

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 9, Issue 3, March 2020

Women Safety System using IBEACON

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ABSTRACT: In recent years, acts of assault and violence against women are rising at a menacing rate. With escalation of female employees in industries and other sectors of the commercial market, it is now becoming a necessity for females to travel at late hours and visit distant and isolated locations as a part of their work regime. However, the exponential increase in assault, violence and attacks against women in the past few years, is posing a threat to the growth and development of women. Defense isn't the only measure that can suffice against this increasing abuse. A security solution that creates a sense of safety among women needs to be devised. In instances of attack, it is largely reported that women are immobilized. There is thus, a need of simpler safety solution that can be activated as simply as by pressing a switch and can instantly send out alerts to the near ones of the victim. In this paper we intend to design and implement such a system in the form of a partial wearable and partial portable system.

KEYWORDS: GSM modem, GPS module, image streaming.

I. INTRODUCTION

It is an unfortunate observation that there has been a substantial increase in crimes against women in the past decade. With a variety of software applications now in action, to help women, the statistics have not lowered. According to the National Crime Records Bureau (NCRB), in India, 93 women were raped everyday in the year 2014. Also 3,37,922 cases of crime against women were reported in year 2014 alone [1]. The current practices in female security broadly fall into different categories ranging from android applications developed for mobile phones, and extend to fashionable apparels that can be wore and carried in day to day life. However, our focus is on creating a safety system that merges the benefits of existing techniques and brings about a solution that ensures both defense and creation of a seamless pathway to initiating legal procedures, if any; have to be taken by the victim. We intend to create a partial wearable that can provide a complete security solution and become a utility that eases the apprehension among women and their family members. The objective of research work is to create a safety system in the form of a portable safety device for women, that does the following tasks : x Alerts family and police and gives location co-ordinates of the woman being attacked. X Captures and stores an image/video of the attacker to maintain a proof for legal actions. X Incorporates a defensive mechanism by giving a mild shock

In this paper, we provide a summary of the progress achieved so far, in making of the desired system. The rest of the paper is organized as follows: Section II gives an overview of the system designed to create a safety system for women. Section III & IV will give a brief account of the nature of the design and a description of hardware components and software approach used until the current work progress. An account of implementations performed till date is presented. Section V will produce the results obtained in accordance to the work completed yet, and will discuss on the expected outputs. Section VI will conclude the report giving the summary and an account of future course of the research.

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II. SYSTEM OVERVIEW

Figure 1 gives an idea of how the system design is proposed. The device is intended to be made into two parts. The upper unit in figure 1 is designed to be wearable on the body, while the lower portion is meant to be a portable hand held unit. As shown in the figure 1 below, the device intends to work in two sections. If a woman is subjected to attack by an adversary, then a switch has to be pressed by her, manually, (which will be ideally located at a convenient location on the body), which in turn will trigger the microcontroller to activate the on-body shock circuit, and simultaneously capture the image/video and audio of the attacker, and transmit it via an RF module to another section where it will be stored. Attempts are being made to develop a method by which this image can be transferred on a web server, ideally on the police server. Next, the Global Positioning System (GPS) receiver will acquire the location co-ordinates of the woman subjected to attack, and will send these to the pre-decided cell phone numbers (typically the family and the police), via GSM module. Thus, a 3-fold security is intended to be provided C.Nagarajan et al [10-12] the location tracking system is an important part of this project since it makes sure that help is on the way for the victim. Hence, it is required to be faster and efficient. Location tracking intends to update the location of the victim continuously to either the police or the family of the victim. The programming has to be such that the latitude and longitude of the victim has to be reported at multiple instances and at different times. The most convenient form to inform about location is a Short Message Service (SMS) due to obvious and wide use of cell phones by the masses. The location tracking subsystem is designed as shown in figure 2. It explains the working of the system wherein, a trigger received from the switch drives the microcontroller to receive location data from GPS receiver unit. On parsing the correct reading, the microcontroller commands the Global System for Mobile (GSM) module to transmit the data through an SMS by using AT commands [7-9].

III. HARDWARE IMPLEMENTATION

The hardware components were chosen after conducting an extensive survey of existing tested tracking systems. The specifications are given in the following section :

A. Microcontroller: Arduino Uno R3 board

The choice of microcontroller was made on grounds of simplicity and portability. Among several options, Arduino Uno R3 board [12] was found to be more appropriate for this application, considering its portable structure, comparatively simpler programming platform and its ability to seamlessly interface multiple components. The Arduino board consists of a programmable board along with software IDE (Integrated Development Environment). It operates on 5V DC supply.

B. GPS Module: PA6E-CAM GNSS patch on top module

The GPS PA6E-CAM GNSS module is compatible with the American GPS as well as the Russian GLONASS positioning system [13]. It is based on MT 3333 chipset and works on 5V DC supply with a baud rate of 9600 bps. The SIMCOM 900A GSM module was chosen since it is easy to program the module by its easily available AT (Attention) command set. Also, the SIM 900A module is MMS compatible, which is not the case in SIM 300 modules. For the purpose of portability a GSM SIM900 shield [14] that can sit on an Arduino is preferred. It works on 12V 2A supply.

D. Raspberry Pi 2 Model B

The raspberry Pi is a controller board based on the BCM 28351 chip which is used in many mobile phones. The BCM2835 contains an ARM1176JZ-F processor running at 700MHz, 256MB of RAM, and a GPU named Video Core IV. The raspberry pi2 board runs on 5V 2A DC supply and consists of 4 USB ports [15].

E. Logitech webcam

For experimental purpose, to achieve image streaming on a web server, we are using the Logitech C170 web camera. The same function can be achieved using the custom made camera RaspiCam for Raspberry Pi also [16].

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IV. SOFTWARE APPROACH

A. *Arduino Programming*: For the location tracking system using Arduino, the software approach is given in figure below.

Fig.3. Flowchart for software program approach

The software used is the Arduino Integrated Development Environment (IDE) which provides a smooth platform for programming the microcontroller and the programming sequence is shown in figure 3. The delays are included in order to allow the respective modules to initialize and synchronize with the networks.

B. *Raspberry Pi programming*:

The Raspberry Pi is programmed such that once booted, it begins to stream images automatically as and when a motion is detected by the webcam. The motion software is used as a backbone for development of this system and webcam connected via USB port to the Pi, streamed images of programmed dimensions. The idea is to capture images and stream them to a web page on the IP address of the Pi, so that a live image capturing of the culprit can be done.

V. RESULTS AND DISCUSSIONS

A. *Results of individual testing of GPS module*:

The GPS GNSS module supports both G

PS and GLONASS which are American and Russian positioning systems respectively. In order to test it, the TX pin of the module was connected to the Rx pin of the Arduino, and readings were observed on the software serial port on the IDE.

The deduction of NMEA sentences has been explained in [17]. According to it, the mapping of location co-ordinates from GNRMC sentence is: xLatitude : 19.037143 North x Longitude : 73.003846 East Other parameters like the universal time, speed in knots etc. can also be extracted if required. The GPS module requires at least 4 satellites in its Line Of Sight (LOS) to give proper co- ordinate readings. The GPS module has a Patch On Top (POT) structure and hence can take a longer time to acquire the location. Also the time to fix (TTF) and time to first fix (TTFF) varies under different surroundings and environmental conditions. An analysis of the TTF and TTFF was done the observations are logged in Table I. It can be observed that the GPS fix times depend largely upon the spatial and LOS conditions.

This full-text paper was peer-reviewed and accepted to be presented at the IEEE WiSPNET 2016 conference.

VI. CONCLUSION

The image streaming as mentioned before, was done using Raspberry Pi. The live streaming of images was performed. An image of resolution 640x480 pixels and size 350 kB was streamed. It was found that the latency of image streaming was an average of 3-4 seconds. Figure 6 shows the live streaming of images on the webpage of the IP address of Raspberry Pi in a local network. The port selected to stream can be port 80, 81, 22, etc. We have selected port number 8081 for streaming.

In this paper, we have proposed the designing and implementation of a safety system for women in the form of partial wearable. Going serially as per the objectives mentioned, a location tracking subsystem was successfully implemented and the corresponding results were logged. The successful streaming of images of a live event on a web page was done within an intranet. The further implementation of the system will be performed in accordance with the goals mentioned in the future scope.

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Vol. 9, Issue 3, March 2020

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