

Design And Development Of Women Self Defence Smart Watch Prototype.

Shreyas R.S, Varun.B.C, Shiva Kumar.H.K, Punith Kumar B.E, Kalpavi.C.Y

Abstract— Women all over the world are facing and even subjected to unethical physical harassment. Security for women is still a major issue as the number of crimes and harassment over women and girls is increasing day-by-day. In this age of technology, mobile phone is one of the gadgets that almost everyone like and uses to keep in touch with family and friends. All they need is a device that can be carried everywhere easily.

This proposed paper deals with a quick responding, cost protection system for an individual and especially for women using which a woman in anguish can call for help just with the press of a button on this smart gadget. Self Defense module for women safety is like a Smart Watch for Women safety. It has the ability to help women with technologies that are embedded into a compact device. It has the potential to help women with technologies that are embedded. It is specially designed for women safety and protection. It has a control button that will be used by women to inform nearby police when they are in distress. This watch directly gets connected to the satellite through GPS when activated. Then the location is transferred through the GSM, it also contains a shock mechanism to produce non-lethal electric shock in emergency situations to deter the attacker.

Index Terms— Electric Shock Generator, GPS, GSM, Smart Watch, Screaming Alarm, Voice Recognition.

I. INTRODUCTION

India which seeks itself as a promising super power and an economic hub can achieve its goal if and only if a large numbers of women get themselves involved and participate in the development process. In today's world, women safety has become a major issue as they can't step out of their house at

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any given time due to physical/sexual abuse and a fear of violence. Even in the 21st century where the technology is rapidly growing and new gadgets were developed but still women and girls are facing problems. Even today in India, women cannot move at night in many places and even at day time crowded places hundreds and thousands of incidents of physical/sexual abuse happens to women every day. Among other crimes, rape is the fastest growing crime in the country today. This paper presents an analysis review on the principal need of intelligence defense system with technology requirement and challenges to build the system. Since the prediction of such situation is not possible hence to minimize the act of physical violence (robbery, sexual assault etc.) is to keep all the help tools ready to safely escape from violent situation. This reduces risk and brings assistance when needed.

The status of women in India has gone through many great changes over the past few millennia. From equal status with men in ancient times through the low points of the medieval period to the promotion of equal rights by many reformers, the history of women in India has been eventful. In modern India, women have adorned high offices in India including that of the President, Prime Minister, Leader of the Opposition and Speaker of the Lok Sabha. However, women in India continue to face social challenges and are often victims of abuse and violent crimes and, according to a global poll conducted by Thomson Reuters, India is the "fourth most dangerous country" in the world for women, and the worst country for women among the G20 countries.

This paper proposes new ways of interaction between people and technology, making the technology to adapt to the users' needs and interact with the environment that surrounds them. This kind of interaction is reached by means of technology that is embedded whose main aim is facilitating their daily activities.

In this sense, the use of context-aware technology is an essential aspect in these developments to perceive stimuli from the context and react to it autonomously. An environment capable of recognizing the presence of people, and locating them .Activity context is the base to our technology to demonstrate all its potential.

There are many approaches that propose electronic tele monitoring systems aimed at tracking victims and aggressors in order to reduce risk situations. Though these approaches are based on locating and data transmission technologies such as GPS and GPRS. This module directly gets connected to the satellite through GPS when activated. Then the location is transferred through the GSM and this device is

also provided with a shock mechanism to produce non-lethal electric shock

The paper proceeds as follows. Section 2 present the study of several existing systems with its functionality. Section 3 analyses the present systems critically based on cost factor. Section 4 presents the proposed model. Section 5 discusses the working of proposed model. In Section 6 discusses the Working of Prototype developed. In section 7 the future scope of the proposed system is discussed. And finally in section 8 presents the conclusions of this paper.

II. EXISTING SYSTEM

The existing systems available and surveyed can be categorized into three ways as follows:-

A. Systems designed as a mobile application for the android mobile

Dongare Uma, Vyavahare Vishakha and Raut Ravina[1] proposed a voice keyword recognizing app to recognize the user and activate the app functionality even when the mobile keypad locked. The GPS module tracks the longitude and latitude to trace an exact location of a user and sends the pre-stored emergency message including location to the registered contact numbers. The Audio Recording module starts the recording of the conversation for five minutes and stored as evidences. The message goes in queue if network problem and send when network gets available. A notification is generated for successful deliver message. Also user can select contact through voice based contact list and make a call. Note: The spoken keyword converted into a text to compare with the registered keyword.

Magesh Kumar.S and Raj Kumar.M[2] proposed an emergency response situation recognizing app called as IPROB to provide women safety even in the situation like terrorist attacks or natural disaster, by just shaking the mobile above the predefined threshold value automatically activate the system. It starts capturing the surrounding voice to test and confirm the unsafe IPROB situation where it raised the notification and user fail to respond in predefine time then the message alert sends to the register contacts. If the mobile profile at the receiver is in silent mode then convert it into the General profile to give the voice notification as “YOUR CHILD IS IN TROUBLE PLZ HELP...PLZ HELP ...” continuously like a ring tone, until they stop it. If a register contact confirms a PROB then appropriate emergency services like ambulance, fire brigade are alerted. If a register contact responds with an audible notification, then it automatically connects and enables the speakerphone at the victim side. An integrated tri-axial accelerometer used to evaluate the unique movements that a phone experiences as threshold.

Bhaskar Kamal Baishya[3] proposed an android app to provide security different situations as follows. The module provide security to Women at Emergency Situations propose a Save Our Souls (SOS) app to provides the security on a single click of SOS button for the women travelling at night

or alone. No need to unlock the screen, instead by just pressing the power button it directly triggers the application to run at the background, to send the emergency message including the location in the form of latitude and longitude to the registered contacts.

Archana Naik *et al.* [4] proposed an app, in which a single click of SOS sends a message containing the location and/ or audio- video call to the guardian number. At receiver touch the location URL in the message to view it in the Google Map. It also provides different help tools like First-Aid help, Fake Call Help and video call. The First-Aid help tool provides the help on various health issue problems occurred at an accidental or emergency situation during the night time. First aid help for various problems are as: unconscious and not breathing, choking, bleeding heavily, burns, heart attack, diabetes etc. The Fake call help to escape from the meetings- parties at a time when women start feeling uncomfortable and think that, “if someone calls me then I can leave this place”. Fake call rings tone same as that of normal incoming call ring and once call accepted it stop ringing. It also supports Fake Hang Up option. The guardian contacts are by-default for this app, but it able to search the cops, firemen, hospitals contacts nearby to your location. It also sends the audio-video recording via Email-Gmail of emergency situation taken by the user where user unable to speak or tell the circumstances.

B. Systems designed as a device with the help of Microcontroller

The IEEE real project by Thooyavan V [5] proposed an automated highly reliable women security device which consist of the advanced sensors embedded in a wearable dresses. It consist of advanced sensors, GSM and ATMEGA8 microcontroller with ARDUINO tool which keep user under observation at all the time. It monitors the heart beat-rate, temperature and vibration in body through sensors to check for uneasy situation. In such situation it will activate the GPS module to track the location and wireless camera to capture the images that get send to the control room of the receiver through GSM modules to take necessary actions. At the same time processor activate the mice unit with amplifier which strengthens the voice of the women to screams or shout above the threshold limit.

Archana Naik *et al.* [6] proposed a portable device as a belt which is automatically activated base on the pressure difference crosses over the threshold in unsafe situation. A GPS module track the location and sends the emergency messages to three emergency contacts every two minutes with updated location through GSM. The system also activates the screaming alarm that uses a siren, to call out for help and also generates an electric shock to harm the attacker for self-defense which may help the victim to escape. The device mainly consists of micro controller on the ATMEGA328 board which programmed using the ARDUINO programming language.

Nishant Bhardwaj and Nitish Aggarwal [7] proposed the women security device called as “Suraksha” which is an easy to operate device. This device can be activated through-

voice command, Press a switch key and shock (i.e. when the device is thrown with force, a force sensor used to activate the device). In emergency situation it will send the message including instant location to the police, via the transmitter module and registered numbers via a GSM module. Currently the work is under process to embed it in jewelries, mobile or other carrier like belt etc. It can play a major role in the propose projects where all the police stations are connected and share the criminal records, crime investigating cases etc.

C. An advanced artificial intelligence security systems

Remya George *et al.* [8] proposed the advanced automatic technique to predict the unsafe situation based on the female emotion as fear, anger etc. The system follows the steps given below to determine the chaotic situation under the surveillance region to identify the violence situation.

Step 1:- At a higher altitude camera² placed to obtain the body movements as well as to provide the surveillance. If the population density calculated for a given frame contain more than fifteen individuals then such situations are not consider for further processing since the chances of attack in the crowded place are less. The Chaos analyzed by comparing two successive equal sizes captured images through camera¹ is place in such a way that it will captures the face emotion. For two persons, the camera field of view is divided into two regions to find out the distance between the individuals which get compare with pre-defined value called as threshold. If the variance is small indicating the safe distance whereas the large variance indicate the unsafe situation to activate the gender detection section.

Step 2:- It check the gender as male or female base on the facial features (correlation value) to identify at least one female to activate the system.

Step 3:- Facial Expression Reorganization System used to recognize the individual action base on the facial expressions by performing the following steps:-

1. Acquisition step: - It detects and captures the face (normally head position).
2. Extraction step: - To extract the features from image after pre-processing.
3. Gesture recognition step:- It provide intelligent ways to classifies feature into emotion reorganization feature to generate the fine face details as smile, fear and anger.
4. GSM module and alarm system: - If emotion on female face is detected as fear/ anger, and notification generated and send to the control room. Also it activates the surrounding siren. The system able to capture and store the face expression of suspect as for the evidences.

Since the system predicts about an unsafe situation hence require advance technology.

III. CRITICAL ANALYSIS

The above existing systems are analysed based on the parameter like shortcoming, vulnerabilities, cost and parameter that affect the cost.

Table 1: Critical Analysis Summary

Ref Id	Shortcoming	Vulnerabilities	Cost &Parameter that affect cost
[1]	Needs to remember the keyword for activation.	A system may not recognize the user, if noise added with voice.	Cost-Free/ Very Less. A software implementation makes cost less.
[2]	User should remember the Shaking way to activate the system.	A system may not recognize the threshold when shaking frequency gets varies.	Cost-Medium. An integrated tri-axial accelerometer evaluates the threshold.
[3]	Switches replaced with advance sensor	Internet is mandatory	Cost- High. Android mobile with that embedded h/w of Switch and GSM modem
[4]	For SOS key press mobile must be in reach at emergency.	In First-Aid help Tool not provide the nearby hospital information	Cost- Free/ Very Less. Due to software development
[5]	Sensors makes as a dedicated wearable device.	The other device vibration or invisible ray may affect the system.	Cost- Very High. Intelligent sensors for heartbeat, vibration body.
[6]	An alarm Module needed for help.	In crowded train or bus the system get activated.	Cost-High. Hardware with assembly program
[7]	A very small size makes it as a dedicated device.	If any modules fail need to replace entire system.	Cost- High. Nano technology helps to embed it in jewelry.
[8]	An area covered by intelligent Surveillance system is limited	The enjoyment "Masti" with friends at public places may recognize as Chaos.	Cost- Very Very High. Advanced image Processing and Gender detection software

[Note: - Cost mentioned above is categories based on the present currency rate as 1Dollar (\$) =Rs 64

Very Less=under Rs 200;

Medium=Rs 200 to Rs1000;

High=Rs 1000 to Rs 5000;

Very High= Rs 5000 to Rs 20000;

Very Very High=Rs 20000 to Rs 100000]

IV. OBJECTIVES

Self defence and alert system for individuals to avoid crimes in alone or being in badly lit areas:

1. Implementation of a real time monitoring device can solve the problem to an extent.
2. The basic approach is to intimate instant location and a distress message to the cops and registered number like parents, friends, media, and women cell etc. so that unfortunate incidents would be averted and

to provide real time evidence for swift action against the perpetrators of crime against women

- Shock mechanism to produce non-lethal electric shock in emergency situations to deter the attacker. The user can be alerted of the updates on his phone and can take steps to prevent food wastage or can place orders to restock the food in the fridge.

V. METHODOLOGY

The system comprises of sections which describes a quick responding, cost protection system for an individual and especially for women using which a woman in distress can call for help just with the press of a button on this smart gadget. Self Defense System for women safety is like a Smart Watch for Women. It has the ability to help women with technologies that are embedded into a compact device. The women wearing this device as a watch or band, in case of any harassment or when she finds that someone is going to harass, she presses a switch that is located on the watch or band or when the women has fallen the information about the attack along with the body posture and location information is sent as SMS alert to a few predefined emergency numbers And soon help is on its way! The system will consist of embedded hardware and software co-designed for this dedicated application. The system allows for knowing exact location of the individual, as soon as the trigger key on the belt is pressed. By providing the instant location of the distressed victim to the police so that the incident could be prevented and the culprit apprehended. In case if the caretaker wants to know the present location of the lady, he/she can do so by sending a SMS to the SIM number of the lady which contains a secret password. Then this system responds to such request by sending back a SMS containing location information in terms of Latitude and Longitude. This would help reduce crime against women. It also contains a shock mechanism to produce non-lethal electric shock in emergency situations to deter the attacker.

VI. DESIGN CONSIDERATIONS

The module could be seen to be composed of sub-modules namely:

- Sensing module*: Emergency key, Voice recognition module.
- Control module*: ATMEGA328 Microcontroller, Power Supply Unit
- Transmission module*: LCD Module, GSM Module, GPS Module.

These modules work together to determine the location of the victim in danger situation and inform near by police station and to the relative number stored in it a via an SMS.

VII. PROPOSED MODEL

The proposed model consist of the following components

- Microcontroller
- 16x2 LCD
- GPS Modem
- GSM Modem
- Relay, Shock generator

- ULN, APR, Speaker.
- Key, Emergency key, Voice kit
- Power supply, Mobile, TV, Computer police station

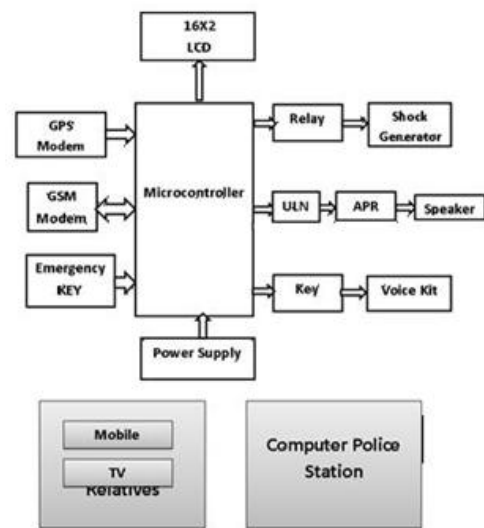


Fig 1:Block Diagram of Self Defense module

VIII. WORKING OF PROPOSED MODEL

Aim of the proposed algorithm is to help women by the technologies that are embedded in it. Smart Watch for Women is specially designed for women safety. When the supply is given the device will turn on. GPS and GSM connected to ATMEGA also start working and it displays the current position of device. Then with the help of GPS the location (latitude and longitude) of the victim is detected and is displayed on the LCD. When the victim feels danger, he/she presses the first emergency key, the kit displays emergency situation and voice kit is enabled. Now the victim gives voice command and it is recognized by the kit. If the voice command matches with the one stored in database then the appropriate action takes place. For example if POLICE gets the voice command given by the victim, then a text message is sent to a number of police station and also an alarm is generated. Another emergency key is also provided in the kit and if it is pressed by the victim it generates a electric shock of around 12 V DC which can give severe shock to the person who is trying to mistreat.

Based on the critical analysis and the requirement of safety functionality the modules are selected as shown in figure 1

The working of selected modules is as follows:

1. Microcontroller :The high-performance Atmel 8-bit AVR RISC-based microcontroller combines 32KB ISP flash memory with read-while-write capabilities, 1KB EEPROM, 2KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter

(8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts.

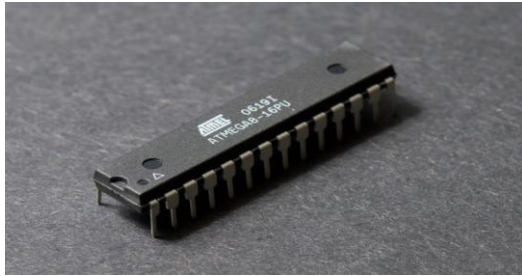


Fig 2 :Atmega 328

2.SOS Key Press Module and Voice Recognition Module:-



Fig 3: Voice Recognition Module.

Any one action can be activates the system, which sends the message including the user location to the registered contacts. At the receiver, just by clicking on the location ink provided in the message it can show the location on the Google map.

3. Global Positioning System (GPS) module: -



FIG 4: GPS RECEIVER.

It is a navigation and precise positioning tool, tracks the location in the form of longitude and latitude based. The GPS Coder Module used this information to search an exact address of that location as the street name, nearby junction etc. In case where GPS is disabled then the system will only send the longitude and latitude.

4. GSM System Module: -



Fig 5: GSM Module.

Global System for Mobile communication (GSM) SIM card is inserted inside the mobile device to send and receive the messages using GPRS. The GSM SIM card number is registered with the system. With increasing usage of GSM, network services are expanded beyond speech communication to incorporate many other custom applications, machine automation and machine to machine communication.

5. Screaming Alarm Siren module:

It makes the alarm at “user end” whenever user activates the system through the SOS button or through voice command. In case of the intrusion activity the alarm siren generated at the home side.

6. Shock Generator :

It contains a shock mechanism to produce non-lethal electric shock in emergency situations to deter the attacker.

IX. WORKING OF PROTOTYPE DEVELOPED

The working of the proposed model can be dealt in steps as shown below

Step 1: When the woman is in distress situation ,she can press the emergency key which activates the self defense module.

Step2: The current location is captured by the GPS module and will be displayed on the LCD DISPLAY which is as shown below



FIG 6: INITIAL LOCATION IDENTIFIED.

This diagram shows us the location of the particular person whom we want to track. This is done with the help of GPS.

Step 4: Through GSM the emergency message is sent to the near by police station, and also to relatives, friends by using the contact numbers which are stored in the GSM.

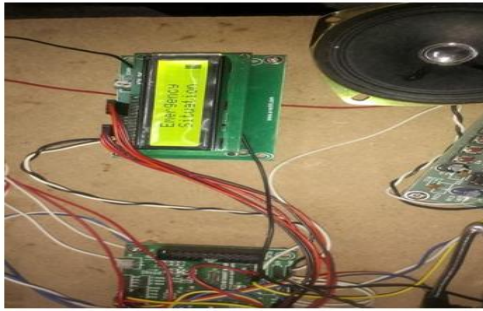


Fig 7: Emergency Switch Turned On.

This diagram explains the emergency situation of the person whom we are tracking. When the switch is pressed emergency information is send to nearby police station. This diagram explains the emergency situation of the person whom we are tracking. When the switch is pressed emergency information is send to nearby police station.

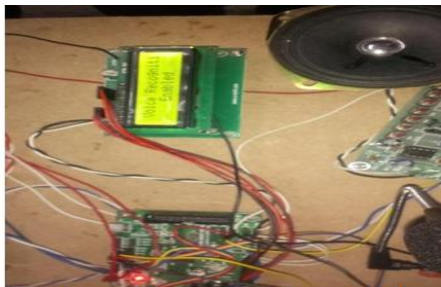


Fig 8: Voice Recognition Enabled.

Step 5: Now the input data that is the voice of the person is stored. Then the data is transferred to the nearby police station. With the help of GPS and GSM the location of nearby police station is found out. The system is implemented with a Sim card which also helps to transfer the information.

Step 6: The module has another emergency key for shock generator which when pressed the module is activated and produces non lethal shock to deter the attackers.

X. FUTURE SCOPE

As the technological changes or new requirement from user to enhance the functionality of product may requires new version to introduce. Although the System is complete and working efficiently, new modules which enhance the system functionality can be added without any major changes to the entire system. By keeping this ability of the product 1 mind, an incremental process model has been used to design and develop the system. These are as follows

1.Primary School Children Safety: As the school children safety are major concerns for parents as well as school management due to the recent incidents of child crimes like children missing, abuse etc. This module monitors the child safety when they are travelling in school buses. Once they reached the school the device gets deactivated by school authority and message send the parents that, “the child

reaches the school safely”. At return journey again the device is activated by school authority and when they reached the home, the acknowledge message is send to the school when parents deactivate the device. The device is capable of audio recording when activated that can be listening by the parents or authorize person.

2. Vehicle Safety System Module: The Safety of four wheeler car is also a major concern in the society due to the increase in the crime rate of stolen car. The intrusion detection module can be modified according to the requirement of vehicle safety system module.

3.Mobile and other valuables Safety System Module: The missing rate of mobiles is high while travelling from bus, train or crowd public area. The area zone module functionality further enhances to provide safety. A small device needed to keep either in same pocket or within the range of few centimeters. As you kept the mobile and forget to pick up or someone stolen it then de to small range the siren of mobile as well as device gets ON for user attention. Also the same device can attach to our luggage, hence in case of forgetting to pick back or try to stolen by someone can be easily noticed by the module and make the attention of user through the siren alarm.

Hence, the advance technology makes the system more robust and reliable. As the new modules provide the functionality which enhance the safety and security. Thus it helps to fulfill the purpose of the project.

Finally, the system will be implemented in a real scenario in order to test its actual performance.

XI. CONCLUSION

It can be concluded that the system helps to supports the gender equality by providing safe environment to women in the society, and allows them to work till late nights. Anyone before doing any crime against the women will be deterred and it help reducing the crime rate against the women.

The Guardian system pursuits a revolutionary concept: the total supervision of people under risk situations, augmenting their safety and autonomy in a completely ubiquitous way. It is important to mention that there is no similar solution in the market. This fact implies a high level of hardware development. The creation of a hardware and software prototype has achieved two objectives: validation of the proposed architecture and checking whether the utilized technology is Appropriate for the system.

Women’s security is a critical and social issue in today’s world. The crime (molestations, robbery, sexual assault, rape, domestic violence) against the women can be now brought to an end with the help of real system implementation of propose model.

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