who can reach the victim with great accuracy.

**Keywords:** Smart Band, GPS/GSM, Smart phone application.

## 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. EXISTING SYSTEM FOR WOMEN SECURITY

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].

The main drawback of these applications and services is that the initial action has to be triggered by the victim which often in situation like these doesn't happen. So the emphasis is to build a solution that works autonomously in situations encountered.

III. PROPOSED MODEL

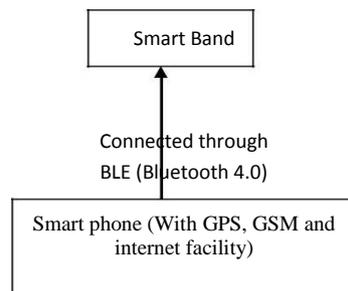


Fig. 1. Main block Diagram

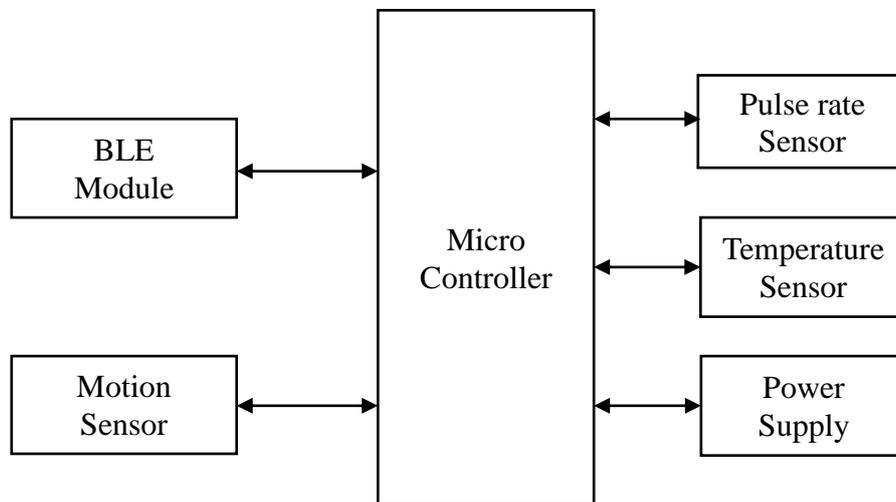


Fig. 2. Smart Band Module

As seen in Fig. 1 consists of Smart phone connected to a Smart Band through Bluetooth Low Energy (BLE). The device

Communicates with smart phone through a specially designed application that acts an interface between the device and the phone. The data directed by the smart band such as the pulse rate, temperature of the body along with the motion of the body is continuously monitored by the application which is pre-installed in the phone. In cases of abuse, the app directs the smart phone to perform the following tasks:

- Sends message to the family members along with the co-ordinates.
- Co-ordinates is sent to nearest police station requesting immediate action.
- Also sends information to people in near vicinity requesting public attention.

The app is programmed in such a way that it uses the GPS of the smart phone to track the co-ordinates and monitor the movement for easy track ability! The help message is sent to the family members and the nearest police station through the GSM facility that is inbuilt in the phone.

The app also provides a social platform where the people who have this particular app installed get the messages instantaneously so that they too can contribute in justice being delivered just in time. This feature is executed by using internet facilities of the phone of the user.

Control Unit collects information from smart wrist unit and GPS receiver. GSM module will then send all these information from control unit to base station. Wrist unit collects the data from human using body temperature sensor, pulse rate sensor and switches. RF module is used to send data from wrist unit to the control unit.

**The Smart Band unit** as seen in Fig.2 consists of various units that precisely monitor the situation and takes necessary action accordingly.

#### **A. PULSE RATE SENSOR:**

Heart beat sensor gives digital output of heart beat. When heart beat detector is working the led flashes for every heart beat. This digital output will be connected to microcontroller directly to calculate the beats per minute (BPM) rate. It works on the principle of light modulation of networked satellites and are tracked to uplinks data for synchronization. The system uses four frequencies in the L-band which ranges from 1.2 to 1.6 GHz.

#### **B. GSM MODULE:**

GSM is used to send data from control unit to base unit .We can use GSM 300 which operates at frequency 900MHz. It has up link band of 890MHz to 915MHz and down link Band of 935MHz to 960 MHz GSM takes advantages of both FDMA & TDMA. In 25MHz BW, 124 carriers are generated with channel spacing of 200 KHz (FDMA). Each carrier is split into 8 time slots (TDMA). At any given instance of time 992 speech channels are made available in GSM 300 [6], [2].

#### **C. DUAL TECHNOLOGY MOTION SENSOR:**

A Motion Sensor is a device that detects moving objects. A motion detector is often integrated as a component of a system that automatically performs a task or alerts a user of motion in a specified area. Motion sensors form a vital component of security.

Many modern day motion sensors use combinations of various technologies. While combining multiple sensing technologies into one detector reduces false triggering, it does at the expense of reduced detection probabilities and increased vulnerability factor [7].

#### **D. BLE( Bluetooth Low energy)**

BLE is designed to connect devices with low power consumption. A study by Beacon software, Aisle labs, reported that peripherals, such as proximity beacons, usually function for an year with a 1,000mAh coin cell battery. This is possible due to the power efficiency of Bluetooth Smart protocol which only transmits small packets as compared to Bluetooth Classic which was compactable for audio and high bandwidth data [8].

#### **E. TEMPERATURE SENSOR:**

Human body temperature is of vital importance to maintain the health and therefore it is necessary to monitor it regularly. We can measure the body temperature using various temperature sensors. For instance, LM35 series are precision integrated circuit sensors whose output voltage is linearly proportional to the Celsius temperature. It operates linearly +10. 0mV/°C scale factor with 0.5°C accuracy. In emergency cases body temperature varies drastically which can trigger module for rescue.

**F. GPS MODULE:**

Global Positioning System (GPS) is able to determine the latitude and longitude of a receiver on Earth by calculating the time difference for signals from various satellites to reach the receiver. In six different orbits approximately 12,500 miles above the earth, 24 MEO (Medium-Earth Orbit) satellites revolve around the earth 24 hours and transmit location every second as well as present time from atomic clocks and by monitoring blood flow through skin when is in contact with the wrist band at each pulse.

**IV. SOFTWARE ALGORITHM**

The following steps are initiated when once the unusual behaviour of the user is detected. The decision is made by the inputs given by the various sensors like pulse rate sensor, temperature sensor and unusual motion detected by the motion sensor. The situations are pre-programmed into the system based upon which the device makes the decision and is handled by the smart phone app.

1. Assign the transmitter and receiver pins of GPS module.
2. Set the serial buffer with baud rate 9600 and bit rate 4800.
3. Now set a loop which will then trigger the following actions:
  - a) Scan the contact number from SIM.
  - b) Get data from GPS module.
  - c) Convert the longitude and latitude obtained from GPS into a Google URL.
  - d) Attach this URL with an alert message.
  - e) Send this message to pre-selected ICE(In Case of Emergency) numbers from SIM memory periodically until device is reset.

**V. CONCLUSION**

This type of an idea being the first of its kind plays a crucial role towards ensuring Women Safety in the fastest way possible automatically. The proposed design will deal with critical issues faced by women in the recent past and will help solve them through technologically sound gadgets.

With further research and innovation, this project can be implemented in different areas of security and surveillance. The system can perform the real time monitoring of desired area and detect the violence with a good accuracy.

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