International Journal of Engineering Science Invention Research & Development; Vol. IV, Issue II, AUGUST 2017
www.ijesird.com, E-ISSN: 2349-6185

CONCEPTUAL DESIGN OF WOMAN SAFETY DEVICE - THE SMART GUARD

S.P. Sanjeevi[1*], A. Shanthoshini Selvapriya[2]
[1]*School of Mechanical Engineering,* [2]*School of Computing, SASTRA University, Thanjavur, Tamil Nadu, India*
spvcsanjeevi@gmail.com

***Abstract*- In our mother India, women are respected in principle but not in practice. It is an irony that today's modern society is not safe for women. Reports of molestation, harassment, rape and murder are abundant. This terrible problem needs to be addressed. Every parent of a girl child is worried about his/her daughter's safety every second she steps out her home. This work provides a smart wearable device using Internet of Things to protect and safeguard women from danger. 'The Smart Guard' comprises of a watch and a mobile application. A pulse sensor in the watch continuously monitors the pulse of the user. If it exceeds a certain limit (customized for the user), it automatically activates the mobile application and a camera (present in the watch). The camera records video & audio and sends to the user's mobile phone through Bluetooth every five seconds. The video clips are stored in Google Drive which can be retrieved even if the mobile phone is lost/damaged. Simultaneously, the mobile application sends the current location to the desired contacts and also starts the siren (in mobile). Further, the smart guard has a provision of pepper spray as a self-defense weapon to escape from the situation. This smart guard is first of its kind, automatically acting at emergency without any need of manual pressing of any button.**

***Keywords*- Mobile application, pepper spray, pulse sensor, siren, smart-watch.**

I. INTRODUCTION

In our mother India, women are respected in principle but not in practice. It is an irony that today's modern society is not safe for women. Reports of molestation, harassment, rape and murder are abundant. This terrible problem needs to be addressed. Over 34,600 cases of rape have been reported across India in 2015 [1]. Among these, in 33,093 cases, the offenders were known to the victims [1]. Twenty five percent of children raped, were targeted at work by their employers and coworkers [2]. Women being weaker by physical strength cannot fight equally with the criminal and escape from him. In work places and on the way home, if they face some problems they cannot depend on the neighbors wholly. They cannot inform their parents or family members at that critical situation. If they try to call someone through phone, the offender will throw away the phone. So, this work aims at notifying the family members including the emergency number of India '112' and police station, automatically without the offender noticing it. To automate the notification pulse rate of the user is considered as the criterion. It can be monitored at the wrist comfortably. While the pulse rate is continuously monitored, the smart guard gets actuated if the pulse rate exceeds the preset threshold value, customized for the user. To make the device a utilitarian one, a watch resembling a bracelet is made use of and everything is concealed inside the watch.

Some notable existing works on woman safety are Sonata ACT watch and some mobile applications in play store [3]. In the ACT watch, the user needs to press the button at the time of emergency. The offender might notice it and throw the watch away after which its location will not be useful. Same is the case with the mobile applications which need to be activated by doing some actions in the phone for which time will not be there or the offender may not allow. The purpose of this work is to bring automation into women safety gadgets. This makes the emergency situation easy to escape. Many women, under pressure and fear may not be able to press any button in the gadget for help. Something which does not require any button to be pressed or perform any action is needed. The perfect solution is 'The Smart Guard'. This gadget automatically senses the emergency and starts to function. A CAD model of the smart guard concealing the components is shown in Fig. 1.

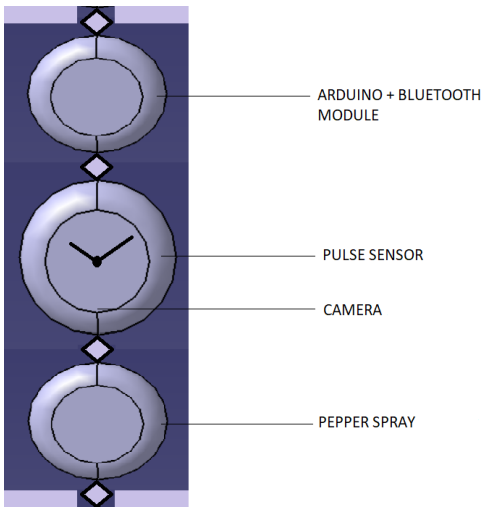

Figure 1: Pictorial representation of the watch in CAD

2. HARDWARE AND SOFTWARE COMPONENTS WITH THEIR INTENDED FUNCTIONS

2.1. WATCH

The watch used in this device has a normal size dial (round or square). Under the dial, a pulse sensor is placed. A video camera is housed on the dial. On the adjacent sides of the dial, watch straps enclose the components. On one side of the dial, Arduino board and a Bluetooth module are placed. On the other side, pepper spray is placed. It is to be manually operated because when something goes wrong it will affect the user itself. The schematic representation of the components of smart guard is shown in Fig. 2.

2.2 ARDUINO LILYPAD-A DATA PROCESSING BOARD

Arduino LilyPad is an open-source physical computing platform designed for e-textiles and wearables to make realistic and intuitive communication between electronics, physical devices, vehicles, internet, etc. It is a microcontroller board, based on ATMega168V (ATMEL Microcontroller) which is operating at 2.7-5.5 V and 2.7-5.5V of Input Voltage with 16kb of flash memory for storing programs and 512 bytes of EEPROM for storing parameters [4]. It has a number of facilities for communicating with internet, computer, mobile application, another Arduino board, or other microcontrollers. It has 14 digital input/output pins, 6 analog inputs, a crystal oscillator of 8 MHz, a USB connection, a power jack, and a reset button [4]. It has an internal boot loader that supports burning of most recent codes without any external hardware. It can be programmed with the Arduino Software (IDE) which includes a serial monitor allowing data to be sent to the board. The RX and TX pins of LilyPad plays the major role in transmission and reception of data via the USB-to-serial chip converter (FTDI chip) [4]. This is the brain of the smart guard.

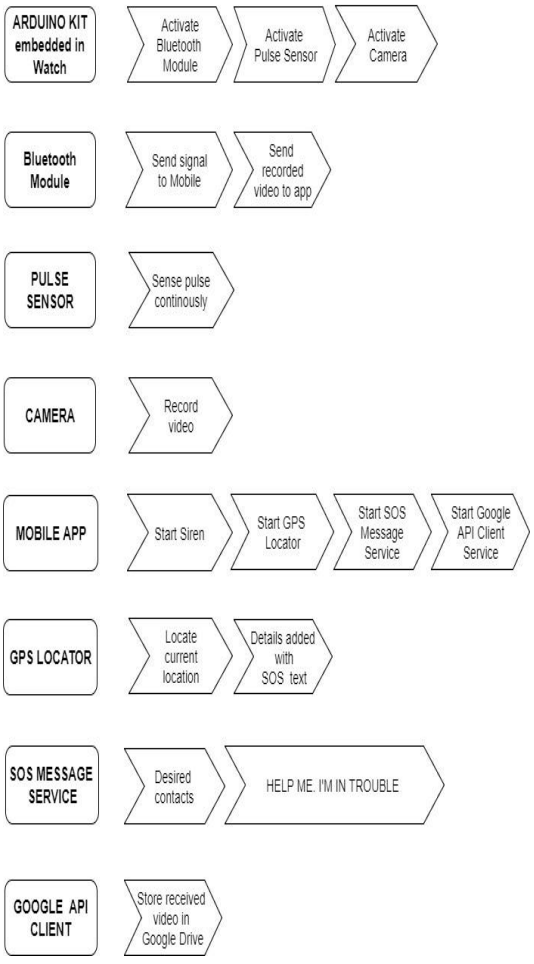

Figure 2: Schematic representation of the components with their functions

2.3 ARDUINO SOFTWARE (IDE)

With the help of software library functions from the wiring project, Arduino IDE an integrated development software helps to code Arduino microcontrollers to interface the sensors and other type of physical components to perform the desired

operation of an application. Using special rules of code structuring, it supports the languages C and C++. It encodes the executable C or C++ code into hexadecimal (text file) and loaded into the Arduino board by Arduino boot loader using USB-to-serial convertor (FTDI chip) on an Arduino board [4].

2.4 BLUETOOTH MODULE

The HC05 Bluetooth module is one of the global standards-based wireless technology designed to address the unique needs of low data rates, low-cost and low-power wireless M2M networks which can be set to either Master/Slave. It is a technology developed for data transfer in wireless network. It works with an operating voltage of +3.3V and sips a power of 50mA [5]. It supports wireless serial communication using Software Serial Library. It is programmed wirelessly with the Arduino software IDE to provide reliable data communication between the Smart Guard and Android mobile Application over a range of approximately 10 meters (30 feet) using short-wavelength UHF radio waves in the ISM band from 2.4 to 2.485 GHz [5].

2.5 PULSE SENSOR

The 'Pulse Sensor Amped' is a plug-and-play heart-rate sensor for Arduino. The Pulse Sensor is a photo plethysmograph, which is a well-known medical device used for non-invasive heart rate monitoring [6]. It essentially combines a simple optical heart rate sensor with amplification and noise cancellation circuitry. To get the reliable pulse readings, it sips power with just 4mA current operating at 5V.

2.6 GOOGLE DRIVE

Google drive is a file storage and synchronization service which allows users to store files in the cloud, synchronize files across devices, and share files. A mobile application interfaced with the Smart Guard is designed with Android Google Drive API. The API is part of the Google Play services client Library [7]. It provides abstractions to backup and for managing (storing and retrieving) the data to/from the Google drive via Mobile Application.

2.7 ANDROID MOBILE APPLICATION

The Android app is designed with the following features:

- Starts alarming the siren
- Using the in-built GPS in mobile, it tracks the current location and sends the location to the preset contacts along with the SOS message through text
- To receive the recorded video from the smart guard through Arduino Bluetooth module
- Using Android Google Drive API, it sends the data payload to the drive every 5 seconds

2.8 GPS (GLOBAL POSITIONING SYSTEM)

New generation mobile phones combine many functionalities into a single device – the Smart phones. One such convenient feature is the inbuilt GPS (Global positioning system) which works exactly like a standalone GPS.The Global positioning system is made up of satellites, ground stations and receivers.They contain low-power transmitters and GPS receivers that let them communicate with the nearest tower and with the units from the 30 global positioning satellites in the GPS systems [8]. This feature available in smart phone is utilized by the smart guard.

III. WORKING

A safety switch is provided in the watch. It is the one which makes the entire system work. It may be switched off at home or whenever the user finds it not needed. When the user steps out her home the switch can be made on. It starts the pulse sensor and switches on the mobile data in mobile. Whenever emergency is detected, the system works accordingly. Fig. 3 depicts the working of the system.

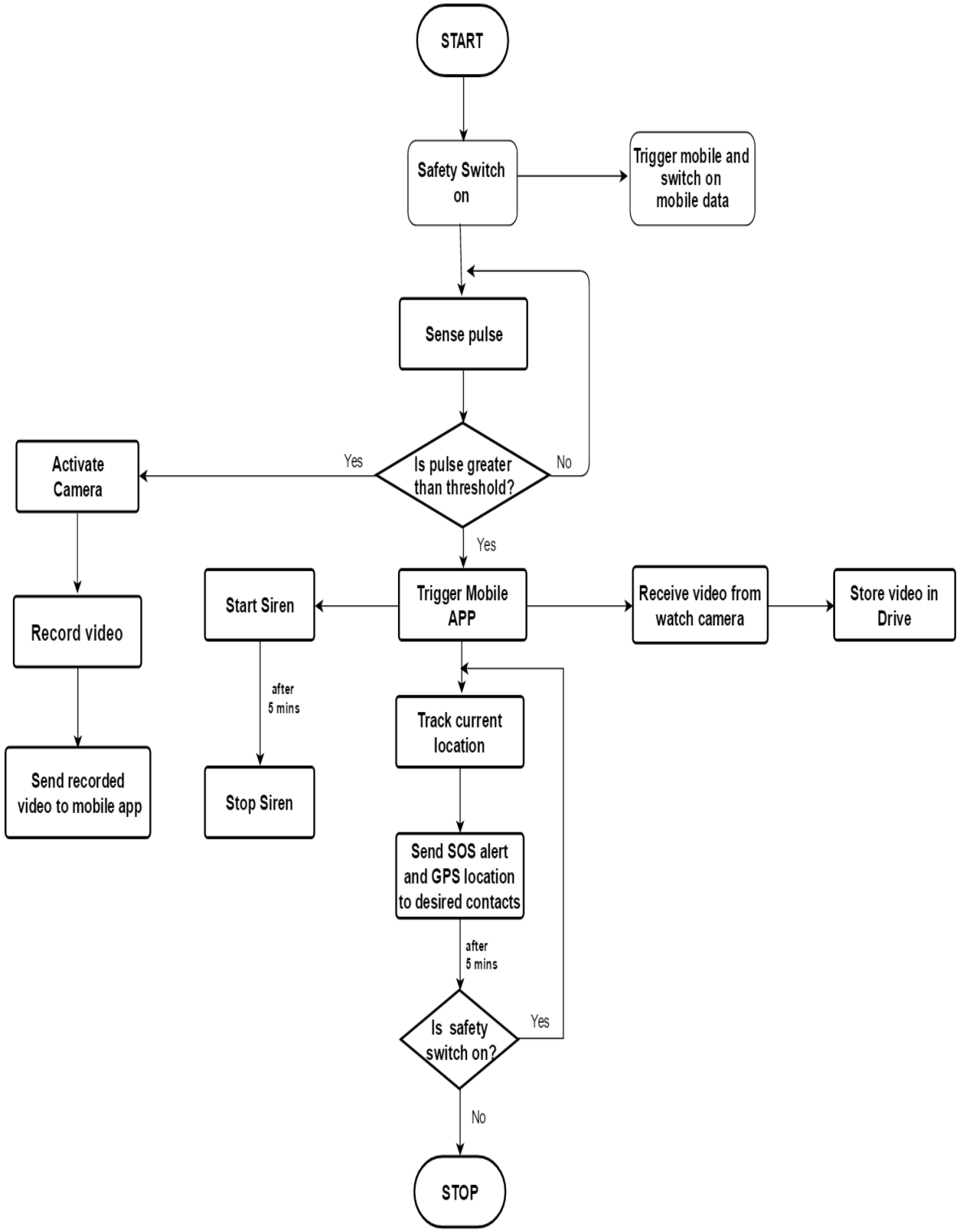

Figure 3: Flow chart showing the working of the system

4. CONCLUSION

4.1 ADVANTAGES OF SMART GUARD

- Automatic activation during emergency
- Captures video for investigation
- Sounds a sonorous siren to draw attention of the neighborhood
- Pepper spray for self-defense to escape from the situation

- Sends location information to preset care takers
- Default numbers of police and emergency

4.2 LIMITATIONS OF SMART GUARD

- Requires a smartphone with internet facility
- Range of Bluetooth is 10 meters

4.3 APPLICATIONS OF SMART GUARD

As the current scenario for women is terribly insecure every woman is in immediate need of some protective measure. This 'smart guard' guards them in such unsafe situations by equipping them a self-defense pepper spray and also informing their care takers at once automatically. It is best suited for college girls and working women who travel in the evening time. With this pepper spray a woman can make an offender suffer for around 30 minutes and create time to escape. There is no need to take the mobile and call her care takers, they will be informed and they will contact. Also, separate pepper spray will be inside the handbag. At the time of accessing it the offender might attack. This provision in watch makes the job simple.

Compared to Sonata ACT watch this 'smart guard' acts automatically and does not demand any manual pressing of a button. There are some mobile applications for women safety which need to be turned on taking the mobile. But this smart guard makes you free from such things and watch communicates with the mobile phone in the hand bag and activates it. The camera does not flash any light and so the offender will never notice it. It is also capable of recording during the night time.

4.4 FUTURE SCOPE OF THIS WORK

Use of Wi-fi or ZigBee instead of Bluetooth can be studied with their ranges and the feasibility of fitting inside a watch. With the advancement in technologies the same concept can be carried out in some alternative methods.

REFERENCES

[1] PTI (2016 August 30). Over 34,600 rape cases in India, Delhi tops among union territories. The Indian Express. Retrieved from, **http://indianexpress.com/article/india/india-news-india/over-34600-rape-cases-in-india-delhi-tops-among-union-territories-3004487/**

[2] DeeptimanTiwary (2016 August 31). NCRB data: 25 percent of children raped were targeted at work by their employees and co-workers. The Indian Express. Retrieved from, *http://indianexpress.com/article/india/india-news-india/ncrb-data-rape-child-minor-workplace-by-employee-crime-3005142/*

[3] Titan launches Sonata ACT, one-of-a-kind safety watch (2016 December 9). Retrieved from, *http://tata.com/company/releasesinside/titan-sonata-act-launch*

[4] Arduino products- LilyPad Arduino board. Retrieved from, *https://www.arduino.cc/en/Main/ArduinoBoardLilyPad*

[5] Bluetooth- HC05-HC06-modules-how-to. Retrieved from, *https://arduino-info.wikispaces.com/BlueTooth-HC05-HC06-Modules-How-To*

[6] Pulse sensor amped. Arduino code v1.2 walkthrough. Retrieved from, *https://pulsesensor.com/pages/pulse-sensor-amped-arduino-v1dot1*

[7] Introduction to the Google drive Android API. Retrieved from, *https://developers.google.com/drive/android/intro*

[8] USA Today. How does GPs work on cellphones? Retrieved from, *http://traveltips.usatoday.com/gps-work-cell-phones-21574.html*