

DESIGN AND IMPLEMENTATION OF WOMEN SAFETY SYSTEM BASED ON IOT TECHNOLOGIES

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Abstract— Every day, every woman, young girls, mothers and women from all walks of life are struggling to be safe and protect themselves from the roving gaze of the horribly insensitive men who molest assault and violate the dignity of women on a daily basis. The streets, public transport, public places in particular have become the dominion of the hunters. Due to these atrocities that women are subjected to in the present scenario, a smart security wearable device for women based on Internet of Things is proposed. It is implemented in the form of a smart device and comprises of Arduino, Matlab based camera, buzzer and button to activate the services. This device is extremely portable and can be activated by the victim on being assaulted just by the click of a button that will fetch her current location and also capture the image of the attacker via Matlab based camera. The location and the link of the GPS Values will be sent to predefined emergency contact numbers or police via smart phone of the victim thus preventing the use of additional hardware devices/modules and making the device compact.

Keywords-Internet of Things, Women Safety, Computer Networking, Smart safety device, Arduino, GPS, Mobile Application

I. INTRODUCTION

In the present scenario, women are keeping pace with men in every walk of life but unfortunately at cost of being subjected to abuse, harassment, and violence in public and even at their own houses. They cannot step out of their houses at any time of the day, cannot wear clothes as per their will, nor can they even go for work in peace. There is some kind of inhibition that women are subjected to which not only takes away their sense of freedom but also shatters their confidence and dreams [1]. Due to the above said reasons, it is quite apparent that there is a striving need for women security in the country. However, it is a point worth to note that advancement in technology has paved its path in almost all walks of life. As such, it is now possible to intelligently apply the benefits of current technology to resolve societal issues. This paper, therefore, aims to apply the current trend in technology, i.e., Internet of Things (IoT) to eliminate fear filled lifestyle of female folks. The Internet of Things (IoT) is an ecosystem of connected physical objects that are accessible through the internet [2]. It refers to the ever-growing network of physical objects that feature an

IP address for internet connectivity, and the communication that occurs between these objects and other Internet-enabled devices and systems. Typically, IoT is expected to offer advanced connectivity of devices, systems, and services that goes beyond machine-to-machine (M2M) communications and covers a variety of protocols, domains, and applications. The interconnection of these embedded devices (including smart objects), is expected to usher in automation in nearly all fields, while also enabling advanced applications like a smart grid, and expanding to areas such as smart cities [3]. In the recent past, issues on women harassment are accentuating at great heights, creating anguish and distress among the women of today. As a matter of grave concern, this paper introduces a Raspberry-Pi based wearable device called the Smart Ring that proves constructive to the women in danger and helps them to fight such odds [4]. The main objective of the system is to intimate an instant location and a help message through an Android app to a registered number of contacts and the police, so that untoward incidents could be prevented and to provide real time evidence for swift action against the perpetrators of the crime. Fig 1. Depicts the applications of IoT which is gradually evolving in all frontiers of mankind.



Figure 1. Applications of IoT

II. LITERATURE SURVEY

Authors of [5] have worked on the use of Internet of Things (IoT) that leads to the Smart Security technology. They have highlighted the development of a safety device called the Smart Band that communicates with a Smart Phone that has access to the Internet, thereby, alerting the victim's family, friends and police about the incident, aided by GPS tracking and message services [5]. Also, authors of [6] have proposed a smart intelligent security system for women and have shown their concern regarding various issues faced by women. Their proposed system uses two objects, a wrist band and spectacles, where the

band incorporates a switch to activate a screaming alarm and tear gas mechanism for self-defending purpose and also sends alert messages and location to emergency contacts. The system also incorporates a mechanism to figure out the attacker using a live streaming video [6]. Authors of [7] have developed a smart security device based on IoT concept. Throwing light on societal challenges faced by women, a device called “watch me” has been proposed that includes a sensor to detect the heart beat rate of a person that will become high when the woman is in danger, generating an alarm sound to grab the attention of nearby people. The device also automatically makes a call to registered contacts and supports GPS tracking to track the victim’s location [7]. Authors of [8] have described the deployment of Internet of Things in the physical world across many sectors. The paper presents a novel approach to collect data from the devices using sensors and many case studies in which it can be applied, through a sample demonstration of smart home based on this principle [8]. Suraksha: The device is based on Blood pressure sensors and sends a help message to registered numbers and location tracking [9]. Child Safety wearable device: This device enables to track the daily activity of children and also locate the child using Wi-Fi and Bluetooth services present on the device [10]. HearMe: An application that includes lock screen access and instant siren on the receiver device and can be accessed through hardware buttons to facilitate quick access to the woman [11]. Femme: It consists of a device and a smart phone that are synchronized using Bluetooth, which triggers the instant location to the registered contacts and includes audio recordings [12]. Abhaya app: It is an android app which was mainly developed for women safety that provides instant location to the registered contacts by pressing a single power button in the phone [13].

III. SYSTEM DESIGN

Considering the issues with women of today, the need of the hour is to keep our women in safe hands. The blooming technologies of the 21st century have been best utilized in developing various applications and devices to protect women in distress. Technologies such as IoT and Virtual Reality are in demand and have proved beneficial to the women society [14]. However, still tragedies prevail indicating the need for better approaches. Hence, this paper aims at designing a device that is more accessible and portable to help the victim to reach her family and friends in an emergency. Most of the times, it is challenging to apprehend the criminal. This issue can be solved by the image that is captured by the device that is being developed. Also, there is a need for a system that helps senior citizens of the society to call for help in case of a health crisis where the situation does not favour the

person to contact for medical help. This work, thus leads towards the development of a Arduino based Smart device using IOT technology. Fig 2. shows the architecture diagram of SMARISA comprises of The Raspberry Pi Zero is a low cost single board computer used for interfacing Raspberry Pi camera and buzzer, a buzzer module emits a high frequency alarm to draw the attention of the public towards the victim, a camera module that captures the image of the criminal when the victim is being assaulted thus helping in criminal apprehension on pressing of a button, a Message Sending module that is used to send the current location of the victim tracked via GPS of the user’s smart phone and the link of the image captured via Matlab camera and Arduino to the emergency contact numbers using SMS, and an Android application that provides the user interface with IOT.

POWER SUPPLY

The power supply section is the section which provide +5V for the components to work. IC LM7805 is used for providing a constant power of +5V. The ac voltage, typically 220V, is connected to a transformer, which steps down that ac voltage down to the level of the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation.

A regulator circuit removes the ripples and also retains the same dc value even if the input dc voltage varies, or the load connected to the output dc voltage changes. This voltage regulation is usually obtained using one of the popular voltage regulator IC units.

ARDUINO UNO

Arduino/genuino uno is a microcontroller board based on the atmega328p (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 Mhz quartz crystal, a USB connection, a power jack, an icsp header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a ac-to-dc adapter or battery to get started. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

BLOCK DIAGRAM

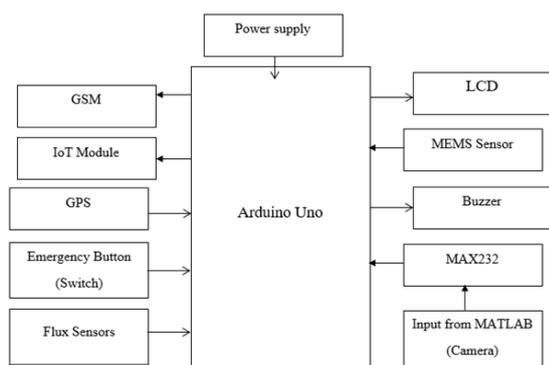


Fig 2: Block Diagram

Monitoring Section:

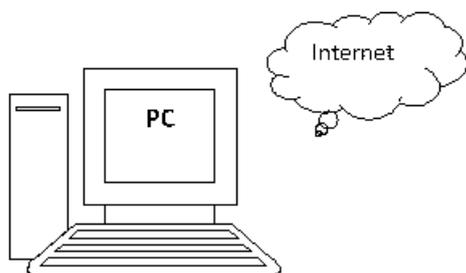


Fig 3: Monitoring Section

"Uno" means one in Italian and was chosen to mark the release of Arduino software (IDE) 1.0. The Uno board and version 1.0 of Arduino software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.

LIQUID CRYSTAL DISPLAY

LCD (Liquid Crystal Display) screen is an electronic display module and finds a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven-segment and other multi-segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven-segments), animations and so on.

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel

- Improved spectrum efficiency
- International roaming
- Compatibility with integrated services digital network (ISDN)

matrix. This LCD has two registers, namely, Command and Data.

The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

BUZZER

A buzzer or beeper is a signaling device, usually electronic, typically used in automobiles, household appliances such as a microwave oven, or game shows.

It most commonly consists of a number of switches or sensors connected to a control unit that determines if and which button was pushed or a preset time has lapsed, and usually illuminates a light on the appropriate button or control panel, and sounds a warning in the form of a continuous or intermittent buzzing or beeping sound. Initially this device was based on an electromechanical system which was identical to an electric bell without the metal gong (which makes the ringing noise). Often these units were anchored to a wall or ceiling and used the ceiling or wall as a sounding board.

GLOBAL SYSTEM FOR MOBILE

Global System for Mobile Communications (GSM) modems are specialized types of modems that operate over subscription-based wireless networks, similar to a mobile phone. A GSM modem accepts a Subscriber Identity Module (SIM) card, and basically acts like a mobile phone for a computer. Such a modem can even be a dedicated mobile phone that the computer uses for GSM network capabilities.

Traditional modems are attached to computers to allow dial-up connections to other computer systems. A GSM modem operates in a similar fashion, except that it sends and receives data through radio waves rather than a telephone line. This type of modem may be an external device connected via a Universal Serial Bus (USB) cable or a serial cable. More commonly, however, it is a small device that plugs directly into the USB port or card slot on a computer or laptop.

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.

Features

- Support for new services.
- SIM phonebook management
- Fixed dialing number (FDN)
- Real time clock with alarm management

- High-quality speech
- Uses encryption to make phone calls more secure

The Global Positioning System (GPS) is a satellite-based navigation system that can be used to locate positions anywhere on earth. Designed and operated by the U.S. Department of Defense, it consists of satellites, control and monitor stations, and receivers. GPS receivers take information transmitted from the satellites and uses triangulation to calculate a user's exact location. GPS is used on incidents in a variety of ways, such as:

GPS is made up of three parts: between 24 and 32 satellites orbiting the Earth, four control and monitoring stations on Earth, and the GPS receivers owned by users. GPS satellites broadcast signals from space that are used by GPS receivers to provide three-dimensional location (latitude, longitude, and altitude) plus the time.

- To determine position locations; for example, you need to radio a helicopter pilot the coordinates of your position location so the pilot can pick you up.
- To navigate from one location to another; for example, you need to travel from a lookout to the fire perimeter.
- To create digitized maps; for example, you are assigned to plot the fire perimeter and hot spots.
- To determine distance between two points or how far you are from another location.

ESP8266 WIFI MODULE

- These modules include 1MB (8Mbit) of flash memory, twice the size of the older blue colored ESP-01 module
- The ESP8266 Serial/UART to WiFi module is a great way to connect your Arduino or other microcontroller projects to a WiFi network
- Create your next internet of things (IOT) project with affordable network connectivity by implementing this module into your design
- The module has the ability to run independent of a host controller

IV. RESULTS AND DISCUSSIONS



Fig 4: LCD Display for Camera Input

- Short message service (SMS)
- The eight pin header includes two GPIO pins that allow for direct connection of the module to sensors, peripherals, or host controller
- The ESP8266 has 3.6V tolerant I/Os so you will need a logic level converter to connect it with higher voltage devices such as Arduino
- The ESP8266 requires 3.3V power so you may need a 3.3V voltage regulator to provide the correct voltage, depending on your setup

MEMS SENSOR

An accelerometer is a micro-electromechanical device that measures acceleration forces. These forces may be static, like the constant force of gravity pulling at our feet, or they could be dynamic - caused by moving or vibrating the accelerometer. There are many types of accelerometers developed and reported in the literature. The vast majority is based on piezoelectric crystals, but they are too big and too clumsy. People tried to develop something smaller, that could increase applicability and started searching in the field of microelectronics. They developed MEMS (micro electromechanical systems) accelerometers.

FLEX SENSOR

A flex sensor or bend sensor is a sensor that measures the amount of deflection or bending. Usually the sensor is stuck to the surface, and resistance of sensor element is varied by bending the surface. Since the resistance is directly proportional to amount of bend it is used as goniometer, and often called flexible potentiometer.

FEATURES

- - Angle Displacement Measurement
- - Bends and Flexes physically with motion device
- - Possible Uses
- - Robotics
- - Gaming (Virtual Motion)
- - Medical Devices

As soon as device is switched ON, the LCD displays the above message as shown in figure



Fig 5: Output Message for Camera

When the camera captures the image of the person who has been listed as authorized in the Database, then the LCD displays the message as AUTHORIZED. In case of any mismatch with the person capture and image Database, the LCD displays the message as UNAUTHORIZED.



Fig 6: Latitude and Longitude values for Camera Output

As soon as the Camera captures the image, the Latitude and Longitude values are capture from the GPS system and gets displayed on the LCD.

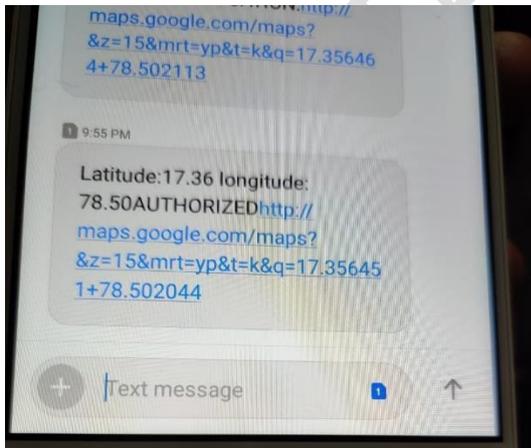


Fig 7: Mobile device output
GSM module sends the message to the mobile device as displayed in Fig

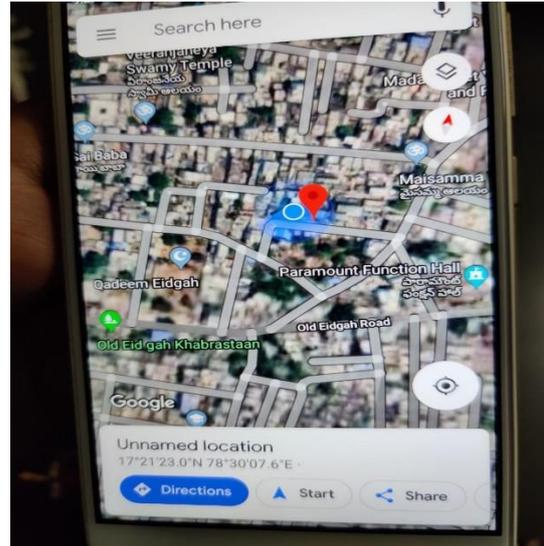


Fig 8: Google Maps on Mobile device
When the URL is clicked it navigates to the Google Maps giving the directions to the Victim's location, we can depict this from the above Fig

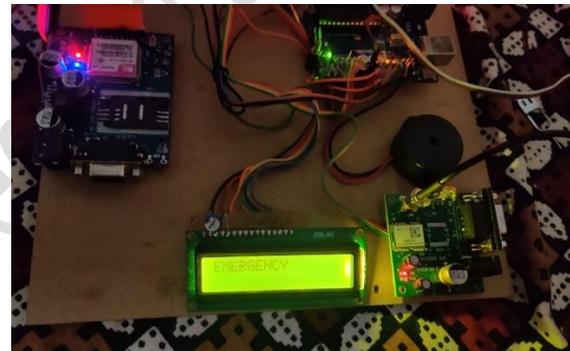


Fig 9: LCD Message for push button switch activation

LCD displays the message shown in the above Fig when the Push button switch is activated by the Victim

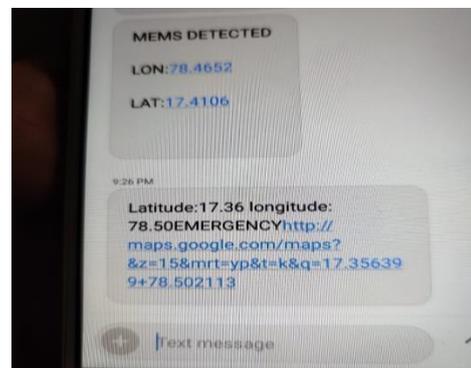


Fig 10: Mobile message for Push Button switch
GSM module sends the above message to the mobile device when the Push button switch is activated

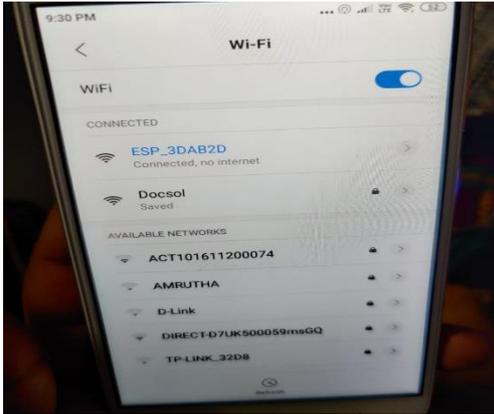


Fig 11: WIFI for connecting to IOT device

ESP_3DAB2D is the WiFi name for IOT module. The mobile device needs to be connected to this WiFi to track the Victim's location details

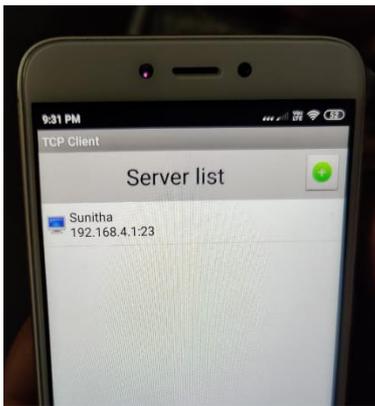


Fig 12: TCP Client connection through Mobile device

192.168.4.1:23 is the port address of IOT module. With the help of mobile device TCP Client App we can track the Victim's location details

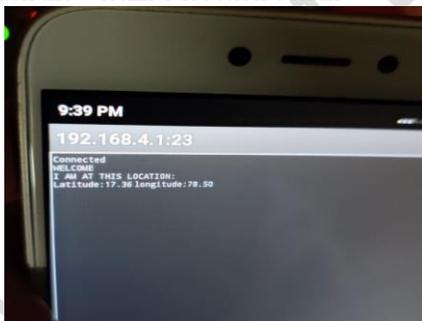


Fig 13: Flex Sensor activation message on TCP Client

The above message is displayed on the Mobile device when the Flex sensor is activated by the Victim. This message is viewed in TCP Client App



Fig 14: LCD display when MEMS activated
LCD displays the above message shown the Fig when the MEMS sensor is activated

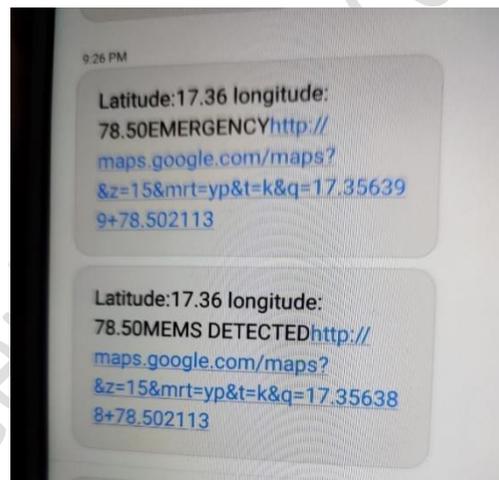


Fig 15: Mobile message when MEMS detected error

The above message is sent to mobile device when the MEMS sensor is activated

V. CONCLUSION

The existing systems are not powerful enough to prevent crimes against Woman. Main purpose of the system is fast process, low cost of development, acceptable quality, accurate tracking. This paper put forth a technique where a woman, when in danger, can instantaneously intimate to the concerned authorities. The proposed technique uses GPS tracking of the smart phone to get the device's co-ordinates. This technique further uses the image and alert message to inform the family and police personnel. However, this technique is effective only with the availability of smart phone to the victim and the contact personnel. Hence, there is a scope for further improvements by using GSM and GPS aspects in the approach.

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