



## **DESIGN AND IMPLEMENTATION OF SMART DEVICE FOR WOMEN SAFETY USING GPS-GSM TECHNOLOGY**

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**ABSTRACT** The world is becoming so much more unsafe for women. Social evils like molestations, dowry, crime against women. Incidents of crime against women have been increasing at an alarming pace in Indian cities, most common incidents being rape, kidnapping, sexual harassment and eve teasing. Security for women is still a major issue. In this age of technology, mobile phone is one gadget almost everyone uses to keep in touch with family and friends. All they need is a device that can be carried around easily and worn whenever the woman feels unsafe. Women safety and security has emerged as a key concern for the country over the recent years. In this project suggests a new perspective to use technology to protect women. The system resembles a smart belt which when activated, tracks the location of the victim using GPS (Global Positioning System) and sends emergency messages using GSM (Global System for Mobile communication), to two emergency contacts and the police control room. The system also incorporates a screaming alarm to call out for help.

**KEYWORDS:** GPS, GSM, SHOCKING UNIT, FORCE SENSOR

### **I. INTRODUCTION**

Sixty six percent of women have reported sexual harassment in the year 2014 in New Delhi. It has also been proven that in urban environments, women are more prone to experience harassment especially in developing countries. Though there are a few Smartphone based solutions for the same, it might not be possible for the victim to reach for her phone in some situations without the knowledge of the perpetrator. Thus, there is a need to introduce a

discrete safety device that can be triggered discursively without any explicit action.

As per the survey, majority of women respondents (65%) are dependent on public transport to commute to their destinations comprising 45% of them traveling by metro followed by 30% commuting by bus and remaining 25% by auto. Whereas remaining women respondents (35%) said that they opt for private mode of transportation to reach to their destinations which consist of mainly four wheelers (38%) and two wheelers (22%) and remaining 40% commute by transportation services provided by their organizations/colleges/institutions.

### **II. LITERATURE REVIEW**

1. In the Existing system there is no monitoring system for girls, it should create many problems for them and the no safety mechanism to protect the girls from the misbehavior activities. In addition, there is no alert mechanism for the girl's safety it should be done by manually only.

2. Having this concern in mind many developers have come up with creative applications. Some of such applications are: Codes like \*91# is used to provide emergency services, which will alert police control. Free mobile application 'Help me on mobile' to ensure safety of women was launched to assist those who need emergency.

3. Women are the subject of exploitation inside and outside the home say whether on roads, trains, cabs, schools etc.

4. Women occupy almost half the globe. But their survival has always been a question, when it comes to existence with honor and dignity.

5. Women's empowerment in the country can be brought once their safety and security is ensure, either it may be at home, public places or during travelling.



### DRAWBACKS

- Cases of acid attacks on women could be seen as another vector of violence that exclusively targets females by rejected males who attack the face, symbol of feminine persona.
- Sexual harassment at the workplace is common with a 2010 survey indicating that 88 percent of women who work in large numbers in the IT/ITES sector have faced some form of persecution. Though as the current public debate indicates all professions seem equally vulnerable. To those working in less privileged jobs exploitative maltreatment may be even more brutal.
- There is no hidden camera detector which is portable to ensure our privacy.

### II. PROPOSED SYSTEM

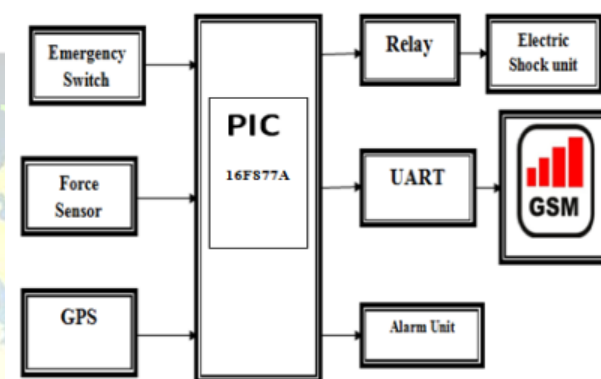
- The proposed system is to design a portable device which resembles a Smart device. If the person is in Emergency means she can press the Emergency switch means the device will get activated automatically & immediately the location (Address) of the victim will be tracked with the help of GPS and emergency messages will be sent to contacts which we have stored already and one to police control room every two minutes with updated location address through GSM Technology and the alarm unit will be activated.
- The electric Shock unit tricks the muscles of an attacker, making them do a great deal of work rapidly. This instantly depletes the attacker's blood sugar by converting it to lactic acid. In short, he is unable to produce energy for his muscles, and his body becomes unable to function.
- 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.

### ADVANTAGES

- User does not require a Smartphone unlike other applications that have been developed earlier.

- 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.
- It is an all-in-one system. Hence no need to carry multiple devices. GPS tracking feature tracks the user lively when you are the move after triggering the emergency button.
- This device works without internet connectivity.

### III. BLOCK DIAGRAM

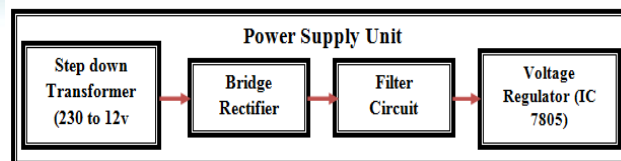


**FIGURE 1:** Block diagram

### IV. HARDWARE MODULE

#### a) POWER SUPPLY UNIT

Power supply is a reference to a source of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU.



**FIGURE 2a:** Power supply unit

The 230v AC is stepped down to 12v AC voltage with the help of the step down transformer which is the operational voltage of the device. Rectifier circuit is used, to convert the AC input is converted to DC.



The full wave bridge rectifier uses four diodes arranged in a bridge circuit to give full wave rectification without the need for a centre-tapped transformer. A typical power supply filter circuit can be best understood by dividing the circuit into two parts, the reservoir capacitor and the low pass filter. Each of these parts contributes to removing the remaining AC pulses, but in different ways. And finally the regulator regulates the negative voltage. The regulated DC output is very smooth with no ripple. It is suitable for all electronic circuits.

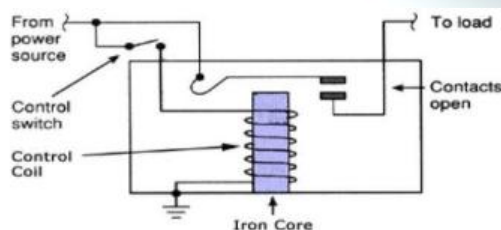
## b) RELAY

Relays are simple switches which are operated both electrically and mechanically. Relays consist of an electromagnet and also a set of contacts. The switching mechanism is carried out with the help of the electromagnet. The main operation of a relay comes in places where only a low-power signal can be used to control a circuit. It is also used in places where only one signal can be used to control a lot of circuits. The application of relays started during the invention of telephones. They played an important role in switching calls in telephone exchanges. They were also used in long distance telegraphy. They were used to switch the signal coming from one source to another destination. The high end applications of relays require high power to be driven by electric motors and so on. Such relays are called contactors.

### RELAY DESIGN

There are only four main parts in a relay. They are

- Electromagnet
- Movable Armature
- Switch point contacts
- Spring



**FIGURE 2b:** Internal circuitry of relay

An iron core is surrounded by a control coil. As shown, the power source is given to the

electromagnet through a control switch and through contacts to the load. When current starts flowing through the control coil, the electromagnet starts energizing and thus intensifies the magnetic field. Thus the upper contact arm starts to be attracted to the lower fixed arm and thus closes the contacts causing a short circuit for the power to the load. On the other hand, if the relay was already de-energized when the contacts were closed, then the contact move oppositely and make an open circuit.

As soon as the coil current is off, the movable armature will be returned by a force back to its initial position. This force will be almost equal to half the strength of the magnetic force. This force is mainly provided by two factors. They are the spring and also gravity.

Relays are mainly made for two basic operations. One is low voltage application and the other is high voltage. For low voltage applications, more preference will be given to reduce the noise of the whole circuit. For high voltage applications, they are mainly designed to reduce a phenomenon called arcing.

## c) PIC16F877A MICROCONTROLLER

PIC microcontroller is the smallest microcontrollers that can be programmed to carry out a huge range of tasks. These microcontrollers are found in many electronic devices such as phones, computer control systems, alarm systems, systems.

Every PIC microcontroller architecture consists of some registers and stack where registers function as Random Access Memory (RAM) and stack saves the return addresses. The main features of PIC microcontrollers are RAM, flash memory, Timers/Counters, EEPROM, I/O Ports, USART, CCP (Capture/Compare/PWM module), SSP, Comparator, ADC (analog to digital converter), PSP (parallel slave port), LCD and ICSP. The 8-bit PIC microcontroller is classified into four types on the basis of internal architecture such as Base Line PIC, Mid Range PIC, Enhanced Mid Range PIC and PIC18.

The PIC microcontrollers appeal in the fields of electronics and robotics. Key features include wide availability, low cost, ease of reprogramming with built-in EEPROM an extensive collection of free application notes, abundant development tools, and a great deal of information available on the Internet. Every PIC microcontroller





has a set of registers that also function as RAM (random access memory). Special purpose control registers for on-chip hardware resources are also mapped into the data space. Every PIC has a stack that saves return addresses. The stack was not software-accessible on the earlier versions of the PIC, but this limitation was removed in later devices.

#### ARCHITECTURE OF PIC MICROCONTROLLER

The PIC microcontroller architecture comprises of CPU, I/O ports, memory organization, A/D converter, timers/counters, interrupts, serial communication, and oscillator and CCP module. The four features that you might make you use a 16F887 instead of a 16F877(A) are

- External gate.
- Volt Reference.
- Nano Watt.
- Internal Clock.

The gate could be used to more accurately capture an input time e.g. for a reciprocal frequency counter. The volt reference means you don't need an external reference although it will probably not be useful for highly accurate operation. It is definitely more useful in a battery powered operation where you want to compare the input battery voltage to a known reference e.g. using the comparator and the internal 0.6V reference.

40-Pin PDIP

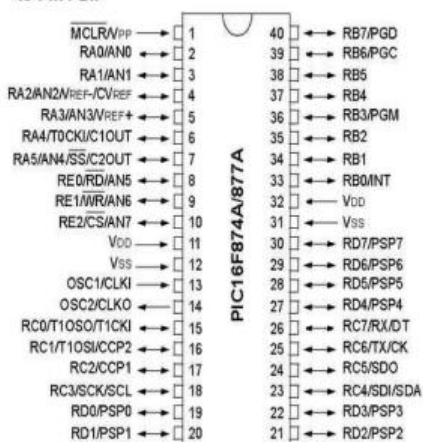


FIGURE 2c: 16F877A PIN DIAGRAM

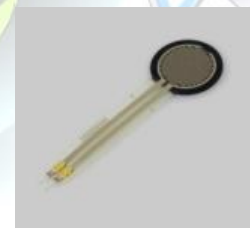
#### d) FORCE SENSOR

A force-sensing resistor is a material whose resistance changes when a force or

pressure is applied. They are also known as force-sensitive resistor and are sometimes referred to by the initialize FSR. [3] discussed about a system, GSM based AMR has low infrastructure cost and it reduces man power. The system is fully automatic, hence the probability of error is reduced. The data is highly secured and it not only solve the problem of traditional meter reading system but also provides additional features such as power disconnection, reconnection and the concept of power management.

Force-sensing resistors consist of a conductive polymer, which changes resistance in a predictable manner following application of force to its surface. They are normally supplied as a polymer sheet or ink that can be applied by screen printing. The sensing film consists of both electrically conducting and non-conducting particles suspended in matrix. The particles are sub-micrometer sizes, and are formulated to reduce the temperature dependence, improve mechanical properties and increase surface durability. Applying a force to the surface of the sensing film causes particles to touch the conducting electrodes, changing the resistance of the film. As with all resistive based sensors, force-sensing resistors require a relatively simple interface and can operate satisfactorily in moderately hostile environments. Compared to other force sensors, the advantages of FSRs are their size, low cost and good shock resistance.

FIGURE 2d: Force sensor



#### e) GPS

GPS stands for Global Positioning System and was developed by the US Department of Defence as a worldwide navigation and positioning facility for both military and civilian use. It is a space-based radio-navigation system consisting of 24 satellites and ground support. GPS provides users with accurate information about their position and velocity, as well as the time, anywhere in the world and in all weather conditions.

The Global Positioning System consists of a network of 24 broadcasting satellites orbiting the earth at a height of 20,200km.

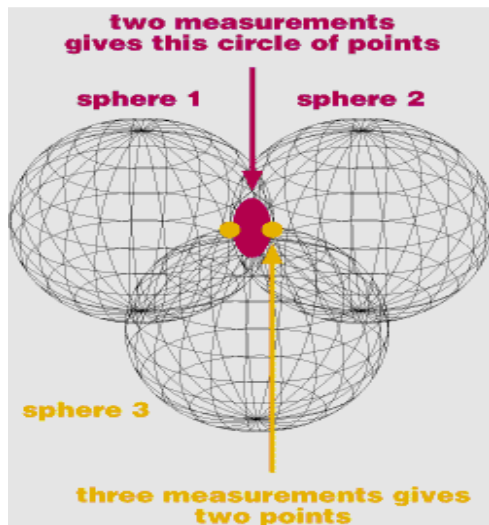


FIGURE 2e: Locating a position

The concept of ranging is best illustrated by example. Consider one satellite that is a distance of 25,000 kilometers from a person holding a GPS receiver. Then the person's position is known to be somewhere on a sphere 25,000 km in radius, centered on the satellite. However, the exact location of the person on that sphere is yet unknown. If, at the same time, the distance from the person to a second satellite can be discovered to be 20,000 km, then a second sphere of radius 20,000 km on which the person is positioned can be determined.

#### f) GSM MODEM

GSM is a mobile communication modem; it stands for global system for mobile communication (GSM). The idea of GSM was developed at Bell Laboratories in 1970. It is widely used mobile communication system in the world. GSM is an open and digital cellular technology used for transmitting mobile voice and data services operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands.

GSM system was developed as a digital system using time division multiple access (TDMA) technique for communication purpose. A GSM digitizes and reduces the data, then sends it down through a channel with two different streams of client data, each in its own particular time slot. The digital system has an ability to carry 64 kbps to 120 Mbps of data rates.

#### GSM ARCHITECTURE

A GSM network consists of the following components:

- **A Mobile Station:** It is the mobile phone which consists of the transceiver, the display and the processor and is controlled by a SIM card operating over the network.
- **Base Station Subsystem:** It acts as an interface between the mobile station and the network subsystem. It consists of the Base Transceiver Station which contains the radio transceivers and handles the protocols for communication with mobiles. It also consists of the Base Station Controller which controls the Base Transceiver station and acts as a interface between the mobile station and mobile switching centre.
- **Network Subsystem:** It provides the basic network connection to the mobile stations. The basic part of the Network Subsystem is the Mobile Service Switching Centre which provides access to different networks like ISDN, PSTN etc. It also consists of the Home Location Register and the Visitor Location Register which provides the call routing and roaming capabilities of GSM. It also contains the Equipment Identity Register which maintains an account of all the mobile equipments wherein each mobile is identified by its own IMEI number. IMEI stands for International Mobile Equipment Identity.

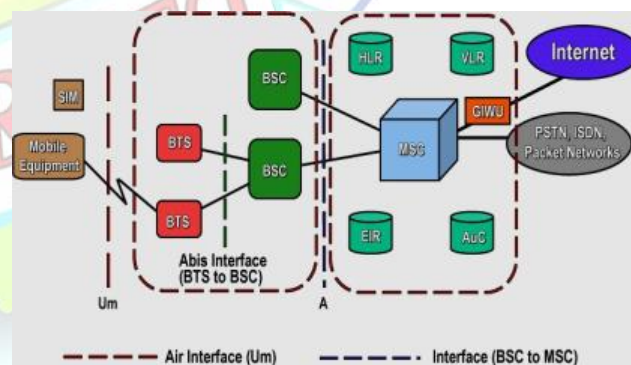


FIGURE 2d: Working of GSM

#### g) ELECTRIC SHOCK UNIT

**Electric shock** is the physiological reaction or injury caused by electric current passing through the (human) body.<sup>[1]</sup> Typically, the expression is used to describe an injurious exposure to electricity.<sup>[2]</sup> It occurs upon contact of a (human) body part with any source of electricity that causes a sufficient current through the skin, muscles, or hair.





Very small currents can be imperceptible. Larger current passing through the body may make it impossible for a shock victim to let go of an energized object. Still larger currents can cause fibrillation of the heart and damage to tissues. Death caused by an electric shock is called electrocution.

## **V. SOFTWARE MODULE**

### **EMBEDDED C**

**Embedded C** is a set of language extensions for the C Programming language by the C Standards committee to address commonality issues that exist between C extensions for different embedded systems. Historically, embedded C programming requires nonstandard extensions to the C language in order to support exotic features such as fixed-point arithmetic, multiple distinct memory banks, and basic I/O operations.

There are a variety of different compilers on the market, manufactured by different companies that use Embedded C. One of the more popular ones is the Keil compiler. Because of this, Embedded C is also sometimes known as Keil C.

Embedded C has several keywords that are not present in C. These keywords are associated with operations needed by microprocessors. You will need to be familiar with all of them to be able to write Embedded C programs.

#### **Unsigned char data a;**

Here, the unsigned char declaration is like a normal C declaration. We just added the data keyword, which tells the microcontroller to store the unsigned char a in the internal data memory.

**bdata:** The bdata keyword lets you store a declared variable in the bit addressable memory. Take a look at this example:

#### **Unsigned char bdata a;**

This is similar to the data declaration we showed you above. You have to access bdata variables in a different way, however.

**Using:** This keyword lets you execute a function by letting it access a register bank. There are three possible values: 1, 2 and 3.

## **VI. CONCLUSION**

This work was aimed at developing a smart low-cost device to help women feel safer and prevent the occurrence of rape, harassment and other dangerous situations. The design is developed using a PIC microcontroller with GPS-GSM technology embedded in it. This device is clipped to the user's accessories. This low cost system does not require the user to have physical access to her smartphone and the device is well hidden. To trigger the device, the

user is required to press buttons, a trigger will be sent to her smart phone which will send an alert via SMS to five preset numbers containing the location details of the device. The size and form of the device make it easy to incorporate in daily life. Due to its small size, it is discrete and difficult to notice. In the future, an appropriate case can be designed for the device to improve its durability and prevent any hardware damage. The device works well only in scenarios where the user are in danger. By working on more number of scenarios and with sufficient collection of data (subjects with different age group, gender, and height), the reliability and robustness of the system can be improved.

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