

# Smart Foot Device Using Atmega Microcontroller for Women Safety

<sup>1</sup>Vinayak Barve, <sup>2</sup>Vikram Deshmukh, <sup>3</sup>Nikita Pawar  
BE

Dr. D. Y. Patil Institute of Engineering Management & Research, Maharashtra, India

**Abstract** - In today's world, women come across many situations that make them feel unsafe. The recently developed solutions for the safety of women include Smartphone Applications, Intelligent Security Systems and Wearable devices. The device proposed in this project is combination of all the advantages of existing devices. This smart device will be clipped to the footwear of the user and can be triggered discreetly, on tapping one foot behind the other three times, an alert is sent via Bluetooth Low Energy communication to an application on the victim's phone. Application is programmed to generate & send a message seeking help to preset contact no. with the location of the device attached & cloud computing technique to be used for sending women's information to nearby police station.

**keywords** - Bluetooth low energy, Arduino, cloud computing, wearable device, mobile application, acceleration sensor.

## I. INTRODUCTION

With increasing issues regarding women security & safety, women from various walks of life face situations that make them feel threatened in different environments. In India, every twelve-minute sexual crime is recorded [1]. It has also been proven that in urban environments, women are more prone to experience harassment especially in developing countries [2]. In such situations, the aid of a safety device that will inform the victim's family members or the authorities (in severe situations) may help women feel safer, confident and reduce the chances of harassment. Though there are a few Smartphone based solutions for the same, it might not be possible for the victim to reach for her phone in some situations without the knowledge of the perpetrator. Thus, there is a need to introduce a discrete safety device that can be triggered discreetly without any explicit action. The idea to develop a smart device for women is that it is completely comfortable and easy to use as compared with already existing women security solutions.

The sequences of actions performed by the devices connected are as follows: (1) the devices use wireless sensors to detect any change in the environment. (2) If a valid change is observed, the appropriate message is sent to the other device(s) in the network. (3) Based on the information received, the device can be programmed to behave in a certain manner.

## II. LITERATURE SURVEY

'Suraksha' is a security device that can be activated in three ways; a voice command, click on a button and when it is thrown with a force. Upon activation, this system sends the location of the device to preselected contacts via an inbuilt GSM module. However, during times of distress, it might not always be possible for the user to carry this device in her hand. In addition, the attacker might notice the device that the victim is holding.

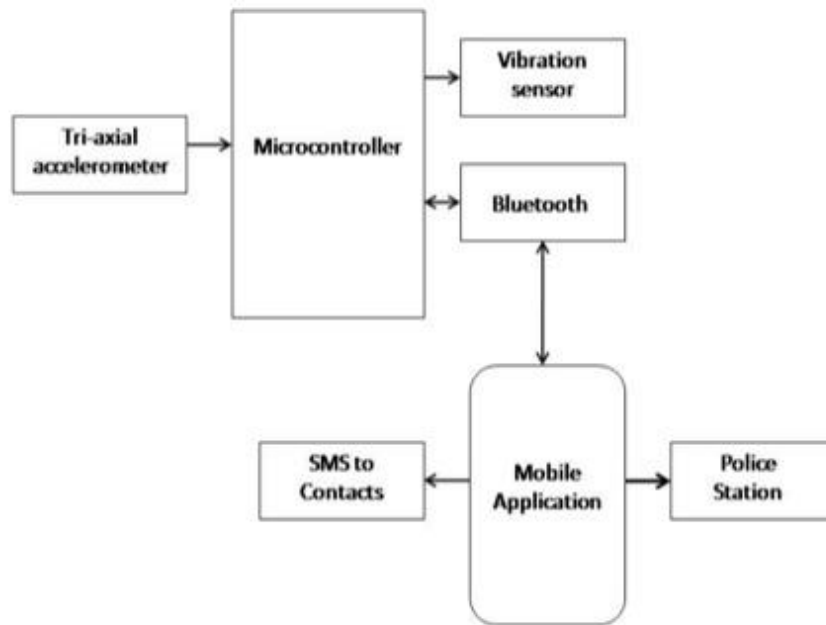
Channel V developed an application that is triggered by holding the power button down two times in a row. On receiving the trigger, the application sends an alert message to the victim's family with the location of her mobile phone every two minutes. The smartphone-based solutions that exist require the user to have access to her phone, in dangerous situations; the user might not always have the opportunity to reach for her Smartphone.

There are many wearable devices like watch, jewelry items, whistle etc. which when triggered buzzes alarm, send's call or message with GPS location to preset contact no. However, these devices are distinctly noticeable and can easily be removed from the victim.

## III. PROPOSED SYSTEM & METHODOLOGY

The device needs to be clipped on the footwear of the user. Then Bluetooth connection between the device and the user's Smartphone needs to be established. The device must be paired with the user's Smartphone to work in conjunction with the application, so that no unauthorized user can connect to the device. BLE (Bluetooth Low Energy) is used; the phone can be connected to the device without much loss in the battery life. The tri-acceleration sensor present on the device will record the acceleration reading in x, y and z-axes once every second. When the user taps, her foot on which device is clipped from back with the help of other foot, the accelerometer senses a change in the reading in the z-axis and an alert is sent to trigger the user's phone via BLE connection. Vibration sensor is used to alert the user about the activation of device. When consecutive three taps are detected, an alert is sent to the user's smartphone via the established BLE Connection. On receiving the alert from the device, an application on the smartphone is programmed to send its location to contacts that the user can preset on the application. Cloud base system is set up to send user's information to nearby police station, according to user's live location so that police can also reach for help.

### 1. BLOCK DIAGRAM



## 2. COMPONENT SPECIFICATION

- A. **Light Blue Bean:** Light Blue Bean is an Arduino-compatible microcontroller board that ships with embedded Bluetooth Low Energy (BLE), RGB LED, temperature sensor, and an accelerometer. Bean+ is the successor to the already popular, which includes a rechargeable LiPo battery along with a couple of Grove connectors. The board comes with a coin-cell battery, which further helps it to maintain the small form factor. It can be paired with Android or iOS devices for remote connectivity and control. It also comes with software called Bean Loader for programming from Windows or Mac equipped with BLE. Bean Loader installs an Arduino IDE add-on for programming the Bean platform. An Atmega328p microcontroller with 32KB Flash memory and 2KB SRAM powers light Blue Bean / Bean+. With eight GPIO pins, two analog pins, four PWM pins, and an I2C port, Bean is perfect for quickly prototyping BLE-based IOT projects.



Fig. Light Blue Bean Arduino

- B. **Tri-axial accelerometer:** The accelerometer used is the BMA250, which is a digital, tri-axial acceleration sensor. The sensor allows measurement of accelerations in three perpendicular axes and is used to sense tilt, taps and motion. The acceleration sensor data depends on the orientation of the foot of the user. Upon tapping the other foot from behind, the acceleration sensor reading with respect to the z-axis undergoes a distinct change. This property is used to detect and trigger an alert when a woman is in danger.
- C. **Mobile application:** The application is programmed to send a message for help with the google map location attached via Short Message Service (SMS) to preset contacts. Thus, the user can call for help even if the smart phone is not within reach. Cloud computing technique with location wise mapping will be used to send user's information to nearby police station.

## 3. SOFTWARE SPECIFICATION

- A. **Android studio:** Android studio is the official integrated development environment (IDE) for android application development. It is based on the IntelliJ IDEA, a Java integrated development environment for software and

incorporates its code editing and developer tools. In this paper Android Studio version 3.5 is used for developing mobile application.

- B. Arduino programming:** Arduino programs are written in the Arduino Integrated Development Environment (IDE). Arduino IDE is a special software running on your system that allows you to write programs for different Arduino boards. The Arduino programming language is based on very simple hardware programming language called processing, which is similar to C language.
- C. Cloud computing:** For creating, a cloud to store user's information "Firebase cloud" is used. Firebase provides all the facilities of Google Cloud Platform (GCP) like database management, analysis, google maps etc. It is also very easy to integrate developed application with Firebase.

#### IV. CONCLUSIONS

This work is aimed at developing a smart low-cost device to help women feel safer and prevent the occurrence of rape, harassment and other dangerous situations. This low cost system does not require the user to have physical access to her smartphone and the device is well hidden. To trigger the device, the user is not required to press any buttons or carry any object in her hand. Due to its small size, it is discrete and difficult to notice. Device needs to be always connected via Bluetooth to phone. If the user taps her foot from the back involuntarily, false alarm might trigger. In case if mobile network service is unavailable, there will be problem in sending SMS & information to police.

#### V. REFERENCES

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