Smart women protection system using IOT

Ms. Akshatha K S[1], Eshitha D[2], Jyothika R[3], Nanditha V[4], Nikitha M[5]
[1]Assistant Professor, Dept of ISE
[2, 3, 4, 5]Dept of ISE
[1, 2, 3, 4, 5] East West Institute of Technology, Bengaluru

Abstract- *In today's digital age, the need for secure and privacy-preserving Public Key Infrastructure (PKI) solutions has become increasingly critical. Traditional PKI systems rely on centralized authorities, presenting vulnerabilities and privacy concerns. To address these challenges, we propose LRS_PKI, a novel blockchain-based PKI framework utilizing linkable ring signatures. LRS_PKI decentralizes certificate issuance and management while ensuring privacy and security through cryptographic techniques. Linkable ring signatures enable anonymous signing by a group of users, maintaining signer anonymity while enabling signature verification. By leveraging blockchain technology, LRS_PKI achieves transparency, immutability, and tamper-resistance in certificate management. Each certificate issuance or revocation is recorded as a transaction on the blockchain, facilitating public verification and eliminating the need for a central authority. LRS_PKI offers enhanced security, privacy, scalability, and interoperability compared to traditional PKI systems. Its decentralized nature mitigates single points of failure and reduces the risk of attacks. With LRS_PKI, organizations can establish a robust and trustworthy infrastructure for securing digital communications and transactions in a decentralized manner.*

Keywords- Wearable IoT devices, Panic button, GPS tracking, Real-time alerts, Emergency SOS, AIpowered safety analytics.

I. INTRODUCTION

The safety and security of women have become paramount concerns in today's rapidly evolving societal landscape. Despite advancements in technology and infrastructure, women still face significant risks in various public and private settings, including harassment, assault, and other forms of violence. The increasing prevalence of such incidents calls for innovative and efficient solutions to address these issues proactively. In this context, Artificial Intelligence (AI), combined with image classification techniques, offers a transformative approach to enhancing women's safety through intelligent surveillance systems capable of realtime threat detection and intervention.

The Growing Need for Women-Centric Safety Measures

In recent years, governments, organizations, and communities worldwide have taken significant steps to address women's safety issues. Public awareness campaigns, improved legislation, and increased police presence in high-risk areas have contributed to mitigating risks to some extent. However, the limitations of conventional measures, such as reactive responses and reliance on manual monitoring, often lead to delayed interventions in critical situations.

Surveillance systems, while widely deployed in urban environments, are typically passive tools that record activities without real-time analysis or immediate action. This lack of active threat recognition undermines their effectiveness in preventing crimes, especially those targeting women. Furthermore, traditional surveillance systems fail to incorporate specific considerations for scenarios that disproportionately affect women, such as stalking, loitering near isolated areas, or unwanted physical proximity in crowded spaces.

Advances in AI and Image Classification

The field of Artificial Intelligence has witnessed remarkable progress in recent years, particularly in the domain of computer vision. Image classification, powered by deep learning models, has revolutionized the way machines perceive and interpret visual data. Algorithms such as Convolutional Neural Networks (CNNs) and real-time object detection models like YOLO (You Only Look Once) have demonstrated exceptional accuracy in recognizing and categorizing objects and activities in images and videos.

These advancements open the door to creating smarter surveillance systems that can identify suspicious activities in real-time. For example, by training AI models to detect behaviors such as physical altercations, stalking patterns, and the presence of weapons, surveillance systems can transition from passive recording devices to active security tools. Such systems can alert authorities or designated individuals instantaneously, enabling faster responses and potentially preventing harmful incidents.

Focusing on Women's Safety Through AI

A critical aspect of developing intelligent surveillance systems is designing them with women's safety as a core objective. Conventional AI models often lack the contextual understanding necessary to identify scenarios specific to women's experiences. For example, loitering near playgrounds or deserted streets, following patterns in crowded areas, or abrupt changes in body language indicative of distress are subtle yet critical indicators that require precise detection capabilities.

By curating a dataset specifically tailored to activities and objects relevant to women's safety, this project aims to build an AI-driven image classification system capable of addressing these unique challenges. The system will leverage advanced image classification techniques to analyze live video feeds, recognize potential threats, and issue alerts in real-time. This approach not only enhances situational awareness but also empowers women by creating a safer environment in public and private spaces.

The integration of AI into safety and surveillance systems presents both challenges and opportunities. One of the key challenges is ensuring the reliability and accuracy of detection models. False positives, where non-threatening activities are flagged as suspicious, can lead to unnecessary anxiety and resource wastage. Conversely, false negatives, where genuine threats go undetected, undermine the system's effectiveness. Addressing these issues requires meticulous dataset preparation, advanced model training, and continuous system evaluation.

On the other hand, the opportunities offered by AI in this domain are immense. A successful implementation of AI-powered image classification for women's safety has the potential to transform urban security landscapes. Beyond detection, these systems can serve as deterrents, as the mere presence of intelligent surveillance is often enough to dissuade potential wrongdoers. Furthermore, integrating these systems with emergency response networks can significantly reduce response times, ensuring timely assistance in critical situations.

II. LITERATURE REVIEW

Literature survey is the most important step in software development process. Before developing the tool it is necessary to determine the time factor, economy and company strength. Once these things are satisfied, then the next step is to determine which operating system and language can be used for developing the tool. Once the programmers start building the tool the programmers need lot of external support. This support can be obtained from senior programmers, from book or from websites. Before building the system the above consideration are taken into account for developing the proposed system.

The major part of the project development sector considers and fully survey all the required needs for developing the project. For every project Literature survey is the most important sector in software development process. Before developing the tools and the associated designing it is necessary to determine and survey the time factor, resource requirement, man power, economy, and company strength. Once these things are satisfied and fully surveyed, then the next step is todetermine about the software specifications in the respective system such as what type of operating system the project would require, and what are all the necessary software are needed to proceed with the next step such as developing the tools, and the associated operations.

Literature study is carried out to get all the related information of current project, which is used to get an idea for the enhancement as well as changes that can be made to improve existing approaches. A literature study is done on various techniques. Following section describes about all the related papers which is used in current project.

III. METHODOLOGY

Today, the safety of women is a significant problem that is the subject of a lot of conversation. The rate of criminal activity is on the rise. The safety of women is a major problem that has to be addressed in this context. The primary objective of the article is to enhance the safe and secure living conditions of women. Compared to the approach that is now in use, which is known as the Bluetooth enabled Women Safety System (BWSS), the method that has been presented, which is dubbed IoT Powered Women Protection (IoTPWP), is capable of performing real-time monitoring of the targeted region and detecting instances of violence with a high degree of precision. The following figure Fig.1 shows the system block diagram.

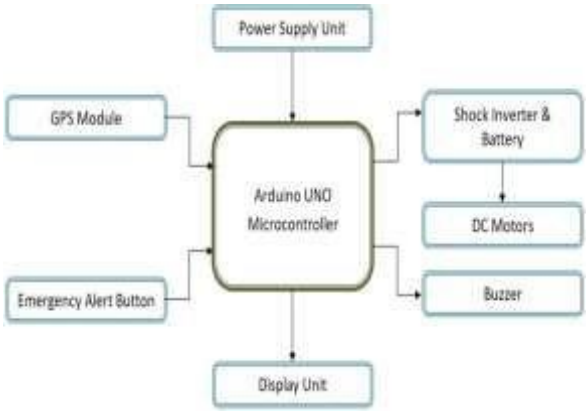

Fig.1 Block Diagram

As part of the system that is being suggested, we have created the apparatus that would alert the system. Throughout the course of this project, we made use of the Arduino controller in order to exercise control over the whole of the computer system. GSM is used in order to convey text messages about GPS positions. LCD stands for liquid crystal display, and the switch is activated when the individual is in danger. In this instance, we are including a Buzzer Laser Diode, which will become active when the ladies hit the switch.

(i) Arduino Controller: Arduino Uno is a microcontroller board that was created by Arduino.cc, which is an open-source electronics platform that is primarily based on the Atmega328 AVR microprocessor. A USB interface, six analogue input pins, and fourteen I/O digital ports are included in the most recent version of Arduino Uno. These ports are used to communicate with electrical circuits that are located outside of the Arduino Uno. Only six of the fourteen I/O ports are available for usage as PWM output pins. The following figure Fig.2 shows an Arduino controller.


Fig.2 Arduino Controller

(ii) GPS Module: The global positioning system, often known as GPS, is a system that is based on satellites and employs both satellites and ground stations in order to measure and calculate its global location. Additionally, the acronym GPS stands for "Navigation System with Time and Ranging." It is necessary for a GPS receiver to receive data from a minimum of four satellites in order to achieve accuracy. Neither the satellites nor the GPS receiver get any information from the GPS receiver. The following figure Fig.3 shows the GPS module.


Fig.3 GPS Module

(iii) Battery: It is possible to describe a battery as an electrochemical device that is capable of being charged using an electric current as well as discharged whenever it is necessary to charge it. The majority of the times, batteries are devices that are constructed from a number of electrochemical cells that are coupled to both inputs and outputs from the outside world. Batteries are used in a broad variety of applications for the purpose of providing power to tiny electronic gadgets like mobile phones, remote controls, and torches. The following figure Fig.4 shows the battery.


Fig.4 Battery

(iv) Buzzer: Mechanical, electromechanical, or piezoelectric buzzers and beepers are all examples of devices that are used for the purpose of transmitting auditory signals. Beepers and buzzers are often used for a variety of purposes, including the confirmation of user input, such as a mouse click or keyboard, as well as alarm devices and timers. A buzzer is a structure that is combined with electronic transducers and a DC power source. It is used in a broad variety of electronic goods, including computers, printers, copiers, alarms, electronic toys, electronic equipment for automobiles, telephones, timers, and other electronic items that are employed for sound devices. The following figure Fig.5 shows the buzzer.

Fig.5 Buzzer

(v) Single Channel Relay: Relays are electromagnetic switches that are used in situations when several circuits need to be controlled by a single signal. Relays may be utilized to turn on and off a circuit by means of a signal with a low power level. The following figure Fig.6 shows the relay.

Fig.6 Single Channel Rela

V. RESULTS

Nowadays, many people are talking about how to make sure women are protected. Crime rates are increasing and there has to be action here to ensure the safety of women. Enhancing women's safety and security is the primary objective of the article. Several parts, including a temperature sensor, a vibration sensor, an ESP8266 camera, and GPS modules, are utilized in the project. In order to determine if the temperature has risen or fallen, a temperature sensor is utilized. Pulse waves are detected by the pulse sensor. Fahrenheit and Celsius are the two units of measurement for temperature. In order for the well-wisher's information to be updated on their smartphone, the smart Android app is set up with the user's device. Whenever the user opens the app, the data (heart rate, temperature, etc.) is updated. Google Maps is also used to keep the user's location up-to-date. When someone is trying to drag or force a victim, the vibration sensors will detect the force and record the readings.

There is a threshold that may be adjusted in the vibration sensor. If the vibration rate is out of the ordinary, the concerned parties will receive a message on their phones. By accessing the link, they may observe the situation unfold in real-time through the distant cloud IoT server. Internet of Things (IoT) wearable gadgets includes sensors into their design to gather data. If the specified values given to the sensors are exceeded, the modules are activated via the internet connection by the sensors. Taking into account the safety equipment for women Smart clothes, smart bracelets, and smart ornaments are designed as wearable that utilize the Internet of Things. Literature reviews have shown that women's safety domain technology is still in its infancy. For the most part, the researchers' gadgets took the shape of smart bands. The sensors' diminutive size and portability make them ideal for use in a variety of settings. Not only are they inexpensive, but they are also easy to use. When the user is in danger, there's no need to hit the button, according to the literature review.

The device's major component, the Node MCU ESP8266 module, links the pulse, temperature, GPS module, and LCD, which is its benefit. The Arduino UNO has the vibration sensor and webcam. On the LCD, user can see the temperature. Figure 7 shows the login module of the android app that is being suggested for accessing the system. The system will let the user continue logging in if their credentials are correct; else, it will refuse it.

Fig.7 Login Module

Figure 8 shows a bird's-eye view of the android app that is being considered for system access. With this feature, users may capture the current situation and upload it to the server for future use in fixing any issues. Figure 9 shows how the proposed Android app may detect the user's current position using its location tracking feature.

Fig.7 Camera Module

Fig.8 Location Tracking

See Fig. 9 for an illustration of how the IoT Powered Women Protection (IoTPWP) system compares to the more traditional Bluetooth enabled Women Safety System (BWSS) in terms of how well it protects women. What follows is a descriptive table of the same information, Table-1.

Table-1: Efficiency Analysis

Iterations	BWSS(%)	IoTPWP(%)
2	91.26	96.64
5	89.21	95.47
7	90.24	97.28
9	88.36	96.72
12	88.37	97.04
15	90.25	97.25
18	88.67	97.45
21	88.40	97.66
25	88.13	97.86
30	87.86	98.07

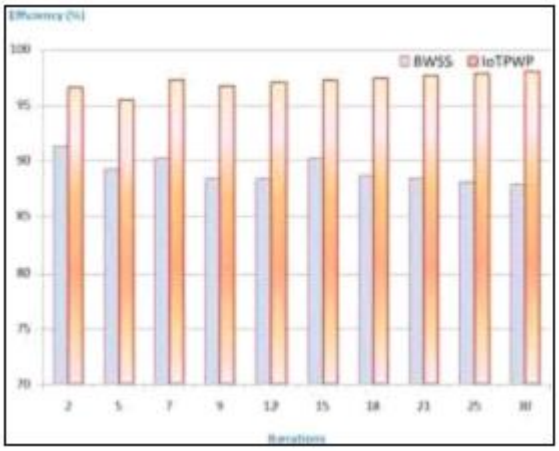

Fig.9 Efficiency Analysis

Figure 10 shows the results of an emergency alert ratio study of the IoTPWP system, which was cross-validated with the BWSS conventional model to determine how well the IoTPWP scheme performed. Table 2 provides a descriptive representation of the same.

Table-2: Alert Ratio Analysis

Triggers Raised	BWSS	IoTPWP
7	2	7
9	5	9
15	7	14
18	9	16
22	12	21
27	14	24
36	16	35
39	18	37
41	21	39
45	23	43

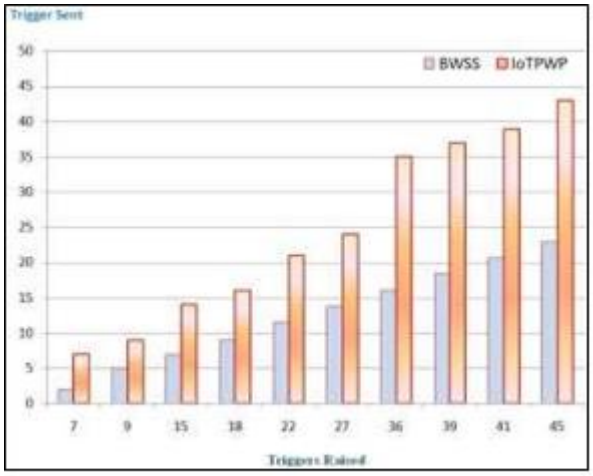

Fig.10 Alert Ratio Analysis

VI. CONCLUSION

In order to safeguard women from dangers such as abuse, discrimination, rape, and violence, this study presents an experimental evaluation of devices that are based on the internet of things (IoT). By taking a variety of terms and their synonyms into account, this paper collection reviews the Internet of Things (IoT) based gadgets designed to keep women safe. It is possible that certain studies may have impacted the findings by using other terms or their synonyms in their work, even when a number of the criteria are utilized to search the pertinent literature. To reduce the likelihood of this happening, we thought long and hard about the keywords we would use, sorted them into different categories, and then used several Boolean operators to combine the keywords according to our criteria. Being the pioneering concept of its sort, this notion is vital in guaranteeing women's safety in the most efficient and immediate manner. The suggested layout addresses and provides solutions to pressing problems that women have encountered recently.

In this paper, we offer designs that address the most pressing problems women are facing today and offer technology solutions that make use of little resources and innovative thinking. Some of the features included in the system include the ability to release tears, loud alarms, live video streaming, and the ability to transmit messages along with their location. This method has the potential to alleviate the anxiety that every woman in the nation has for her personal safety and security. Additional study and innovation might expand the scope of this project to encompass other aspects of surveillance and security. With high precision, the system can monitor the specified region in real time and identify instances of violence. Adding a smart gadget like a watch or ring to the current module and developing a delegate application for women's security on a dedicated server are two ways to improve the job in the future.

REFERENCES

[1] Sasmita Mohapatra, et al., "A Smart Women Protection System Using IOT", Data Intelligence and Cognitive Informatics, Algorithms for Intelligent Systems. Springer, https://doi.org/10.1007/978-981-16-6460-1_35, 2022.

[2] B.S.S. Tejesh, et al., "A Smart Women protection system using Internet of Things and Open Source Technology", International Conference on Emerging Trends in Information Technology and Engineering, DOI: 10.1109/ic ETITE47903.2020.455, 2020.

[3] G. A et al "Efficient Internet of Things Enabled Smart Healthcare Monitoring System Using RFID Security Scheme" Intelligent Technologies for Sensors, 1st Edition, 2023, Apple Academic Press, ISBN: 9781003314851.

[4] N.V.K. Ramesh, et al., "Empowering Women's Safety with smart IoT Technology: A Robust Protection System", 4th International Conference on Signal Processing and Communication, DOI: 10.1109/ICSPC57692.2023.10125736, 2023.

[5] M. T et al "Internet of Things Enabled EnergyEfficient Flying Robots for Agricultural Field Monitoring Using Smart Sensors" Intelligent Technologies for Sensors, 1st Edition, 2023, Apple Academic Press, ISBN: 9781003314851.

[6] M. Singaram, A. Pramodh, P. J. Harini, R. Praveen, S. Hari Pranav and K. Vijayakumar, "IOT based LED Electronics board," 2022 International Conference on Innovative Computing, Intelligent Communication and Smart Electrical Systems (ICSES), Chennai, India, 2022, pp. 1-5, doi: 10.1109/ICSES55317.2022.9914315.