

Cyber Security: A Smart and Secure Women's Safety Solution using Cyber Security Principles

Cyber Security Principles and GPS Tracking System

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Abstract - The safety of women has emerged as an important social concern around the world, impacting our cities and rural areas alike, both areas are seeing increases in incidents of harassment and violence against women. Current safety methods are often unable to provide timely assistance to those who need it, necessitating the use of technological solutions to improve safety outcomes. This paper presents the design and implementation of a GPS-based tracking system aimed at enhancing the safety of women. The proposed system utilizes a mobile device with a combination of GPS and GSM modules integrated with a mobile application to provide real-time location updates and emergency notifications. In an uncomfortable situation, the tracking device (a small chip) will send the user location to their pre-registered contacts and the closest municipal law enforcement agency. Using these features allows law enforcement to have an improved opportunity to respond faster and more effectively to distress calls from women. This paper discusses the evaluation of the tracking system in terms of its performance accuracy, response time, and user acceptance, as well as some of the challenges associated with this type of system, including battery life, network reliability, and data privacy. Overall, the results of this study indicate that GPS-based tracking systems have great potential to help reduce the time it takes law enforcement to respond to requests for assistance and will also significantly improve the perception of safety among women within the smart city infrastructure.

INTRODUCTION:

Within modern day society, Women safety has been in spotlight as a serious public issue, with an ever-growing incidence rate of harassment and violent acts toward women (or children). All demographics have issues regarding the potential danger of being victimized and many are unable to use their mobile phones when in trouble due to fear, panic or just not enough time. In order to reduce these issues, this research paper provides a simple, practical solution to this problem through initiating a safety system.

within common wearables (jewellery) such as rings, bracelets, pendants and anklets. Because women generally wear jewellery every day, it becomes more difficult for an attacker to notice whether somebody has a safety device on them, allowing easier access for the user to activate the system (the safety system) without alerting the attacker. The chip sends real-time location information using GPS technology, along with emergency alerts via a communications module to the pre-registered contacts and/or

law enforcement agencies in the vicinity. Protection of sensitive user information, as well as prevention of abuse or misuse associated with your location is attained using cyber security principles. The system is designed to improve response time and ultimately provides women and children with a more efficient, reliable, and discreet mechanism for enhancing their safety while reducing their fear of harm.

PROBLEM STATEMENT:

The increasing number of cases related to harassment and assault, as well as other forms of crime, have resulted in raising considerable concerns regarding women's safety in modern society today. Mobile applications, helpline numbers, and manual reporting procedures currently used by society to provide safety for women will be ineffective in actual emergencies when victims do not have sufficient time or courage to unlock their phones in order to make a call for help—that can cause serious delays in getting timely assistance from family members and law enforcement agencies. Most safety solutions currently available also require continual internet access and active input from users—neither of which will always be available for women during unanticipated emergencies. There is also the potential for women carrying any type of visible device to become targets of the persons attacking them—this may further endanger them. It is also important to note that issues of secure data handling—location data in particular if not adequately protected through robust cyber security—have created additional issues for women who need assistance from law enforcement agencies. Therefore, there is a strong need for a smart, discreet, and secure women's safety system that can operate quickly and reliably during

emergencies. Such a system should be easy to use, hidden from attackers, capable of sending real-time location alerts, and protected using cyber security principles. Addressing these challenges is essential to improve response time, ensure data privacy, and enhance the overall sense of safety among women and children.

OBJECTIVES :

The major purposes of this study include the following:

- To design an intelligent/concealed personal safety device for women with a tiny tracking device which will fit into your regular jewellery.
- Tracking where someone is in real-time using GPS during emergencies.
- It can allow the quick notification of emergency situations to pre-registered contacts and also to the law enforcement around them.
- Less response time to emergencies is attributed to location data, which is both accurate and timely.
- Safe-guarding users' information through the authenticating and encrypting data over the internet using practices of Internet security.
- To provide an effective and easy solution for the personal safety of all women and children to feel safer.

LITERATURE REVIEW:

It has been seen that within the last few years, many researchers have given importance to the development of technology-based solutions to promote safety among women. Most of these studies have given importance to the increasing need to monitor systems. With an increase in urbanization, the importance of using GPS to promote safety among women has increased. Existing literature highlights mobile application-based safety solutions, which involve one pressing a panic button using their smartphone to send emergency notifications. The mobile application mainly relies on sharing the user's location using GPS and internet service providers. Existing literature has, however, highlighted various limitations of these mobile application-based safety solutions, especially when the victim is inaccessible due to fear, physical inability, or lack of network access. These mobile application-based safety solutions also highly depend on user interaction during emergencies. Additionally, other studies suggest that safety devices such as a smart band or a pendant that offers facilities such as GPS and communication modules can be made more effective. The aim of such devices is to provide quicker access to the user compared to mobile phones. Nevertheless, most such devices are easily distinguishable. This will alert the attacker and increase the chances of failure. It is observed that charging these devices is a major issue with regards to their batteries. Various researchers have presented different approaches in integrating GSM modules with GPS technology for locating the device and sending an alert message. Communication-based on GSM allows sending alerts even from places where internet connectivity is poor. Researchers point out that the integration of GPS with GSM increases the reliability of emergency communication. Most of the proposed systems focus on location tracking and alert generation, but data security and privacy issues are usually ignored. Cyber security has been recently recognized as an important feature for safety-related systems. It is presented in some research works that without implementing proper security mechanisms, location-based services are exposed to data leakage, unauthorized access, and misusing sensitive information. Some recommend encryption and authentication techniques for protecting information of interest, but in most of these systems, these are considered secondary features and

not the core of the system. There are a few research papers that have proposed IoT-based solutions that enhance the security of women. These solutions integrate various sensors, mobile applications, and cloud platforms. The IoT-based solutions offer various features such as the detection of threats as well as monitoring. Although the IoT-based solutions for enhancing the security of women are advanced and innovative, they are quite complex as well as costly. From the literature under review, it is evident that various solutions have been proposed to promote the safety of women. However, despite the existence of several applications that intend to promote the safety of women, each of the applications has its own disadvantages. With the mobile-based applications, the response is not immediate; with the wearable device method, the issue of visibility also exists; also, most applications have failed to address the cyber security problems. The proposed research is built upon the ideas of the prior works; furthermore, the proposed system will include a compact tracking device that is embedded into any type of jewellery. With this provision, the system will become invisible. An important feature of the proposed system is that unlike prior works, the system will also consider the idea of cyber security. Although response time is vital, protection of data is also equally important.

PROPOSED SYSTEM :

The proposed women's safety system aims to deliver a simple, quick, and discreet means to seek assistance during critical situations. Moreover, the system mainly-centre on a little safety chip intended to be embedded within daily wear jewellery like a ring, bracelet, pendant, or an anklet. This is crucial since jewellery can be worn at all times; consequently, the safety system will be hidden but readily accessible at all times. The safety chip itself has three main parts: a GPS module, a communication module of the GSM type, and a control unit. The GPS module is meant for continuous or demand-tracking of the user location. Upon the pressing of the emergency trigger, the actual geographical location of the user will be determined. Coordinates are specific data that supply exact location information.



Fig. 1. How chip add in jewellery's

The communication module is responsible for sending alerts to the concerned authorities who are pre-registered on the

system. The system is not dependent on the presence of the Internet, and the basic services of the network are sufficient to run the system. This way, the system is more secure compared to other applications that depend on the Internet. The information sent includes the present location of the user and the distress signal representing the need to immediately assist the user. With regard to the activation of the system, there is a simple triggering mechanism. This may be achieved, for instance, through the activation of a hidden button, which is embedded in jewellery. With this, the user will be in a position to send an alert without necessarily raising suspicions. Once activated, the control unit will then be able to process the request and send the data and later the alert within a few seconds.



Fig. 2. chip

Like this: Trigger Pressed → GPS Location Fetch → Alert Generation → Message Sent → Law Enforcement Response

Cyber security is an important component of the proposed system. Given the nature of the location information involved in the system, security features such as user authentication and data transmission are built into the system. This helps to reduce the chances of unauthorized access to information and misuse of personal information. Only selected contacts have the authorization to access the location information. The proposed system takes advantage of the simplicity and practicality aspects by avoiding intricate user interaction and continuous observation, which ensures the accessibility of the system for users belonging to any age group. With the integration of simple hardware design, communication, and cyber security, the system is expected to be an effective and viable solution for the safety of women.

Advantages and Limitations of the Proposed Women Safety System:

Table 1.

Aspect	Advantages	Limitations
Accessibility	Jewellery-based design makes the device easy to carry and always available	Very small size limits hardware expansion
Visibility	Hidden inside jewellery, so it does not attract attention	Difficult to visually inspect for damage
Response Time	Sends alerts and location quickly during emergencies	Delay possible in areas with weak network

Aspect	Advantages	Limitations
Ease of Use	Simple trigger mechanism, no complex interaction required	Accidental activation may occur if not designed carefully
Connectivity	Works with basic GSM network, not fully internet-dependent	Network availability affects performance
Data Security	Cyber security measures protect sensitive location data	Requires regular updates for strong security
User Coverage	Suitable for women, children, and elderly users	Needs proper user awareness for correct usage
Practicality	Can be used in real-life situations easily	Battery replacement or charging needed

CONCLUSION:

The issue of the safety of women is of utmost importance in the current society. The current safety measures employed in the environment have proved to be inadequate during critical situations. In the course of this study, the paper provided an intelligent and non-obtrusive women's safety concept that incorporates the use of GPS tracking coupled with cyber security. The model primarily relies on a mini safety chip that is easily carried around in the form of jewellery. The system also provides the facility of location tracking in real time, along with sending emergency alerts, which can communicate in an instant manner to the already registered individuals or nearby law enforcement agencies, thereby facilitating the situation by reducing the need for the use of mobile phones, thereby enhancing the chances of prompt response. The inclusion of cyber security facilities helps in ensuring the security of the location data being sent. Overall, the suggested system presents a realistic, dependable, and easy-to-use solution to promoting women's security. The proposed system promises to attain faster response times in emergency situations and improved feelings of security for women as well as kids. Indeed, this solution has the potential to be an effective step toward promoting individual security in current society.

FUTURE SCOPE:

The proposed system, though providing a reliable solution for safety, has potential to be improved and enhanced further. The system maintains that in the future, additional features, such as the detection of threats with the use of sensors and the ability to be voice-operated, could be included to provide an intelligent solution. The system could be integrated with a mobile application, which could provide the facility to store contacts and explore the history of alerts sent and received. Future versions of the system could be designed to utilize additional cyber security technologies, like biometrics and enhanced encryption algorithms, to provide additional security for the data of users. Integration of the system with technologies used in smart cities, for instance, could be helpful in ensuring better coordination between users and law enforcement agencies. advances in battery life could also

contribute to the longevity and usability of the device. As technology advances continuously, it is anticipated that this women's safety system can improve to an even greater degree and spread to cover more ground to create a safer future for women and children.

REFERENCES:

- [1] S. Sharma and R. Verma, "GPS based women safety system using mobile communication," *International Journal of Engineering Research and Technology (IJERT)*.
- [2] A. Kumar, P. Singh, and N. Gupta, "Smart wearable device for women safety using GPS and GSM," *International Journal of Computer Applications*.
- [3] M. Patel and S. Shah, "IoT based women safety system with real time location tracking," *International Journal of Advanced Research in Computer Science*.
- [4] R. Kaur and D. Kaur, "A survey on women safety devices and applications," *International Journal of Scientific Research in Computer Science*.
- [5] N. Jain and A. Mehta, "Cyber security challenges in location based services," *International Journal of Cyber Security and Digital Forensics*.
- [6] World Health Organization, "Violence against women: Global estimates and trends," WHO Press, Geneva, Switzerland, 2021. [Online]. Available: <https://www.who.int>.