

Safety Alert Device for Women using IoT

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Abstract – Women's safety is a very important issue due to the rise in crime against women these days. Women experience fear in different forms of sexual violence in public spaces like in and around public transportation, schools, workplaces, public toilets, parks, and on the streets. This reality reduces women's freedom of movement. It limits their access to essential services. To resolve this issue women safety system is designed using Internet of Things(IoT). It comprises of Arduino Nano, GPS module, GSM modem, buzzer, and a switch to activate the services. This device can be activated by the victim by turning on the switch that will fetch the location, trigger the buzzer, and also will save the recording. This location is sent to the predefined contacts and the nearest police station. The buzzer simulates a police siren, so that the culprit may assume that the police is situated in the nearby surroundings and will try to flee from that locality. And the audio recording can be used further as evidence.

Key Words: Internet of Things(IoT), Women safety, Arduino, GPS, GSM, buzzer

1. INTRODUCTION

The safety of women has become a major issue. The crime rates against women have only risen to a great extent. Women think twice before stepping out of their homes, especially at the night. Even though we live in the 21st century with much technological advancement and social awareness, women face the problem of harassment of any form and get abused physically or mentally. Areas like streets and public spaces have been the territory of such violence, this issue worsens for women who travel alone. There are many existing applications and devices for women's security through smartphones. Though smartphones have increased rapidly, it is not possible that smartphones and cellular networks will be available all the time.

The Internet of Things(IoT) refers to a vast number of "things" that are connected to the internet so they can share data with other things – IoT applications, connected devices, industrial machines, and more. Internet-connected devices use built-in sensors to collect data and, in some cases, act on it. IoT-connected devices and machines can improve how we work and live. Real-world Internet of Things examples range from a smart home that automatically adjusts heating and lighting to a smart factory that monitors industrial machines to look for problems, then automatically adjusts to avoid failures. Current technological advances in wireless

communications and wireless sensors have facilitated the design of smart, low-cost, small, and lightweight sensors. By integrating the concept of IoT, wireless sensors numerous simple yet effective smart devices can be developed.

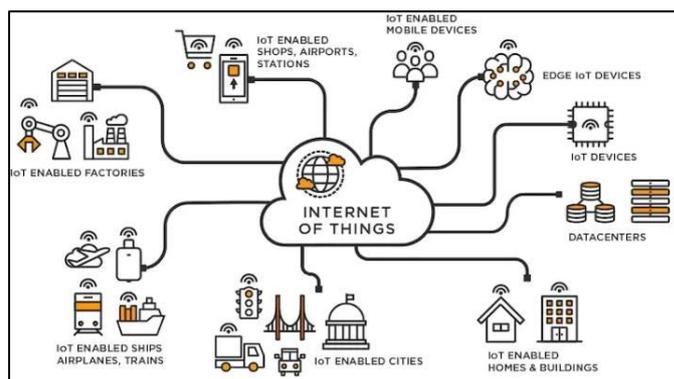


Fig-1: Applications of IoT

The various applications of IoT are Factory digitalization, Product flow, Monitoring, Inventory management, Safety and security, Quality control, Packaging optimization, Logistics and Supply chain optimization. In short, the Internet of Things refers to the rapidly growing network of connected objects that are able to collect and exchange data in real-time using embedded sensors.

Global Positioning System(GPS) is a navigation system based on satellites. It has created a revolution in navigation and position location. The major advantages of satellite navigation are real-time positioning and timing synchronization. Due to this reason satellite navigation systems have become an integral part of most applications, where mobility is the key parameter. The GPS module provides the current date and time, corresponding longitude and latitude, and also sends speed and travel direction if the victim is traveling. It helps to track the victim and makes it easier to access their location and find them.

Global System for Mobile communication(GSM) is used for mobile communication voice and information service as wireless cellular technology. The GSM network architecture can be grouped into four main areas namely Network and Switching Subsystem(NSS), Base-Station Subsystem(BSS), Mobile Station(MS)and Operation and Support Subsystem (OSS). GSM modems support a common set of standard AT(Attention) commands. Therefore AT commands are used to send the location of the victim to the preset contacts and police in the form of SMS. And this SMS is used to notify the victim's family and friends indicating danger.

2. LITERATURE REVIEW

Authors of [1] designed a device for women safety using raspberry pi, raspberry camera module, button and buzzer. The focus here is on helping the victim by sending the victim's real-time location and attacker's information to the police or to specific individuals. This device is manually controlled. If the victim is in trouble, the smartphone app can perform the above-stated tasks by pressing the emergency switch of the device in her hand. Although this device is working for the safety of women, due to the access numbers being stationary, it will be difficult to get assistance, if the victim is away from the access number.

Authors of [2] designed a device called "Touch Me Not", which can be attached to the clothing. It has a button that will be attachable to the clothing. This button will be connected to the system which has two modules, one which can be used when someone makes some sort of unethical movement and the other one which can be used when you sense danger. The first module can be used just to record that is making a short video to capture the assailant, while the second one can be used during times of danger to send your location to family or friends as well as it alerts the nearest police station, such that help can reach as soon as possible. The tool includes microcontrollers, GSM and GPS modules for the hardware section, python for the software section.

Authors of [3] designed a device that can assist women when they feel unsafe. This device will be clipped to the footwear of the user and can be triggered discreetly. On tapping one foot behind the other four times, an alert is sent via Bluetooth Low Energy communication to an application on the victim's phone, programmed to generate a message seeking help with the location of the device attached. The results obtained were analyzed using the Naïve Bayes classifier. In such situations, the aid of a safety device that will inform the victim's family members or the authorities may help women feel safer, confident and reduce the chances of harassment.

Authors of [9] proposed a safety device and application called FEMME using an ARM controller. It is a security device that is specifically designed for women. The device and be purchased or the application can be installed on smartphones and can be accessed in emergencies. The ARM controller and the android application both are synchronized. FEMME provides the quickest and easiest way to contact for help when a person is in distress. The application is activated by pressing the volume key and the power button together. When the application is being used, first it displays 4 main icons, audio recorder, SOS message, video recorder, hidden camera detector.

Authors of [10] designed an Android Application called "Abhaya" for the Safety of Women and it can be activated with a click. A single click on this app identifies the location of the place through GPS and sends a message comprising this URL to the registered contacts and also calls the first registered contact to help the one in dangerous situations. The unique feature of this application is to send the message to the registered contacts continuously for every five minutes until the "stop" button in the application is clicked. Continuous location tracking information via SMS helps to find the location of the victim faster.

3. PROPOSED SYSTEM

The working of the device is explained in the following steps:

1. In case of any emergency the woman needs to manually press the button to turn on the device.
2. This button triggers the microcontroller that activates the buzzer and the audio recorder.
3. The microcontroller triggers the recorder and the GPS module to record and to fetch the location respectively.
4. Recordings are stored in the audio recorder as proof for legal actions.
5. The microcontroller when triggered, receives latitude and longitude from the GPS receiver and transmits these to the GSM.
6. GSM sends the location to the pre-defined mobile number in the form of SMS.

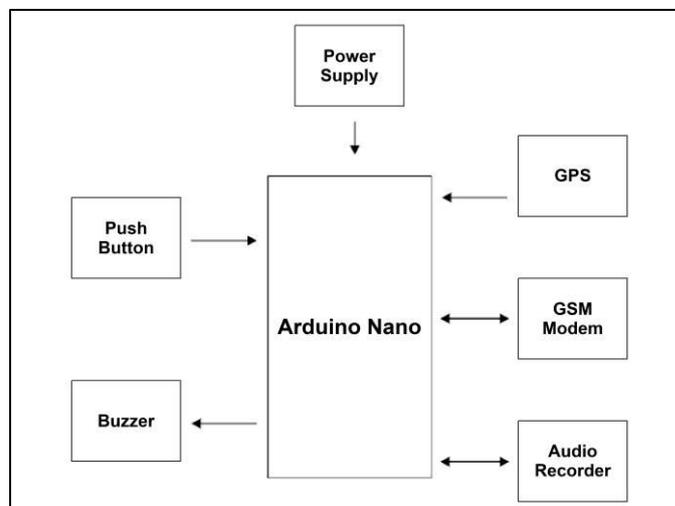


Fig-2: Block diagram

3.1 Technologies Used:

IoT

The Internet of Things(IoT) describes the network of physical objects "things" that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet. These devices range from ordinary household objects to sophisticated industrial tools, bridging the gap between the physical and virtual worlds. IoT enables companies to automate processes and reduce labor costs.

GPS

Global Positioning System(GPS) is a radio navigation system used to determine the latitude and longitude of a receiver on Earth by calculating the time difference for signals from various satellites to reach the receiver. In six different orbits approximately 12,500 miles above the earth, 24 Medium-Earth Orbit(MEO) satellites revolve around the earth 24 hours and transmit location every second as well as present time from atomic clocks. This technology can be used to track the location of a person and to determine the position of an object.

GSM

Global System for Mobile communication(GSM) is a digital mobile network. GSM uses General Packet Radio Service(GPRS), a packet-based communication service, to transmit data, such as through web browsing. It was intended to be a secure wireless system. Features of GSM are Improved spectrum efficiency, High-quality speech, Compatibility with Integrated Services Digital Network(ISDN), other telephone company services, and Support for new services.

3.2 Hardware Components:

Arduino Nano

Arduino Nano is a compatible and flexible microcontroller based on ATmega328p. Operating voltage of microcontroller is 5Volts. Arduino Nano Pinout contains 14 digital pins, 8 analog Pins, 2 Reset Pins & 6 Power Pins. Each of these Digital & Analog Pins is assigned with multiple functions but their main function is to be configured as input or output.

GPS module

GPS module tracks the current location in the form of longitude and latitude. It contains tiny processors and antennas that directly receive data sent by satellites through dedicated RF frequencies. From there, it'll receive a timestamp from each visible satellite, along with other pieces of data. If the module's antenna can spot 4 or more satellites, it's able to accurately calculate its position and time.

GSM modem

GSM modem is a hardware device used to establish communication between computer and a GSM-GPRS system. It is a wireless modem that works with a GSM wireless network. The modem requires a SIM card from a wireless carrier to send and receive messages. The GSM SIM card number is registered with the system. It supports AT commands that are used to send messages and make calls. It operates at either the 900MHz-1800MHz frequency band.

Buzzer

Buzzer is an audio signaling device. It is mainly used to prompt or alarm and is powered by DC voltage. The sound of a buzzer is so piercing that, it is noticeable even in a highly noisy environment. The sounds i.e., ring or beep are used to indicate that a button has been pressed.

Push Button

Push-Buttons are normally open tactile switches. It allows to power the circuit or make any particular connection only when the button is pressed. The circuit is connected when the button is pressed and breaks when it is released. Buttons are typically made out of hard material, usually plastic or metal. It has been utilized in various mechanical and electronic devices.

Audio Recorder

Audio Recorder is a digital device that records sound, saves it in file format. The file types include MP3 and Audio Interchange File Format(AIFF). It offers unparalleled integration with analog input, digital processing, and analog output functionality.

3.3 Working:

The system is enabled by pressing the button. The first step is to locate the victim. Acquiring location is an important part of the project. Since it indicates aid's arrival. The device aims to update the position of the victim to the police station and the family of the victim. GPS uses Trilateration to locate the victim's position on Earth, once the position of GPS satellites orbiting the Earth and their distance from the victim's location are known. The device is programmed in such a way that the coordinate position of the victim is sent to the contacts in the form of a Short Message Service(SMS) as smartphones are widely used.

On analyzing the correct reading, the microcontroller commands the GSM module to transmit the data through an SMS by using AT commands. AT commands are instructions used to control a modem. It is used in GSM technology which includes SMS-related commands like AT+CMGS(Send SMS message), AT+CMSS(Send SMS message from storage), AT+CMGL(List SMS messages), and AT+CMGR(Read SMS messages).

Simultaneously the recording is done using an Audio recorder. It provides high quality of the recording. The recording gets saved in the recorder module. This can be used as proof. Buzzer gets triggered which produces a police siren, so that the culprit may assume the police are nearby and try to flee the locality.

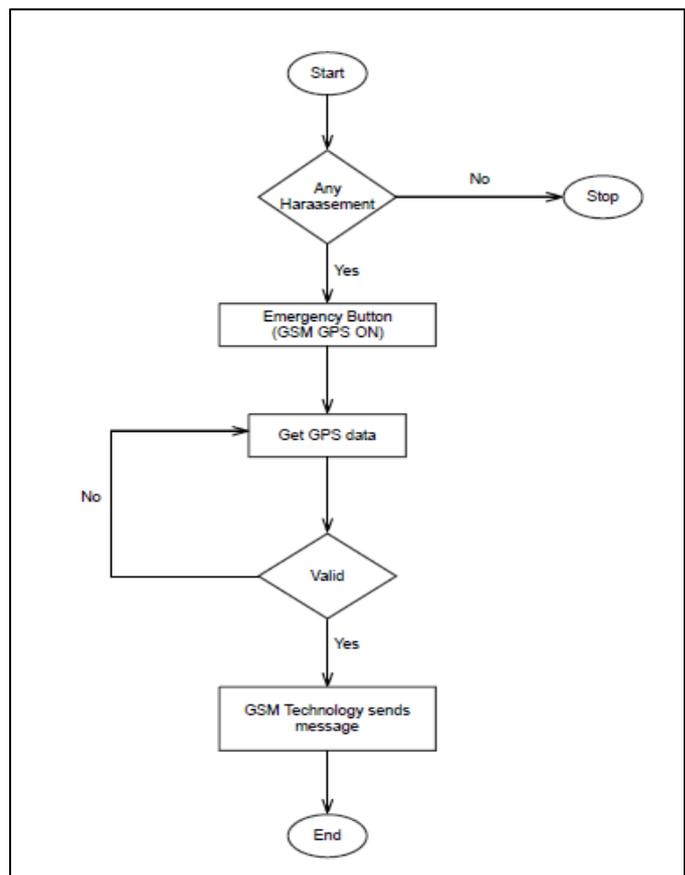


Fig-3: Flow chart

4. RESULT

The device implemented is successful and obtained desired output. The smart security system for women has been developed with such a motivation that the women are provided with a safe environment under all circumstances. The device is user-friendly as anyone can use a smartphone by clicking the URL to view the location on the map.



Fig-4: Message received by registered mobile number

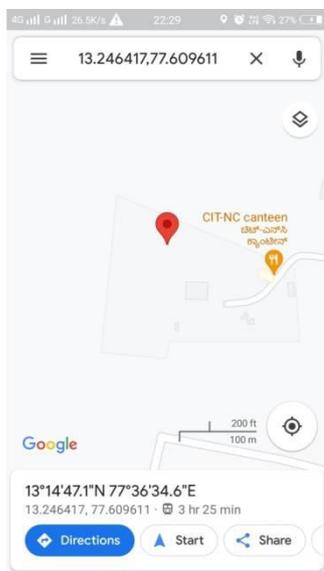


Fig-5: Location displayed in Google Maps

5. CONCLUSION

The proposed system is an effective self-defence gadget which provides protection to women in case of any assault or harassment. The motive of the project is to track the location of the victim without using a mobile, since not everyone can manage to carry the phone all the time. The major merit of this device is its simplicity and it is an effective device for

women who travel alone. This system is designed after referring to all the existing system. Measures are being made to overcome the flaws in previous designs. Further the device can be improved to fetch the accurate location.

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