International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 8 Issue 02, February-2019

Innovative Embedded Shoe Design for Women Safety

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Abstract: **Now a days, women and children safety is a prime issue of our society. The counts of the victim are increasing day by day. Many unfortunate incidents have been taking place regularly. All they need is a device to notify the concerned regarding attack and that can be carried everywhere easily. Also in this age of technology, mobile phone is one of the gadgets that almost everyone uses to keep in touch with family and friends. This paper discusses the design of such an embedded device. This proposed model uses a microcontroller based embedded device to be placed inside the women shoe and an android application specially designed for Safety of Women. This app can be activated by a single click of button, whenever need arises. All that the victim needs to do in case danger is to just remove the shoe and app identifies the location of place, accordingly sends a message to the saved contacts and also make calls to the emergency numbers saved. The unique feature of this application is that user can modify and save the selected contact number and call and message will be send to all contacts at least for three times with a gap of five minutes.**

Keywords: Bluetooth 4.0, ESP32, Touch sensor, Android, GPS, safety, microcontroller.

I. INTRODUCTION

At the present scenario women are competing with men in every prospect of society. Women contribute to fifty percent of the development of our nation. Many unfortunate incidents have been taking place in woman's case. Problems may come from any direction such as women walking on the road after the work, going to super market or many other reasons for which they go alone. People at home are not sure of their return safely. This paper discusses on a security system that is designed solely to serve the purpose of providing security and safety to women so that they never feel helpless while facing such social challenges. This paper proposes an idea which changes the way everyone thinks about women safety. A day when media broadcasts more of women's achievements rather than harassment, it's a feat to be achieved!

The best way to minimize chances in becoming a victim of violent crime is to identify and call on resources to help you out of unsafe situations. Whether you are in instant trouble or got separated from friends during night and do not know how to get home, having these safety models and apps on your phone can diminish your risk and bring assistance when you require it. In this paper, we discuss a model which will help to ensure the safety of the women all over the world. It reduces the risk and helps them in need by identifying the location of person who is in danger.

The idea to develop this model 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, smart band, bulky belts and mobile apps that are just very abstract and obsolete. The proposed model consists of microcontroller with sensor is placed inside the shoe, whenever women feels unsafe or in dangerous situations she needs to just remove the shoe so that the system initiates a call and message with instant location to the saved contacts in the app. So women can be saved and protected, by taking immediate action.

The current system is developed on the basis of android platform. Android utilizes a custom virtual machine that was designed to optimize memory and hardware resources in a smart phone. Android does not differentiate between the phone's core applications and third-party applications. Any application that is built will definitely have equal access to a phone's capabilities providing users with a broad spectrum of applications and services

As a part of literature survey, we investigated some applications that offer the same or similar services for android and other platforms. [1] The aim is to see how these applications work and to see how they can be improved. VithU [2] is an emergency App that, at the click of the power button of your smart phone 2 times consecutively begins sending out alert messages every 2 minutes to your contacts that you feed into the app as the designated receivers or guardians. The message says "I am in danger. I need help. Please follow my location." The receiver will receive a link to your location every 2 minutes giving them your updated location. Also, you will get updates on the Crime Scene in India and a "Tips Feed" option exclusively giving you safety tips in an emergency situation. If you have been a victim or witnessed a Crime you can share the incident with Channel V by posting it in the "Submit Your Story" option in the Menu Bar. Fight Back app [3] is a very basic app similar to VithU. However, one unique feature we like about the app is the Face book status update. Apart from providing SMS and Email options to alert the other person during distress, this app also updates your Face book status. I Safe Apps is a personal safety application [4] requires the name and number of the person who is to be contacted in times of emergency. Users can add multiple people in the emergency contacts list. These are the people

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who will receive notifications or SMS in case of an emergency. All it requires is the user's action to trigger an SOS button provided and it shoots messages as fast as the device can manage. Once the SOS button is hit, the people in the emergency contacts will get a message like: I am in an emergency; followed by another message, which has the exact or approximate GPS location of the cell phone. Glympse is the recent application developed on January 28, 2015. This app is a fast, free and a simple way to share our location using GPS tracking in real time with friends and family. This app does not need any sign up and do not need any contacts to manage. [5]

II. SYSTEM DESIGN

The system is designed in such way that the embedded device is to be placed inside the shoe so that the attacker cannot notice before initiating alert. In case of wearable bands or similar things the attacker can immediately remove it and the victim may not be able to get a chance to press any button. Similarly mobile apps have the limitation that the attacker may not allow the victim to use mobile in such situations. So in order to overcome these kinds of problems we have placed our embedded device inside the shoe. Whenever women feels unsafe, she need to just remove the shoe without any extra activity, the system initiates a call and message with instant location to the saved contacts in the mobile application.

III. BLOCK DIAGRAM

The system consists of Smart phone connected to a Smart Module through Bluetooth Low Energy (BLE). The module communicates with smart phone through a specially designed application that acts an interface between the module and the phone. Figure 1 shows the Main block diagram of the proposed system. The smart module block diagram is given in Figure 2.

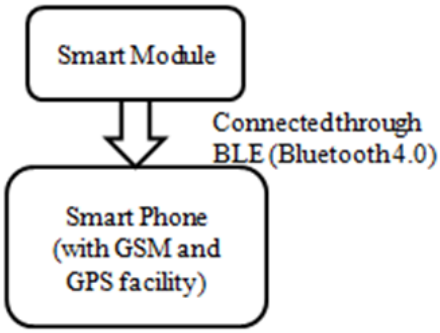

Figure 1. Main Block Diagram

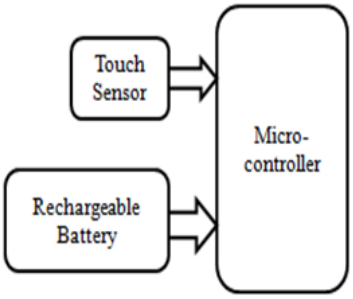

Figure 2. Smart Module

The heart of the embedded device is ESP32 SoC Microcontroller. ESP32 is a series of low-cost, low-power system on a chip microcontroller with integrated Wi-Fi and dual-mode Bluetooth. The touch sensor data is continuously monitored by the microcontroller and transmitted to the mobile application through bluetooth. The smart module is placed inside the shoe, whenever women feels unsafe, she need to just remove the shoe, so that connection with the touch sensor will be lost, and the word "Danger!!" will be send to an app through Bluetooth. Once the word "Danger!!" is received by an app, it automatically initiates call to the "In Case Emergency (ICE)" numbers, and also sends message to that numbers notifying that she is in danger, with the current location where she is present. These ICE numbers can be provided by user in an app and can be saved.

The key features of our model and app that makes it different from other apps designed till now are as follows:

- Initially, we have to enter the three contact numbers of police, family members and friends in to the application say and click on "change" button.
- While travelling, whenever need arises run the application by clicking "Pair me" button. And pair with smart_shoe.
- As and when a woman feels unsafe or in dangerous situation she needs to just remove the shoe.
- As soon as shoe is removed, it firsts make a call to the first saved registered contact number and also sends the message containing location of the victim to that number. This repeats for all the three contact numbers present in the app.

Unique feature of this app is that message with location is sent to all the numbers present in the app for every five minutes for three times. Along with message, a call is made to all three numbers, so as to ensure that contacts receiving a call can look for SMS. After three attempts the mobile application stops automatically. In case of miss-trigger the alert can be stopped by clicking "Disconnect" button in the application.

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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! Thus for app to send location the GPS of smart phone must be enabled. The help message is sent to the contact numbers which are saved in the app through the GSM facility that is inbuilt in the phone.

Also in order to charge the microcontroller present in shoe, rechargeable battery is provided. Thus the microcontroller can be powered up by providing compatible volt. And also in order to save the power the microcontroller is programmed in such a way that, whenever a microcontroller is in touch mode, i.e. when foot is inside the shoe it will be in deep sleep mode. And when the touch mode becomes zero the microcontroller wake up and sends message through Bluetooth. After completion of the task of an app it again goes to deep sleep mode.

IV. RESULTS & UNIQUENESS

A. Uniqueness

In the existing systems, we have mentioned many Android applications having similar feature to our application. In all those applications, victim's location is sent only once to the registered contacts in different forms like SMS, EMAIL etc. But in practical situations, the victim may not be kept at one place standing, she may be moving around. The unique feature of our application is location is sent to all the three contacts for every five minutes for three times. Also, all the contacts will be receiving a call, sometimes there may be chance for people not seeing the SMS, but after receiving the call they get alert and can look at the SMS and can identify that their near ones is in danger quickly.

B. Results

The Mobile application gets connected to the embedded device by clicking the button "Pair me". Figure 3 shows the screen shot of the application immediately after opening the app on the root device. Once the Bluetooth connectivity is established, the present location of the user will be updated in app. For this the GPS of smart phone must be enabled. And "Disconnect" button is provided in order to disconnect between the embedded device and app. And by clicking "Settings icon" the application goes to second page as shown in Figure 4.

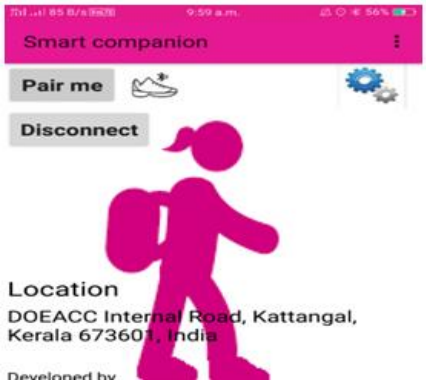

Figure 3. Screenshot of App just after opening the application

Figure 4. Screenshot of App after clicking Setting Icon

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It contains three contact numbers to be filled of which phone numbers receives call and SMS. Also, the layout contains two buttons for each contact number to be saved. By clicking on "ICE" button contact numbers can be entered or can be modified and by clicking on the respective "change" button the contact number entered can be saved. By clicking "Home icon", the application goes to first page as shown in Figure 3.

V. CONCLUSION AND FUTURE SCOPE

This project is very much helpful for any woman. Because when a woman is in danger position then she simply has to remove the shoe. By simply removing the shoe the app, it sends the call for the added guardian numbers and sends the message that she was in danger and sends the location message to the all saved guardian contacts. Through this mobile app we can alert the people at home that a woman belonging to their house is safe or not.

As a future scope, this application can be integrated with the law enforcement database, which includes all the phone numbers of regional cops. Some use cases such as rescuing victim, when the mobile network is not available, after initial alert or switch off condition. Further, it can be developed to record audio as well as video to bring the culprit to light. Thus, this application can not only help women but anyone anywhere in a big way from unsafe conditions.

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