Section A-Research paper
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WOMEN SAFETY SYSTEM WITH NERVE STIMULATOR AND PALPITATION METHOD USING IOT TECHNOLOGY

Ms. S. Pratheepa[1], Dr. S. Rajalakshmi[2], Dr. S. Gunasundari[3],Ms. S. Almelu [4]

Abstract

In recent years, acts of assault, attacks and violence against women are rising at a mendacious rate. The epidemic increase in assaults, violence and attacks against women in the past few years is posing a threat to the growth and development of women. The safety of women in smart cities is the need of the hour. While various legal and technological measures have been taken around the world, women's safety remains an international concern. Crime records are maintained by law enforcement agencies and are most often not available to the public in an easily comprehensible form. While there are some wearable gadgets and mobile apps to protect women, they make limited use of social interventions and are not very effective in protecting women when needed. This work applies the *Palpitation method* to automatically detect if women are in danger. The *Geographic Positioning System* (GPS) for the identification of the location of women and it indicates the nearer police stations and family members of the victim with the help of *Global System for Mobile communication* (GSM) and *Zigbee*. And it also alerts the public by using buzzers. The *Nerve Stimulator* generates an electric-shock pulse which acts as a self-defense system to protect women from criminals.

Keywords: *Geographic Positioning System (GPS), Palpitation Method, Global System for Mobile communication (GSM), Zigbee, Nerve Stimulator.*

Ms. S. Pratheepa[1] PG scholars, Computer Science Department, Velammal Engineering College, India.

Dr. S. Rajalakshmi[2] Assistant professor, Computer Science Department, Velammal Engineering College, India.

Dr. S. Gunasundari[3] Associate professor, Computer Science Department, Velammal Engineering College, India.

Ms. S. Almelu [4] Assistant professor, Computer Science Department, Velammal Engineering College, India.

Introduction

The safety and security of women is an issue of paramount importance in today's world. Unfortunately, incidents of violence and harassment against women are all too common, and it is crucial to find ways to protect and empower women in these

situations. One promising solution is the use of IoT technology to create women safety systems.

Urban regions have seen major social and economic changes as a result of the ongoing urbanization trend. It is crucial to keep an eye out for criminal activity, and it is becoming more and more difficult for law enforcement to ensure the public's protection. These organizations can successfully analyze and comprehend the various crime trends and patterns with respect to their geographic regions thanks to new technologies, which can aid with this hard task. The results of this study demonstrate the superiority of the Hierarchical Density-based Spatial Clustering of Applications with Noise (HDBSCAN) method for locating spatiotemporal crime hotspots.

The Internet of Things (IOT) is a network of computing devices that connect and communicate over the Internet. The core function of the IOT is to connect devices that collect and exchange information through software, cameras, and embedded sensors that detect things like light, sound, distance, and movement. Smart devices work automatically or are controlled and monitored remotely. It is one of the most important innovations that can bring unlimited benefits to our society. IOT development has reached the stage where many things or objects around us will have the ability to connect with the internet for communicating with each other without human intervention. Initially, IOT was introduced to reduce the amount of human intervention and to use different types of sensors for collecting data from different environments and allow all this data to be stored and processed.

An IOT-based women safety system could include wearable devices, sensors, and other smart technologies that can monitor a woman's surroundings, detect potential threats, and provide real-time alerts to emergency contacts and authorities. These devices could be seamlessly integrated with existing communication networks and emergency response systems, providing a rapid and coordinated response to women in danger. This technology could be particularly useful in high-risk areas or situations, such as public transportation, college campuses, or late-night travel.

The use of IOT technology can also help to bridge the gap between women and law enforcement agencies, making it easier for women to report incidents and access support services.

Related Works

Women are typically said to be rendered helpless during attacks. Thus, there is a need for a more basic safety system that can be activated by just flipping a switch and can immediately inform others who are close to the victim. As a partial wearable and partial portable system was built and constructed in this study.

It is advised that women utilize an Internet of Things-based smart security wearable device. The Raspberry Pi Zero, Raspberry Pi camera, buzzer, and button to activate the services are all included in the smart ring (SMARISA) implementation of this idea. This device is quite portable, and the victim only needs to press a button to activate it after being attacked.

Wearable watch-like gadget can be worn on the wrist. When in danger, the victim can press a button on the gadget to activate a camera built on a Raspberry Pi that will capture an image of the attacker. This image is immediately sent as a message and mail to a list of pre-stored emergency contacts as well as the closest police station through the application that is already installed on the victim's phone. Additionally, the victim's location will be tracked by this particular system, and it will be sent via email or SMS along with the captured image.

The proposed model is made up of parts such as an Arduino microcontroller, piezoelectric sensors for pressure sensing, and accelerometer sensors for obtaining values in all directions. The Sim808 module, which includes both GPS and GSM features, is used in this model. When an emergency occurs, a GSM module is used to send alarm messages to known contacts and the local police station.

This project introduces GPS monitoring and notifications through the Arduino system, which can be connected to an alarm system and warn a neighbour, to improve the safety of women. This message system makes use of the GPS, Arduino receiver, and GSM modem. The proposed concept aims to develop an IoT-based security device that relies on the fingerprints of women for protection. Overall, an IOT-based women safety system has the potential to significantly enhance women's safety and security, providing a powerful tool for women to protect themselves and access support in times of need.

Methodology

An IOT gadget for women's protection is the focus of this project design. The Arduino MEGA microcontroller is used in this proposed method to interface multiple input and output devices. The LCD is used to display the current execution process. The Toggle Switch is used for switching from manual mode (Push Button) to auto mode (Heart Rate Sensor) or vice versa. The push button is used to send the alert message by manual pressing in manual mode. The heart rate sensor is used to detect the palpitation level of the women, and then automatically send the alert message in auto mode. The GSM is used to send an alert message or to call the family members of the victim and the nearby police stations for help. The GPS is used to track down the location of women in need of help. The ZIGBEE is used on both sender and receiver sides as part of the design for transferring the emergency data to the family members of the victim and nearby rescue teams. The nerve stimulator is used to provide the electrical shock pulses for self-defence of women. The Arduino UNO is used in the receiver section. The LCD and Buzzer are used to provide the emergency alert message to rescue patrols. The proposed systems block diagram is detailed in (fig3.1) and(fig3.2.)

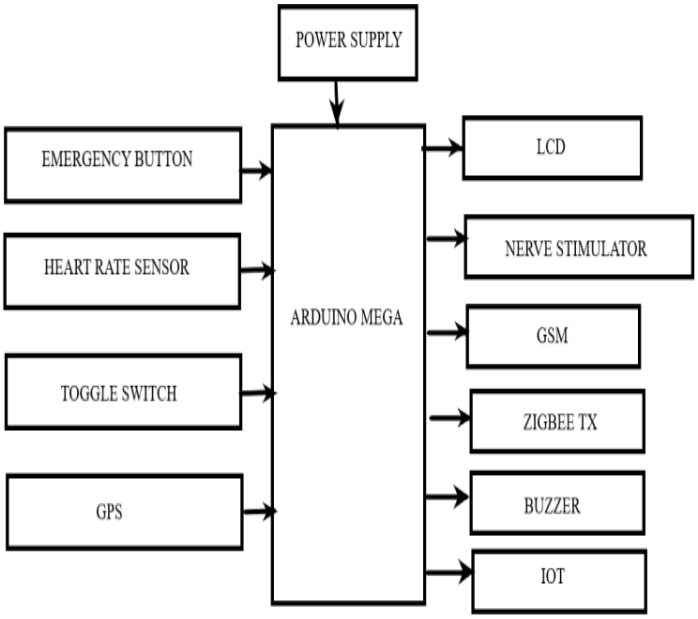

Fig: 3.1 Transmitters

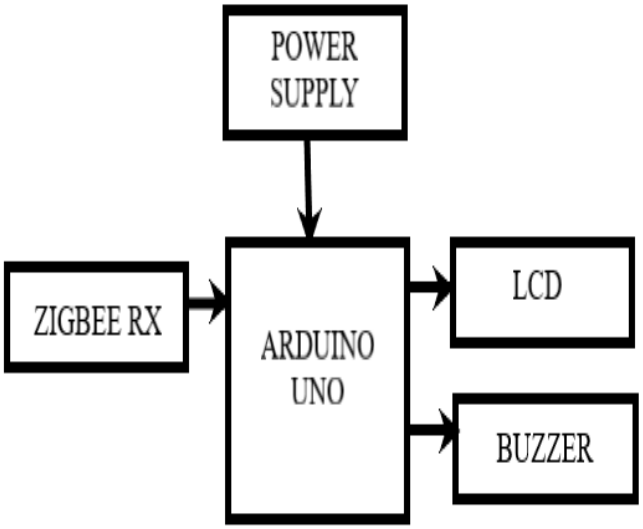

Fig: 3.2 Receivers

Modules

ALERT THROUGH PUSHBUTTON:

In this module LCD and pushbutton is interfaced with Arduino UNO. By interfacing buzzer with Arduino the system can alert to the nearby people, if anyone attacks the victim. The system that is interfaced with

nerve simulator gives shock to the person who touches it.

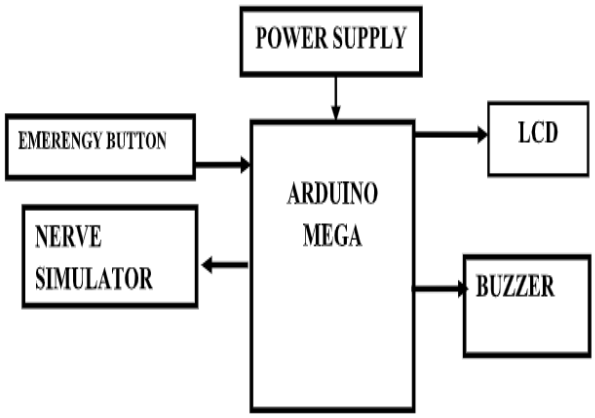

Fig: 4.1 Alert through pushbutton module design.

ALERT THROUGH HEAT BEAT SENSOR:

In this mode LCD and Heat beat sensor is interfaced with Arduino UNO. By interfacing buzzer with Arduino, the system will alert to the nearby people. If anybody touches the system, the interfaced heart sensor will sense it, then gives shock to the person and automatically send the alert message. In the normal heart beat situation, the system can be manually turned on by pressing the switch and the alert message will be sent.

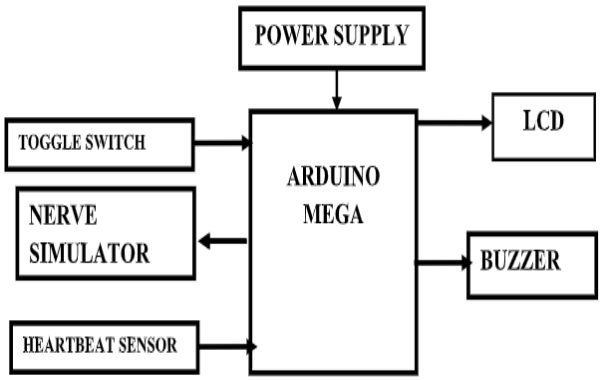

Fig: 4.2 Alert through heart beat sensor module design

ALERT MESSAGE:

While pressing the pushbutton, the system will send the alert message to the mobile numbers linked with the GSM. The LCD is interface with Arduino. To interface LCD to the Arduino, it requires Liquid crystal library. The LCD module will use the liquid crystal to print visible text on display. 16×2 LCD comes with 16 columns and 2 rows hence it is called as 16×2 LCD Module.

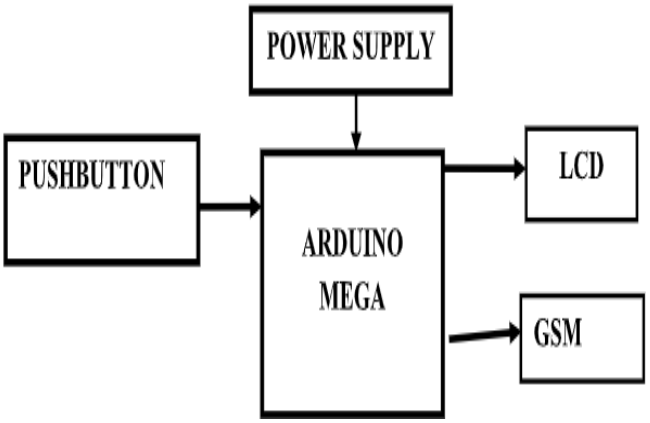

Fig: 4.3 Alert message module design

ALERT FOR POLICE STATION:

When the pushbutton is activated, the ZigBee transmitter on the transmitting side will send data to the receiving side. In receiving side there is a ZigBee receiver which can receive data and alert the police station. The alert message will be displayed on the LCD of the receiving side.

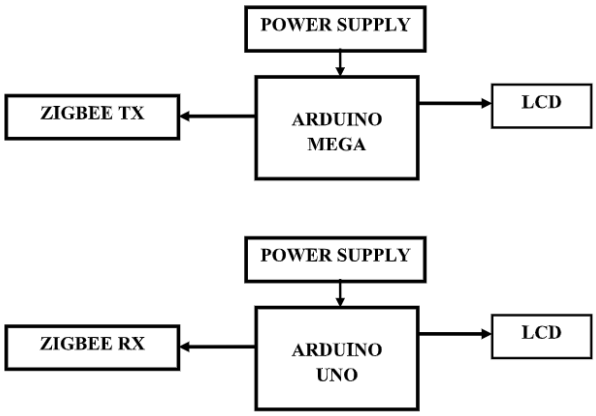

Fig: 4.4 Alert for police station module design

IOT MODULE FOR INTERNET ACCESS AND GPS:

The internet of things (IoT) is the networks of physical devices, vehicles, buildings and other items embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data. And by the use of GPS location can be tracked and it will be updated by the IoT device. In application, multiple IoT devices can be used to monitor the locations on web page and take action accordingly.

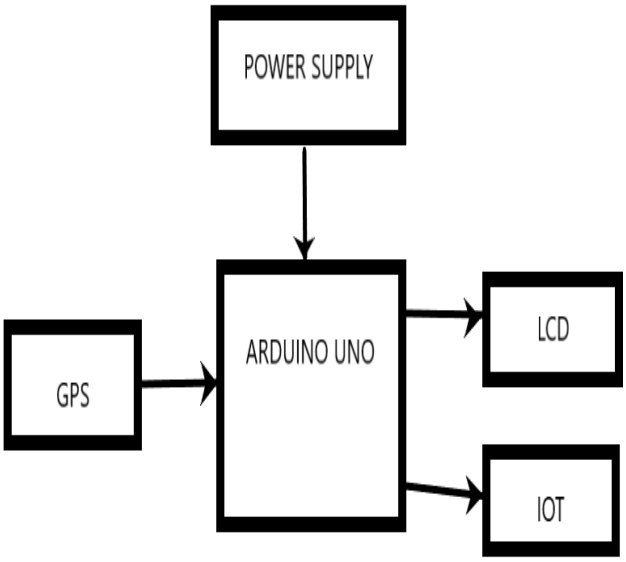

Fig: 4.5 IOT & GPS module design

Features

- Multiple alert systems provided in this project give us higher possibility to send the data properly.
- Arduino boards are reasonably priced, compare to other microcontroller systems. Even the pre-assembled Arduino modules are the least priced variant, so it is cost effective.
- Faster response, since it directly alerts the nearby police and victim family members.
- It provides a switching system for switching from manual mode to auto mode or vice versa.
- Zigbee is for transmitting alert messages without the need for the internet connection and it covers more distance as compared with Bluetooth.
- The nerve stimulator is used to provide the electrical shock pulses for self-defence of women.
- It is used for women safety and defence.
- This system can be used to alert the nearby police station in case of emergency.

Results

This system provides a faster and more cost-effective solution for women's safety. In the proposed system method, the safety measures are improved by adding a three-layered communication alert system. This system provides a switching system for switching from manual mode to auto mode or vice versa. It is helpful to avoid false alerts. It has GSM and ZIGBEE for transmitting the alert message to emergency contacts and nearby police stations for help. There is no need for internet connection for transferring alert messages and required data. Almost all the existing systems lack a self-defense module, and so it uses the Nerve Stimulator for defense systems. It is used as a women's safety device to make the system more accurate, with no chances for data loss and for uninterrupted proper communication.

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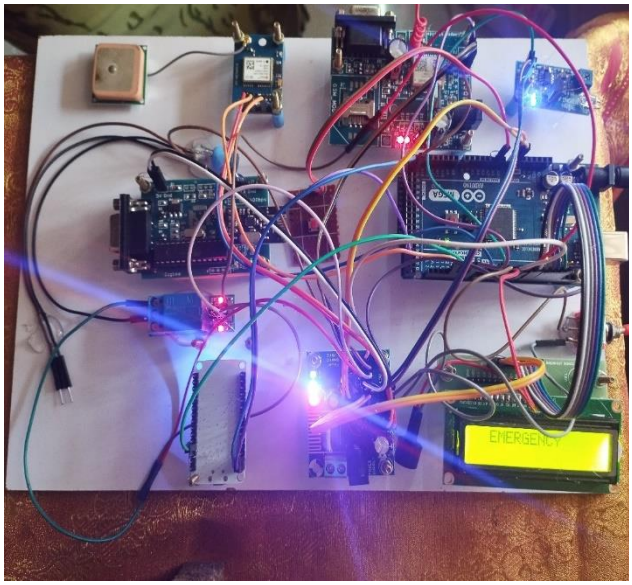

Fig: 6.1 Transmitters

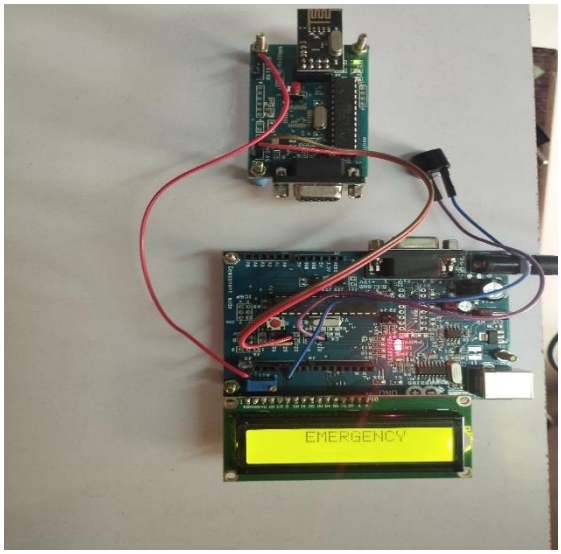

Fig: 6.3 Receivers

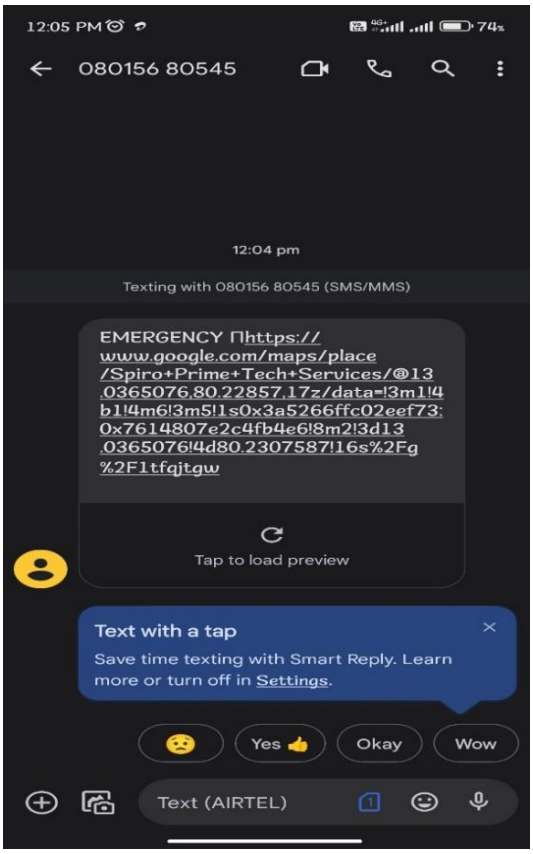

Fig: 6.2 SMS Alert through GS

Fig: 6.4 Alert message update in Webpage

Conclusion

This technology shortens the wait time, enhancing women's safety and also sends alert signals to nearby devices so that help can arrive without any delay. Messages through GPS and GSM technology are an additional part of helping this project to send alert messages to family members. Through Zigbee, the nearest control room will receive the alert messages. Since almost all the women's safety devices lack self-defence kits, the proposed system is built with a nerve stimulator for self-defence.

Future Scope

As a part of the future enhancement, the microcontroller can be replaced by a Raspberry Pi to generate images. The future designs can be smaller women-oriented ornaments or accessories to make the system less suspicious and susceptible. The Raspberry Pi also has its separate camera module, and the video can be live-streamed to a central police database or the app, thus ensuring that prompt actions are taken. Further this alert system can be monitored through a centralized system. The real-time implementation of the suggested system in miniature is part of our future scope.

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