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TECHNOLOGICAL SOLUTIONS FOR WOMEN'S SAFETY: A COMPARATIVE STUDY OF IOT DEVICES AND SOCIAL MEDIA

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Abstract

Nowadays, computer technology is an integral component of our daily life. As a result of technological advancements and the rise of social media, our way of living is changing. The rapid growth of technology is accompanied by an increase in crimes towards women. The competence of technology in assuring women's safety is uncertain. Women's security is hampered by a lack of mental presence, awareness, and technological understanding. Women's opportunities to own, manage, and govern industries particularly IT-based units, must be expanded. With the help of IOT we have some control over and access the devices and things which are associated with the internet even the distances are excessively lengthy. The community has accepted many IoT-based devices to assist women in dealing with potential safety risks. This research paper aims to compare and evaluate these two types of technologies to provide a comprehensive understanding of their capabilities and limitations. This paper will address the both thebeneficial and detrimental effects of technology on the lives of women.

Keywords: Information technology, Crimes againstwomen, Women safety, Cyber Security, Smart gadgets

I. Introduction

The safety of women in public spaces has become a pressing issue globally. Technological advancements have led to the development of various solutions designed to mitigate risks and empower women to feel more secure. Mobile applications and wearable devices have emerged as popular technological tools for enhancing women's safety. The research adopts a comparative study approach, examining a selection of mobile apps and wearable devices specifically designed for women's safety. The study evaluates these technologies based on several criteria, including usability, functionality, effectiveness in emergency situations, user feedback, and scalability. Both qualitative and quantitative data are collected through surveys, user interviews, and case studies to gain comprehensive insights.

For everyone in today's generation, safety is the most essential skill. Even if the economy is growing in our country, there are still a lot of crimes committed against women. In India, 86% of working women report difficulties that are more severe in Delhi, Mumbai, Hyderabad, Kolkata, Chennai, and Pune than in other cities. According to the most recent government statistics, one woman in India is physically abused every hour. However, because there is insufficient evidence, the criminal escapes punishment. The majority of these instances go unreported, unrecognized, andunrecorded. Although surveillance cameras might be somewhat helpful, it can be difficult to find the perpetrator when an incident occurs in a remote area. Modern technology like GSM, IoT-based applications, tracking systems, support women, making them safer.

The review is conducted by meticulously going over and synthesizing the research publications that were published in reputable research venues between 2016 and 2022. According to the findings, pressure and pulse-rate sensors are the most frequently developed sensors in these devices to record the state of women who are dealing with safety-related difficulties. Furthermore, the devices employed a variety of technologies to communicate the notifications, including Raspberry Pi, GSM, and the global positioning system (GPS). It is a free servicethat is available to everyone to use the GPS system to obtain location information that includes landmarks like scope,longitude, and height values as well as timestamp information and other information. In addition, a number of machines learning

methods, including decision trees, hidden Markov models, and logistic regression, are utilized to detect prospective targets among women and aid in averting dangerous situations for them in advance. The need for systems emphasizing auto-activation of alert production with less human input and greater accuracy was noted despite the development of important research in the underlying topic. These systems must be developed in order to effectively address the issue. In addition to reviewing the research, this study provides a taxonomy posing numerous techniques, features, wearables, and sensors used in IoT-based women safety goods.

II. Literature

A smart watch called the "SAVVY BAND" was created by Gaonkar and Megashree in 2017 [1] for women to track their movement in emergency scenarios. The temperature of the body along with vibrations from the hand and body are monitored by this device. The sensor detects the overall amount of UV radiation from the sun, as well as the total amount of sun-controlled UV rays that are transmitted and dispersed in the air. The gadget notifies the nearby police station of the location of the victim in need and requests that they take urgent action.

A wristwatch and a locket camera with features like geofencing and a camera in the locket that can take an imageof the attacker when the SoS button is hit were proposed by Vahini & Vijaykumar in 2017[2]. They presented a technique in which the woman would tap a button for two seconds, and all of her saved emergency contacts would receive a notification and a picture of the intruder.

Some of the most useful applications discussed are Safetipin, Nirbhaya, Go Safely, Pukar, Raksha and Smart Watches. She has raised concerns about Cyber-crimes such as Impersonation, Harassment, Malicious Distribution,Anonymous Sharing, Video Streaming. The paper emphasizes the challenging factors for women's security such as awareness and knowledge of technology. However, the paper does not provide specific solutions or strategies for addressing the negative effects of internet technology onwomen's safety.

Table 1: State-wise Cyber stalking Cases (Sec 354D IPC)

State	No. of Cases
Maharashtra	301
Andhra Pradesh	48
Haryana	27
Telangana	26
Madhya Pradesh	25
Total India	542

A software program called "Helping Hands" was proposed by Pande et al., 2018 [4], which assists the victim in danger by informing the registered contacts of the user's position. It has a variety of functions, and the panic button alerts the added contacts to impending danger via instantmessage.

K Ravikiran and Y Shravani developed a device which had a pulse sensor and a panic button [5]. When the panic button is pressed or the pulse sensor detects an abrupt changein heart rate, the device connects to the internet, captures a picture of the offender, and distributes it to the family members' mobile phones. This device additionally offers an alert sound that the people in the area may hear by means of a buzzer.

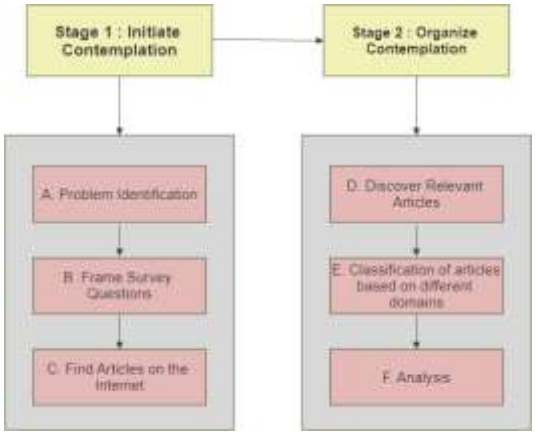
In order to ensure the safety of women, Nandita Viswanath [6] had created and implemented smart foot devices. It was shown that a safety device named Light Blue Bean, an Arduino Bluetooth microcontroller that can be enabled by touching one foot on another four times, functions as expected. When a tap is detected, the safety device is connected to the smartphone via Bluetooth, thetriaxial acceleration sensor measures the acceleration of the tap with three perpendicular axes, and a notification is sent via Bluetooth to the user's pre-saved contacts in the mobile device.

In this work, a system was developed that detects mobile applications that leak sensitive data [7] and also analyses applications downloaded from the Google Play Store with respect to data leakage. Malicious programs were found and the most informative details were obtained using the J48

classification method. Features connected to data leaks-voting, assessing mobilemalware from the standpoint of data leaking. Internet and social media addiction, a lack of securitymeasures are all contributing factors to the daily rise in cybercrime. The majority of mobile apps set up a trap for users to gather private data from women, which results in big cybercrime incidents like harassment, impersonation, hacking. Government and police agencies now offer a variety of free mobile applications for women's protection as a resultof advancements in ICT and the internet

III. Methodology

The techniques used to survey and evaluate the literatureare described in this section. Fig. The procedures taken for the technique chosen, which consists of the two stages of initiating and



organizing contemplation, are shown below.

A. Problem Identification

In today's environment, women's safety could be seen as anissue that is highly contentious. Certainly, technology has done a great deal to protect the ladies from these sorts of dangerous situations. Mobile applications and innovative hardware- software integrated devices are solutions put forth by software engineers. I combined the several IoT safety scopes that are now accessible for women.

B. Frame Survey Questions

A relevant inquiry into one particular issue or concern is known as a research question. After considering several requirements, I made the decision to focus on a few key criteria, such as

- A person's capacity to utilize or operate the application/gadget, in an unsafe situation.
- Victim has the literacy necessary to operate the software orgadget.

C. Find Articles on the Internet

The finer details of our survey protocol are presented inthis subsection. Some online resources that impartially aided inthe primary research study include:

- Research Gate
- IEEE Xplore
- Sci Hub
- Google Scholar

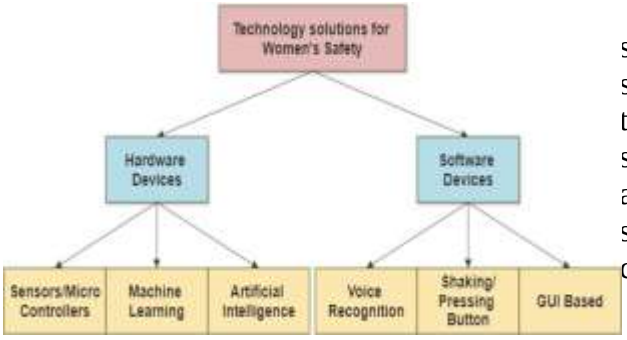
D. Discover Relevant Articles

By combining a variety of descriptors, I analyzed an aspect of the crucial research. By expanding the keywords with possible identical phrases, the accompanying research topicwas created. When looking for pertinent content, keywordslike:

- Women’s safety

- Women's safety with IoT
- Applications used for Women's safety

E. Classification of articles based on different domains



First, two categories are used to categorize the IoT suggestions to address challenges linked to women's security, as shown in figure. For the suggested survey to be effective, I studied the research on women's safety based on efficient usage of gadgets and mobile applications. Both categories provide effective solutions for women's safety, and in certain circumstances, they complement one another.

The majority Smart Hardware devices offer security through internal hardware and software configurations. The programming of microcontrollers like Arduino and Raspberry Pi, together with temperature sensors, is the method adopted in the majority of hardware devices to assist women in unsafe circumstances. Machine learning algorithms may be used to create yet another form of smart gadgets. These items have the ability to detect adverse situations and deliver electric shocks or send alert messages to the victims' families and friends. A women's abnormal bodily variable values might alert her enlisted contacts or the local police station if she is in difficulty. The second category of women's safety has emerged around developed mobile applications. These portable programs could come in the form of speech recognition software. This sort of program may transform the victim's audio message into text and send it to each of her listed phone numbers. Similarly, certain programs may be opened by shaking the phone a predetermined number of times or pushing the volume up or power button for a short period of time.

F. Analysis

The outcomes and findings of the review are discussed and analyzed in this part. Based on an examination of the data, a taxonomy of IoT-based women's safety devices is proposed, the shortcomings and difficulties of current devices are brought to light, and implications for the underlying domain's future directions are given. There are four key attributes in the suggested taxonomy.

1. Wearables

When considering purchasing a women safety wearable, it's essential to research different options, considering factors such as usability, features, reliability, and customer reviews to choose the device that best suits individual needs. These wearable devices come in various forms, such as smart jewelry, bracelets, pendants, or even clothing accessories, and are equipped with functionalities to provide immediate assistance, alert authorities or contacts, and act as a deterrent against potential threats. Wearable devices for women's safety connect via Bluetooth or Wi-Fi to other devices such as smartphones. These devices feature a loud siren or alert sound that can be activated with a simple button press. Manufacturers strive to optimize battery performance to ensure that the devices are reliable and do not require frequent charging.

2. Sensors

A sensor is a device that determines or locates a physical characteristic that reacts to the particular devices. There are numerous different kinds of sensors that are employed to measure a variety of variables; some of the sensors are identified using various physiological sensors, including: MEM sensor, temperature sensor, flex sensor, pulse rate sensor.

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Sensors	Operations
Acceleration sensor	It detects whether there is motion or not, and if any axis' acceleration rises over a certain threshold, the system is turned on.
Temperature sensor	It's essential to continuously check the body temperature of people. Temperature sensors like the LM35 series are employed for women's safety.
Pulse-rate sensor	It is a micro-chip that keeps track of pulse rate. Average pulse rates range from 90 to 100; if they rise, the mechanism is activated.
Tilt sensor	To determine a body's orientation, tilt sensors are adopted. Every 20 milliseconds, the body's orientation is determined for women's safety.
Flex sensor	Flex sensor is a tiny instrument that is applied to clothing like an adhesive. It determines how much pressure is applied to women's hands.

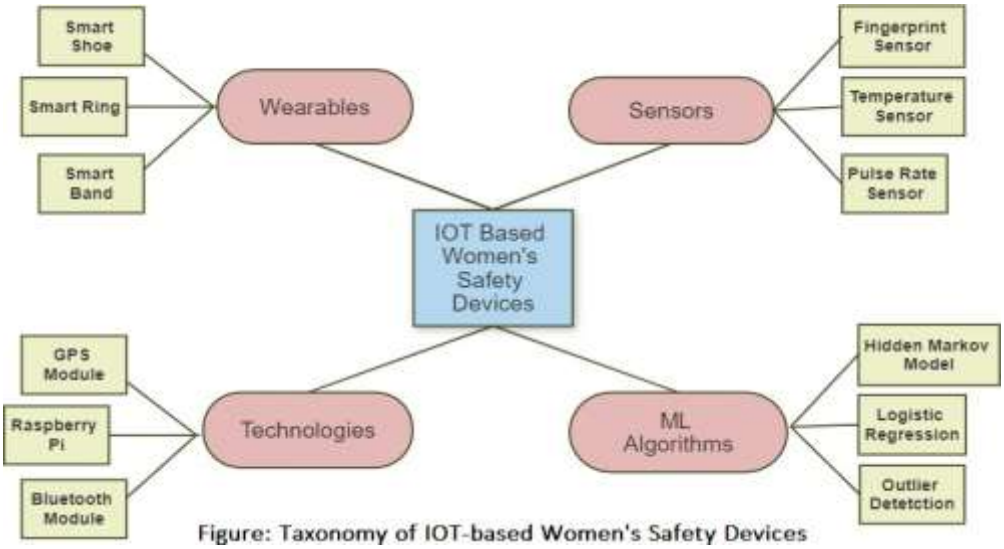

Figure: Taxonomy of IOT-based Women's Safety Devices

3. ML Algorithms

In order anticipate a threat, women's safety equipment uses logistic regression. Predictions vary from -∞ to +∞ when pulse rate and body temperature are used as independent variables. A smart bracelet gathers data from sensors and uses a logistic regression model to determine whether the lady is in danger. The logistic regression modelis fed a sizable training and test dataset in order to make a prediction. The sensors are regularly checked throughout analysis. The disadvantage in this is that the values must be based on real-time data otherwise the prediction may be inaccurate.

The Hidden Markov Model offers superior prediction anda powerful sense of any suspect behavior. It offers facial recognition analysis and conversation classification in relation to women's safety. The equipment has a 94.7% accuracy rate. In the event of an aftershock, the device will only be active. The model uses IoT and HMM to identify the victim woman's voice in order to gather values. The use of speech recognition as an HMM solution works well. However, in the worst-case scenario, if the perpetrator isaware of the gadget and covers the victim's lips, it may notbe able to defend the woman.

For the purpose of outlier detection, women's safety systems incorporate pressure and temperature sensors. A riskis identified as soon as any sensor picks up on an irregularity of any type. Similarly, when a person unexpectedly approaches the lady and the temperature in her immediate vicinity rises, the temperature sensor activates, indicating the presence of danger. The restriction for outlier detection would be that temperature increases can occur for a varietyof causes, including health problems.

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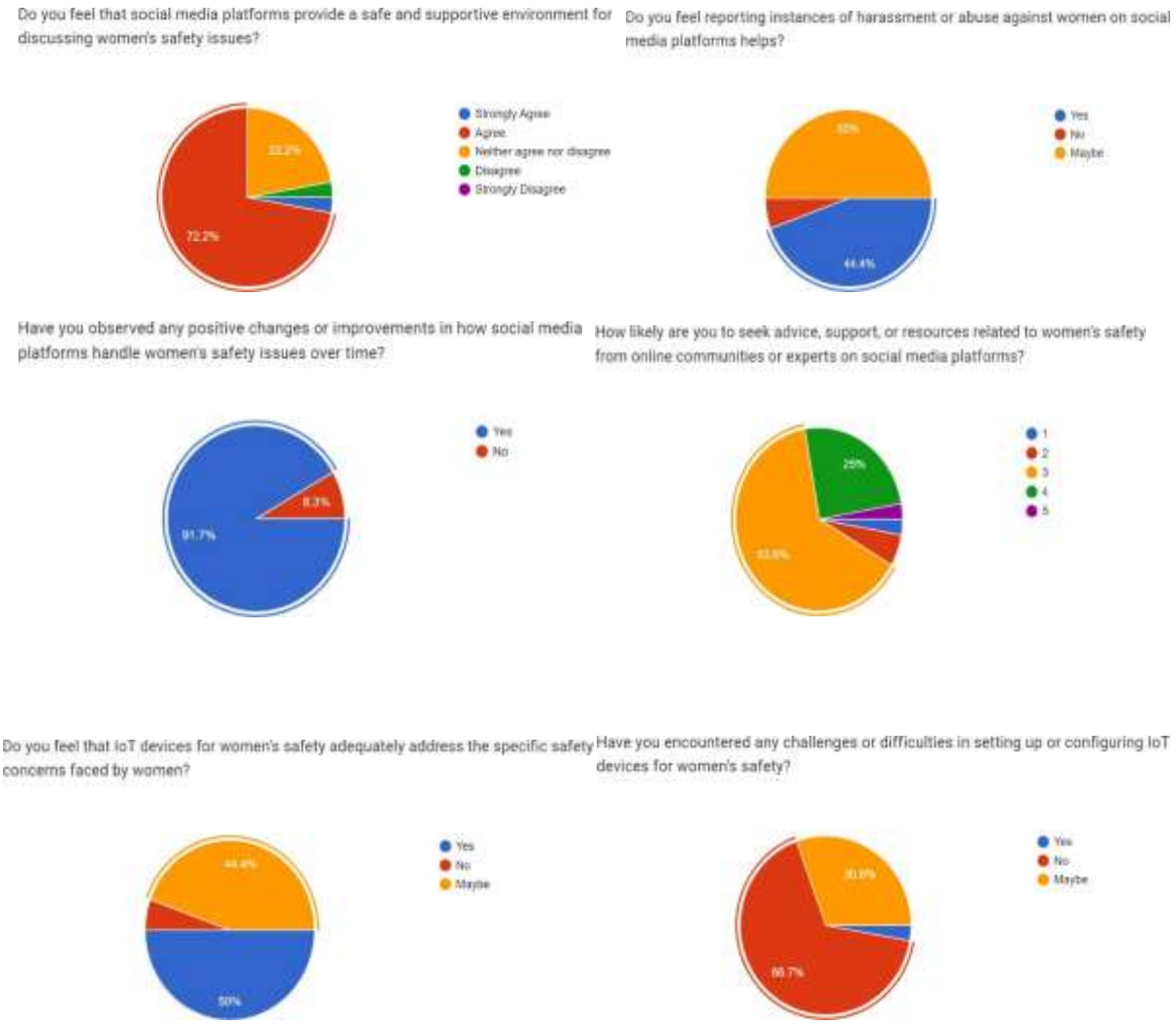
4. Technologies

GPS modules are commonly integrated into women's safety devices, such as wearable devices, mobile applications. These devices leverage the GPS functionality toprovide accurate location tracking and facilitate emergency response. By using GPS modules, women can alert authorities or trusted contacts of their exact location in case of emergencies or dangerous situations. In case of an emergency, such as an assault or abduction, a person can activate a panic button or trigger an alert on their safety device. The GPS module then provides the exact location coordinates to emergency services, enabling them to respond promptly and accurately.

Raspberry Pi can be used to set up surveillance systems for women's safety. By connecting a camera module to the Raspberry Pi, users can create a video monitoring system thatcan help deter potential threats and provide evidence in case of incidents. Raspberry Pi offers various software options for video capture, storage, and remote access. It can beincorporated into wearable devices or panic buttons to enhance women's safety. The Raspberry Pi can be programmed to respond to button presses or other triggersand initiate emergency alerts or actions, such as sendingdistress signals with location information.

IV. Results



V. Conclusion

We all depend on the Internet in our daily lives. Women's Security is a major concern. It is incredibly challenging to preserve our personal information in the modern world because of social media and technological improvements. Due to a lack of ICT security knowledge, addiction to the social media, and a lack of security measures, cybercrime incidents are rising daily. Most mobile apps set up a trap for users to gather private data from women, which results in big cybercrime incidents including harassment, impersonation, and hacking.

Government and police agencies now provide a variety of free mobile applications for women's protection. Modern technology like GSM, IoT-based apps, tracking systems, and smart watches may support and care for women, making them safer and enabling them to work even late into the night and go anywhere without any issue. By identifying distinct hazard locations using information collected from the database, this technology also aids in the planning of better security and, ideally, significantly lowers crime against women. This study demonstrates the numerous elements that have been included into applications and smart gadgets created for women's safety. The different methods that have been employed so far to protect women against fraudulent activity are discussed in this study.

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