SELF DEFENSE SYSTEM FOR WOMEN SAFETY USING SAFETY ELECTRIC GUN, LOCATION TRACKING AND SMS ALERTING

Lanasa Rajan¹, S.Aiswarya², R.Sowmiya³, D.Sasidharan⁴

¹(Dept of ECE, UG scholar, KTVR Knowledge Park for Engineering and Technology, Coimbatore, lanasarajan@gmail.com)
²(Dept of ECE, UG scholar, KTVR Knowledge Park for Engineering and Technology, Coimbatore, aiswayaa13@gmail.com)
³(Dept of ECE, UG scholar, KTVR Knowledge Park for Engineering and Technology, Coimbatore, sowmiya888@gmail.com)
⁴(Dept of ECE, Assistant Prof, KTVR Knowledge Park for Engg and Tech, Coimbatore, sasidharanduraiswamy@gmail.com)

Abstract—All women across the world are facing many unsafe situations like molestation, sexual harassment, eve-teasing, kidnapping and rape. The survey results show that in India every year around 25,000 crime cases have been booked against women and it has been rapidly increasing every year. This creates a warning situation in which the women have to be self-protective. This paper describes a device known as Safety Electric Gun which can be used for various situations to protect themselves. In addition to this device, an APR circuit is used to record the conversation between the woman and the attacker. In unknown locations she can press the buzzer which will produce an alarming sound to indicate the unsafe situation she is facing. GPS and GSM technologies have been used for tracking the locations to send the emergency and distressed message to the preprogrammed contacts of people that are stored in the microcontroller.

Keywords—Microcontroller; GPS; GSM; Safety Gun; APR Circuit; Buzzer

1. INTRODUCTION

Even though many technologies have been developed for the safety and security of women, still women feel diffident to travel out in odd hours or to travel alone and even in day time they feel anguish to travel in crowded places. We cannot predict what incidents can occur but still there are chances of reducing incidents like sexual abuse, violence, assault by having safety devices nearby through which we can protect themselves by using the Safety Gun to produce an electric shock to the aggressor. The software is evolved to track their children in real time through GPS and this concept provides an Android based solution through which people can track their children in real time through GPS and the emergency message will be sent to the contacts that have been predefined in the mobile by the women [1].

Therefore, the women will be safe in all situations such that a safe environment will be created and the women would finally be free from the clutches of crimes that are taking place against her.

The cruelty against the women can be brought to an end with the help of a device known as the Safety Gun. The Safety Gun is a simple and portable device. This device can be attached to the belt. The women in unpleasant happenings can press the safety switch which prepares the Safety Gun to be ready to give a non-lethal shock to the attacker. In case the Safety Gun is not taken by the women she can press the Help Switch which will activate the device by tracking the location with the help of GPS and the emergency message will be sent to the preprogrammed mobile numbers that is her family, friends, etc. so that unfortunate incidents would be averted and provide real time evidence for swift action against the perpetrators of crime against women.

The total design of the system has hardware and software system which is designed to be near real-time monitoring of the women and to provide immediate help. The women can protect themselves by using the Safety Gun to produce an electric shock to the aggressor. The software is evolved to reveal the systems capability in providing real-time response by using GPS to indicate the location and to send the immediate message to the preprogrammed mobile number.

The Safety Gun will be given the first preference when the women know that the aggressor is going to attack her. The second preference will be given to the location tracking and SMS alert system when is women is attacked without her knowledge or from the backside. A vibration sensor is provided which will sense the vibration level and automatically send the emergency message when the device is dropped or thrown away by the attacker.

Therefore, the women will be safe in all situations such that a safe environment will be created and the women would finally be free from the clutches of crimes that are taking place against her.

2. RELATED WORK

A. Women employee security system

An electronic method for safety of women that is inbuilt as a device in the transportation systems such as auto rickshaws, cars, buses etc. This system can locate the women in distress through the location tracking by GPS and the emergency message will be sent to the contacts that have been predefined in the mobile by the women [1].

B. A Review on IOT based Smart GPS device for child and Women Safety Applications

An IOT(Internet Of Things) technology is used which provides an Android based solution through which people can track their children in real time through GPS and this concept could also be used for the benefit of women to be safe [2].

C. One Touch Alarm System for Women’s Safety using GSM

An one touch alarm system has been proposed which uses an buzzer for alert when the women is in dangerous situations, whenever the women feels unsafe she just has to hold on to a button on the device which will start producing an alert signal and the location information will be sent to the preprogrammed contacts [3].
D. A Method for the Personal Safety in Real Scenario

A method of personal safety had been proposed which also uses the tracking concept with the emergency message being sent to the contacts of the women, it had been developed like a gadget which provided an alarm system and call for help [4].

E. Mobile based Women Safety Application

Mobile applications for women safety have been developed that provides the women with a reliable way to send an emergency call to the police by discreetly triggering the calling function by just shaking the mobile or by a simple press of a PANIC button on the screen such as I Safe Apps, Suraksha [5].

F. Smart Electronic System for Women Safety

The smart electronic system has been implemented in public transport vehicles where in the driver’s name, mobile number, vehicle registration and the secured pin secured by the passenger will be sent as an SMS to the concerned person of the passenger [6].

G. Prototype of an Intelligent System based on RFID and GPS Technologies for Women Safety

Active RFID and passive RFID tag is used to scan the information which will be given to the microcontroller which will have the contacts of the women, through GPS the location will be tracked and through GSM the distressed message will be send to the concerned person [7].

3. EXISTING METHOD

There already exist many systems which are inbuilt in public transport which is used for tracking the location of the women. Tracking devices are inbuilt in watches and bands. Many safety apps have been developed such as VithU app, Suraksha, I Safe app etc. Alarm systems have been developed to alert the surrounding people in the environment if any misbehavior is done with the women in just a press of a button. RFID tags have been used to scan the information and through GPS and GSM the location and distressed message will reach the concerned people.

4. PROPOSED METHOD

This paper describes an immediate responding, safeguard system for women using which a woman in discomfort can call for help just with a press of a button on this safety gun.

The safety gun has the ability to help women with technologies that are embedded into a compact device. The women carrying this device, in case of any harassment or when she finds that someone is going to harass her, she can press the switch that is located on the safety gun which contains a shock mechanism to produce a non-lethal electric shock to avert the attacker or when she has forgotten to take the safety gun she can press the buzzer on the gadget which will produce an alarming sound to indicate the nearby people that she is in danger, she can also record the conversation that is taking place within them such that she can produce an evidence of the person who is attacking her.

When the help switch on the gadget is pressed the location information is sent as a SMS alert to a few predefined emergency numbers so that her family members, friends and the police can locate her easily in terms of latitude and longitude.

In case of any accident, the vibration sensor will sense the vibration level and send an emergency message immediately to the ambulance and police such that the help to the women can be provided within a short period of time.

This would help to reduce violation, immoral act against women and intimation to the police and ambulance can be provided through which the immediate help can be provided to the women.

5. HARDWARE DESCRIPTION

The figure consists of

1. Safety Electric Gun
2. Transmitter Side Block Diagram
3. Receiver Side Block Diagram

The three blocks consists of the following sections:

- Gun Switch:

  It is a manual switch, when it is pressed it activates the Safety Electric Gun to be switched ON. Here 1=ON and 0=OFF.
• **Safety Electric Gun:**

   It is a device which when activated produces a high voltage shock to deter the attacker. First the AC is converted into DC and stored in the battery. The DC is provided to the transistor (NPN) which is then supplied to the oscillator then it is passed to the transformer (step-up transformer). The transformer will convert the DC into AC. The bridge circuit is used to convert the AC again into DC then the voltage multiplier logic is used. The high voltage will be stored in the capacitors, when the attacker touches the terminals of the device a spark is produced which eventually results in a shock.

• **Power Supply:**

   It provides regulated DC supply to the other components of the circuit. +5V and +12 V are the two power supply values that are going to be used. +5V is given to the switches, IC, LCD, RF transmitter and RF receiver. +12V is given to relay, GPS, GSM and APR circuit. The power supply has an AC input and the output is DC. A bridge of diodes is used to convert the AC into DC. Capacitors are used to reduce the fluctuations and the regulators are used to regulate a constant voltage of +5V or +12V through LM7805 or LM7812.

• **Help Switch:**

   It is a manual switch which when pressed activates the GPS which tracks the location and through GSM the emergency message will be sent to the pre-programmed numbers. Mainly there are four types of switches namely SPST (Single Pole Single Throw), SPDT (Single Pole Double Throw), DPST (Double Pole Single Throw) and DPDT (Double Pole Double Throw). In this project DPST switch is used.

• **Vibration Sensor:**

   Vibration Sensors are used for measuring, displaying and analyzing linear velocity displacement and acceleration. It is used to sense the vibration value and when a high vibration value is sensed it activates the GPS which tracks the location and through GSM the emergency message will be sent to the pre-programmed numbers. There are many types of vibration sensors such as piezoelectric sensor or accelerometer sensor, velocity sensor, proximity probes, laser displacement sensor. In this project piezoelectric sensor is used. It consists of 3 pins namely input, output and ground.

• **PIC Microcontroller:**

   PIC stands for Peripheral Interface Controller. PIC 16F877A is the microcontroller which is used in this project. The microcontroller is the most vital part of the system. The microcontroller controls all the activities taking place in the system by executing the program which is stored in the flash memory of the microcontroller. In PIC 16F877A, 16 represents the bit number, F represents Flash memory, 877 represents the model number and A represents Atmel. It is a 40 pin IC where 33 are I/O pins and it consists of 5 ports namely A, B, C, D and E.

• **Relay driver:**

   It is an electrically operated switch. When the applied current or voltage exceeds the threshold value, the coil activates the armature which is either used to close the open contacts or to open the closed contacts. It consists of 16 pins namely input, ground, trigger, common, normally open and normally closed.

• **MAX 232:**

   It is an integrated circuit which converts the signals from the RS232 serial port to the proper signal which are used in the TTL compatible digital logic circuit. It has 16 pins namely C1+, C3+, C1-, C2+, C2-, C4-, T2 Out, R2 In, R2 Out, T2 In, T1 In, R1 Out, R1 In, T1 Out, GND and VCC. Here C1+, C2+ and C3+ are positive voltage multipliers that are a unit of external capacitor. C1-, C2- and C4- are negative voltage multipliers that are a unit of external capacitor. T1 In and T2 In are transmitter data input from TTL logic level. T1 Out and T2 Out are transmitter data output from RS232. R1 In and R2 In are receiver data input from RS232. R1 Out and R2 Out are receiver data output from TTL logic level. GND is ground and VCC is the power supply voltage.

• **GSM:**

   GSM stands for Global System for Mobile communication. It is duly interfaced to the MC through the level shifter IC MAX232. The SIM card is mounted on the GSM modem for receiving the digital command by SMS from any cell phone that sends the data to the MC through serial communication. It has two types of frequencies which are uplink frequency of the range 880-915MHz and downlink frequency of the range 925-960MHz. It has four pins namely input, ground, transmitter and receiver. It is used for transmitting the data services and mobile voice.

• **GPS:**

   GPS stands for Global Positioning System. It is a navigation device that is capable of receiving information from GPS satellites and to accurately calculate the geographical location of the person. Its frequency is given by L1=1.57GHz, L2=1.22GHz. It has 3 pins namely input, ground and receiver.

• **RF Transmitter and RF Receiver:**

   RF stands for Radio Frequency. The transmitter and receiver both operate at a frequency of 434MHz. The RF transmitter receives the serial data and transmits it wirelessly through RF antenna. The transmitted data is then received by the RF receiver which is operating at the same frequency as that of the RF transmitter.

• **LCD Display unit:**

   Liquid Crystal Display is an electronic display device that is operated by applying varying electric voltage to a layer of liquid crystal which is used to display the information of the system on the display screen. 16*2 display is used in this project where in 16 is the number of columns and 2 is the number of rows.

• **APR circuit:**

   APR stands for Audio Playback and Record which is used to record the audio message for about 1.2 minutes and this message can be played back. It provides high recording and playback. It does not require any software or microcontroller for its support. It has nonvolatile flash memory technology, it
does not need any battery backup, with the on-board microphone it can record the voices and the recorded voices can be played back. Here APR33A3 IC is used.

- **Speaker:**

  It is an output device which contains a transducer that converts the electric current or electrical signals into acoustic energy or sound waves for the production of sound that will indicate the emergency situation to the person in the control room (police station) and the nearby ambulance. There are three most commonly used systems such as cone, dome and horn type drivers.

- **Buzzer:**

  The buzzer is also known as a beeper which is an audio signaling device. When the buzzer is pressed an alarming sound is produced which will indicate and alert the surrounding people of the incident that is taking place. There are many types of buzzers such as electromechanical, piezoelectric and mechanical.

6. **BLOCK DIAGRAM EXPLANATION**

The block diagram has three sections:

1. Safety Electric Gun (figure a)
2. Transmitter Side (figure b), which consists of power supply, help switch, vibration sensor, microcontroller, relay, MAX 232, buzzer, APR circuit, speaker, GPS, GSM and RF transmitter.
3. Receiver Side (figure c), consists of power supply, RF receiver, microcontroller, LCD, APR circuit and speaker.

Here a Safety Gun is provided to the women who can be use it all the time for self-protection. The Safety Gun has three stages in which the AC is converted into DC supply through the bridge circuit using diodes. This DC voltage is then stored in the battery. The battery provides the stored DC to the transistor, here we use NPN transistor and then it is supplied to the oscillator. The DC voltage is then supplied to the transformer, here we use step-up transformer which is used for converting the DC into AC. The AC is converted into DC through the bridge circuit using diodes. The voltage multiplier logic is used which is used for converting low voltage AC into high voltage DC. The DC is stored in the capacitors and when the attacker touches the terminal ends a spark is produced which eventually produces a high voltage shock to the attacker. The Safety Gun is a light weight and simple to carry device.

The Help switch is a manual switch which when pressed will send a distressed message to the family, friends and the police through the GPS which tracks the location and the distressed message will be sent through the GSM.

Incase of any accident the vibration sensor will sensor the value of the vibration produced and the location of the women in distress will be tracked through the GPS and the emergency message will be sent to the ambulance, police and the family of the women through the GSM module.

The buzzer is also provided which will produce an alarming sound to the surrounding people in order to avoid the unsafe situations. The APR circuit is provided which is used to record the conversation that is taking place between the women and the attacker, which will act as evidence to the police and the family members of the women.

The Safety Electric Gun is not interfaced with the transmitter gadget such that it can be used as a first method of defense for the women in danger and she can get rid of the attacker easily by producing a high voltage electric shock.

All the components in the transmitter side are connected to the PIC microcontroller, the contacts are stored in the microcontroller and when the help switch is pressed through the GPS the tracked location is sent to the relay driver which is connected to the microcontroller and then the distressed message will be sent through the GSM to the preprogrammed mobile numbers (police, family members and friends) that are stored in the microcontroller.

When the buzzer is pressed then an alarming sound is produced which the alert the surrounding people and if any conversation takes place between the woman and the attacker then it can be recorded with the help of the APR circuit which will act as an evidence.

In case if any accident the same procedure follows except for the help switch the vibration sensor is used which senses the vibration level and immediately sends the location tracked through the GPS to the preprogrammed mobile numbers (ambulance, police and family members) that are stored in the microcontroller.

In the receiver side the preprogrammed numbers will receive the emergency message (hospitals, family members), distressed message (police, family members). The LCD display will be displaying the message with the corresponding location where the accident has taken place. If the person concerned is not available in the place then then through the APR circuit the recorded message will be played through the speaker such that the person concerned gets an alert message that an incident has taken place.

All these connected components work together to form an overall security and safety system for the women in distress.

7. **RESULT**

The whole design provides an ease for the women to move with liberty at any point of time. A safe and secure environment is thus established for all the women.

Figure b: Safety Electric Gun
The GPS module will collect the latitude and longitude information of the women's location. The GSM will send the location information of the women that is given by the GPS module such as shown in figure d. This message will be received by the predefined contacts that are stored by the women.

8. CONCLUSION

This self-defense system will provide an overall safety and security to the women 24x7. By using this device the women can travel out in odd times anywhere also the travelling becomes easier in public transportation and in unknown vehicles for office going women such as cabs, taxis etc.

This device can also be used by the women at home who are staying alone for their safety when they are not sure of the people around them. Even if the woman is lost in any place she can be tracked with the help of GPS and GSM.

This gadget can be also used by:
- Elderly people
- Handicapped people
- Male gender
- Children

- Provides legal evidence of crime with audio and exact location information

The whole system has the following advantages:
- Lightweight
- Portable
- Cost effective
- No maintenance is required
- Low power consumption
- High performance
- Fast response
- Environmental friendly system
- Compact in size
- Wireless connectivity
- Easy coding for system
- Enhanced consistency

9. FUTURE WORK

The future work that can be done on this project is adding a camera which can be used for capturing the image of the attacker, size can be further reduced using Nano Technology, MIC sensor can be used instead of APR circuit.

REFERENCES


