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SECURITY ASPECT OF IOT BASED WEARABLE DEVICE FOR WOMEN SAFETY

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Abstract: The Internet of Things (IoT) has revolutionized the way we live, work and communicates, with wearable devices being a prime example. Wearable devices, particularly those designed for women's safety, have gained popularity due to their ability to provide instant help during emergencies. However, these devices face several security challenges that need to be addressed to ensure the safety of their users. One of the primary security challenges faced by IoT-based wearable devices is the risk of unauthorized access to sensitive user data. Wearable devices collect a vast amount of personal information, including location, health data, and other personal identifiers, which, if compromised, could lead to serious privacy violations. Another critical security challenge is the risk of device hacking, which could lead to remote control of the device, data theft, and even physical harm to the user. Wearable devices that lack robust security mechanisms are vulnerable to malicious attacks, making it imperative to incorporate strong security protocols in their design. Moreover , the security of IoT-based wearable devices for women's safety should be a top priority in their design, development, and implementation. These devices must have robust security mechanisms to safeguard user data and prevent unauthorized access and hacking. Additionally, user awareness and education on safe device usage practices are crucial to ensure the security and privacy of their personal information.

Keywords: Wearable devices, Women safety, Mobile APP, IoT, security.

1. Introduction:, IoT-based wearable devices for women's safety face other security threats, such as denial-of-service attacks, data breaches, and the potential for the data to be intercepted during transmission. Denial-of-service attacks can be particularly dangerous, as they can prevent the device from functioning properly during an emergency. Data breaches can occur due to vulnerabilities in the device's software or when the device is connected to an unsecured

network, leading to the theft of sensitive user data. Moreover, since wearable devices rely on wireless communication technologies, they are susceptible to interception of data during transmission. This can result in the unauthorized access or modification of sensitive data, including location and health information, compromising user safety and privacy.To mitigate these security risks, IoT-based wearable devices must be designed with security in mind from the outset. Security measures such as, authentication, and IoT based SMS alert control mechanisms should be implemented to safeguard user as well as data and prevent unauthorized access. Additionally, regular security updates and patches must be provided to address any new security threats that may arise. Finally, user education is essential to ensure that users understand the security risks associated with these devices and take necessary precautions to protect their personal information. This includes regularly changing passwords, avoiding connecting to unsecured networks, and keeping the device's software up-to-date. In addition , while IoT-based wearable devices have the potential to enhance women's safety, their security must be addressed to ensure their safe and effective use. Proper security measures and user education are critical to mitigate the risks associated with these devices and protect the privacy and safety of their users.

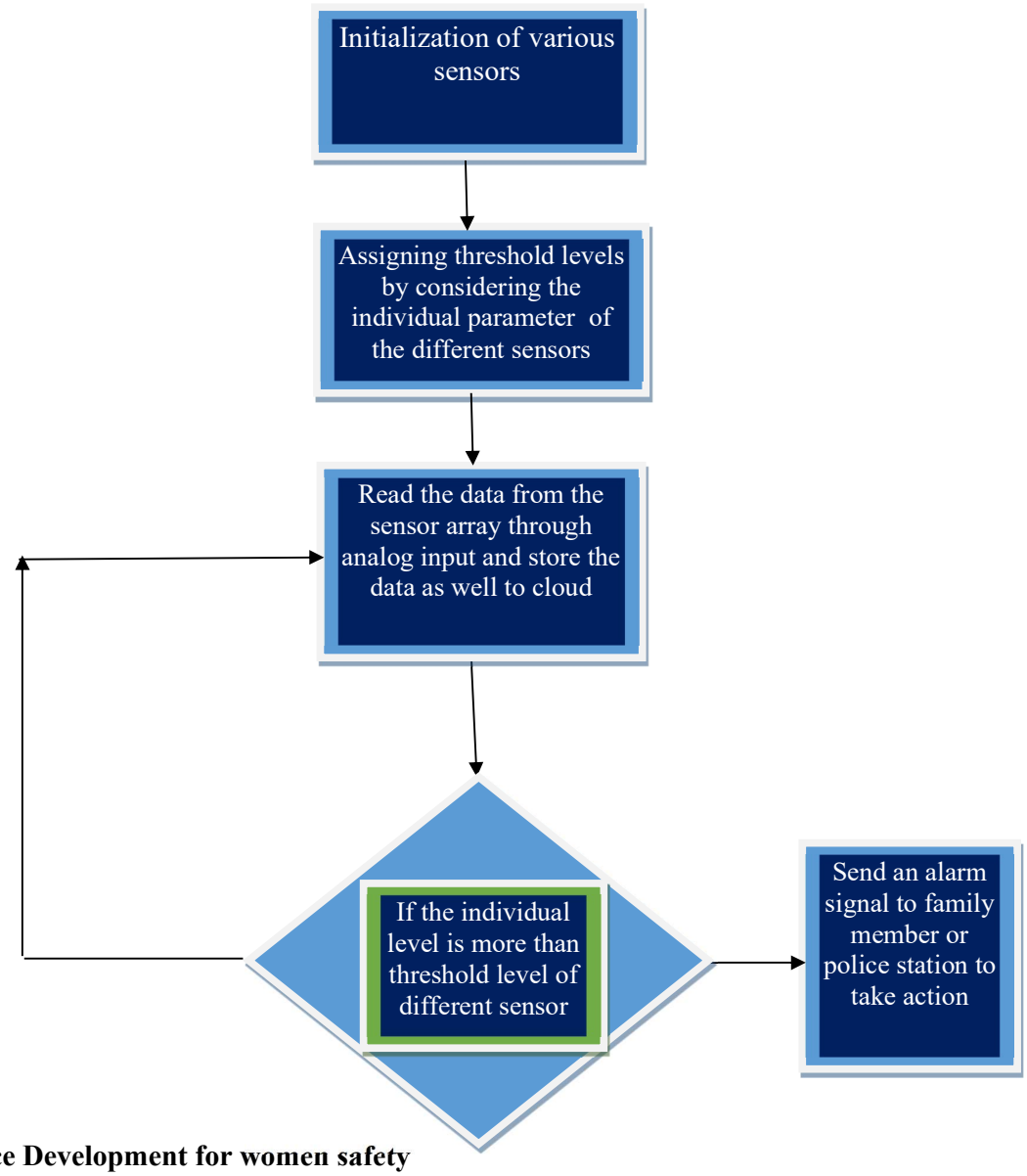
2. Design methodology of the wearable device system:

When designing an IoT-based wearable device for women's safety, it is important to follow a structured design methodology to ensure that the device meets the desired requirements and is secure and reliable. The following is an overview of a typical design methodology:: The first step is to identify the user requirements and the intended use case. This includes defining the functionality of the device, the sensors and features required, and the user interface. Once the user requirements have been identified, the system architecture can be developed. This includes defining the hardware and software components, the communication protocols, and the integration with other systems. With the system architecture in place, a prototype of the device can be developed. This involves designing the physical hardware and selecting the necessary components, such as sensors, batteries, and communication modules. The software for the device must be designed and developed, including the firmware for the device's microcontroller, the user interface, and any backend systems required for data processing and storage. As mentioned earlier, security and privacy are critical aspects of an IoT-based wearable device for women's safety. Designers must incorporate security measures such as encryption, authentication, and access control mechanisms. Moreover , the design methodology for an IoT-based wearable device for women's safety must be comprehensive and structured to ensure that the device meets the desired functionality, reliability, and security requirements. A well-designed device will provide users with a safe and effective tool to enhance their safety and security.

3. System architecture of wearable device

IoT-based wearable devices for women's safety must follow a structured design methodology that incorporates user requirements, system architecture, prototyping, software development, security and privacy considerations, testing and validation and continuous improvement. The flow chart of the propose model is shown below.

Flow chart



4. Device Development for women safety

Developing a wearable device for women's safety requires a multidisciplinary approach that incorporates user requirements, sensor technologies, wireless communication, battery life, user interface design, security, integration with backend systems.

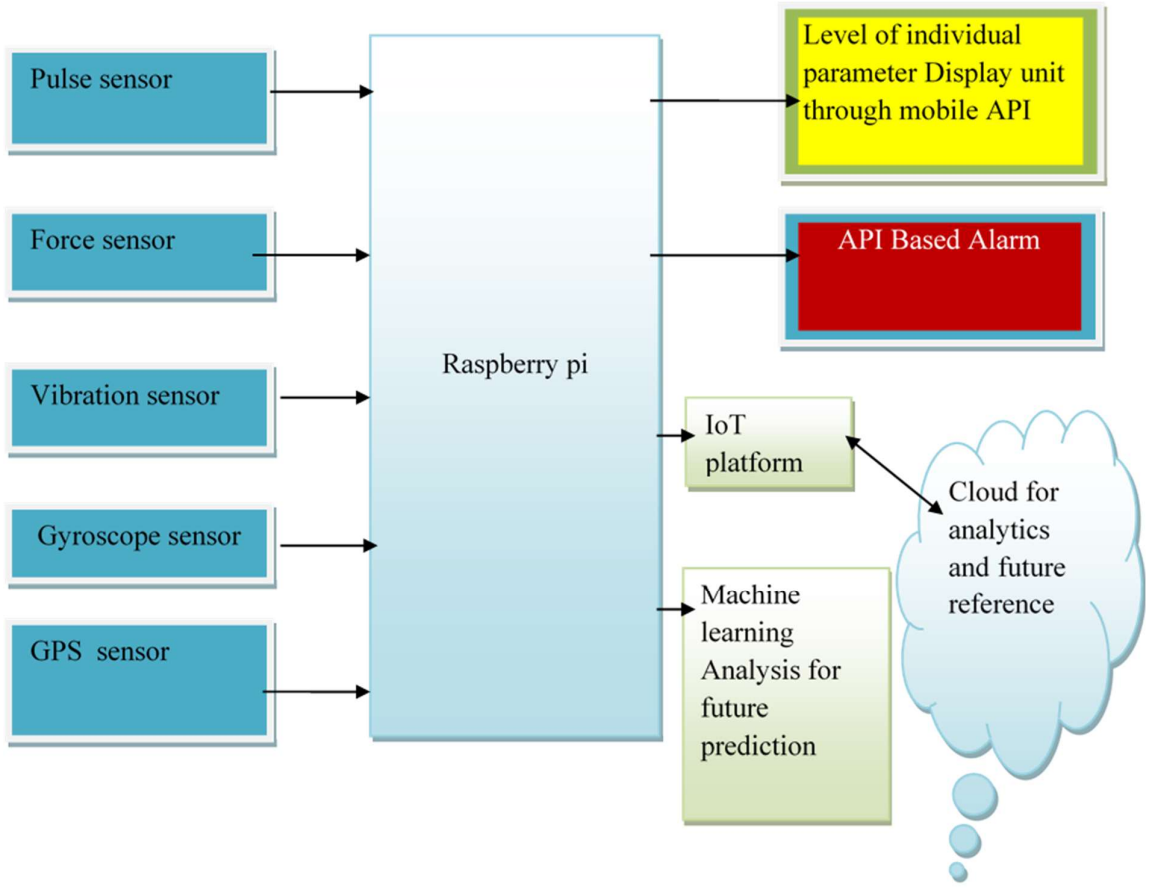


Fig 2 the block diagram of the wearable device

The **pulse sensor** typically consists of an infrared LED and a photo detector that is placed on the skin. When the infrared light from the LED is absorbed by the blood vessels in the skin, the photo detector measures the changes in light intensity caused by the pulsing of the blood vessels. These changes in light intensity are then converted into a digital signal by the sensor's circuitry, which can be processed and displayed on a screen or transmitted wirelessly to a smart phone**.**

Force sensor or piezoelectric sensors, on the other hand, generate an electrical charge when they are compressed or deformed. Force sensors is used to detect a sudden increase in force, such as during an assault or struggle, which could trigger an alarm or emergency alert. Force sensors can also be used to measure the force applied during self-defense techniques

Vibration sensor that detects vibration or mechanical shock. It is commonly used in wearable devices to measure physical activity and detect motion. Vibration sensors will be used to track movements in self-defense techniques.

Gyroscope sensor is a type of sensor that measures angular rotation and orientation. In wearable devices for women's safety, gyroscope sensors can be used to detect sudden movements or changes in orientation, such as during a struggle or assault, triggering an alarm or emergency alert.

GPS is a type of sensor that uses satellite signals to determine location and provide geo_location data. It is commonly used in wearable devices to track movements and provide

location-based services. In wearable devices for women's safety, GPS sensors can be used to track the location of the user and provide real-time location data in case of an emergency or distress signal.

5. Discussion and Implementation:

IoT-based wearable devices for women's safety must follow a structured design methodology that incorporates user requirements, system architecture, prototyping, software development, security and privacy considerations, testing and validation, production, and continuous improvement .All the sensors are interface with Raspberry Pi to collect individually different parameter from different sensor. At any case of an assault or struggle or self defense if any sensor (pulse sensor, Force sensor, Vibration sensor and Gyroscope sensor) activate i.e. the level of individuals parameter is more than the threshold value then SMS alert will send to concerned family member or police personnel, through web application using IoT technology. Along with API based alarm will start.

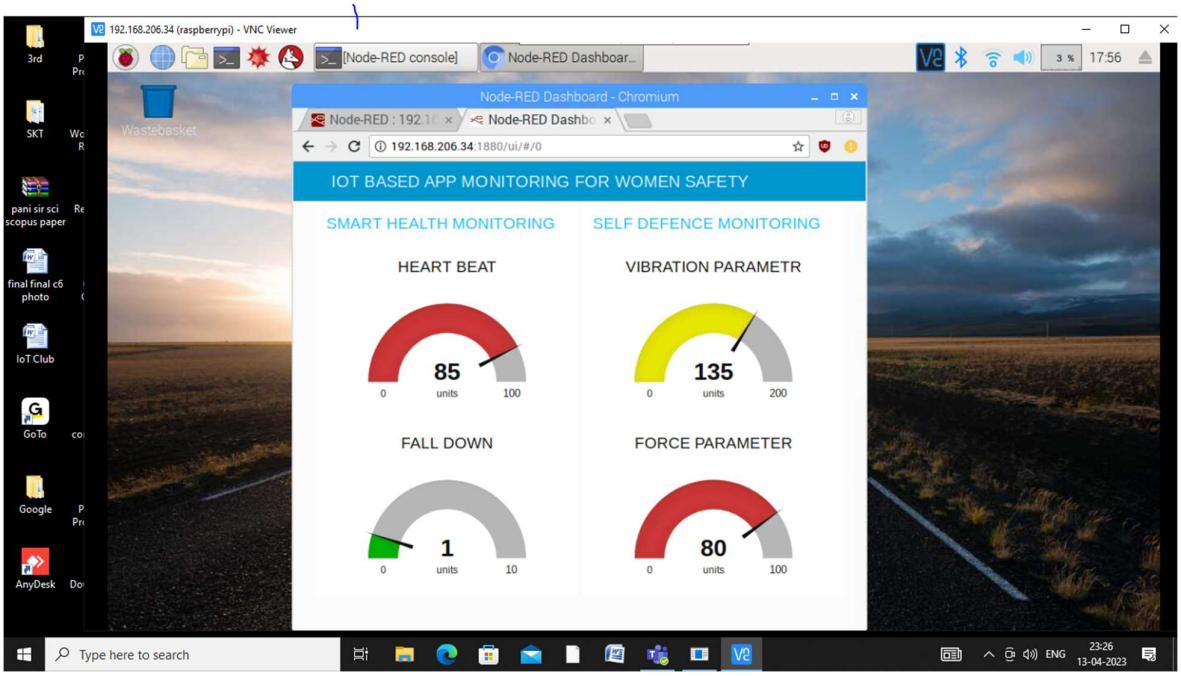


Fig 3 The mobile application of the wearable device.

Through this APP we can monitor the health condition of the women mostly when she is outside ,green level indicator indication that she is not fall down at any time of force fully attack or during an assault or struggle, but the red signal of heart beat sensor or force sensor indicates that she is in problem so an auto alert start through IoT based to the police personnel as well as the family member. Through the GPS sensor the exact location we can find out for the safety purpose of the women. All the sensor and raspberry pi module shown in fig. 4

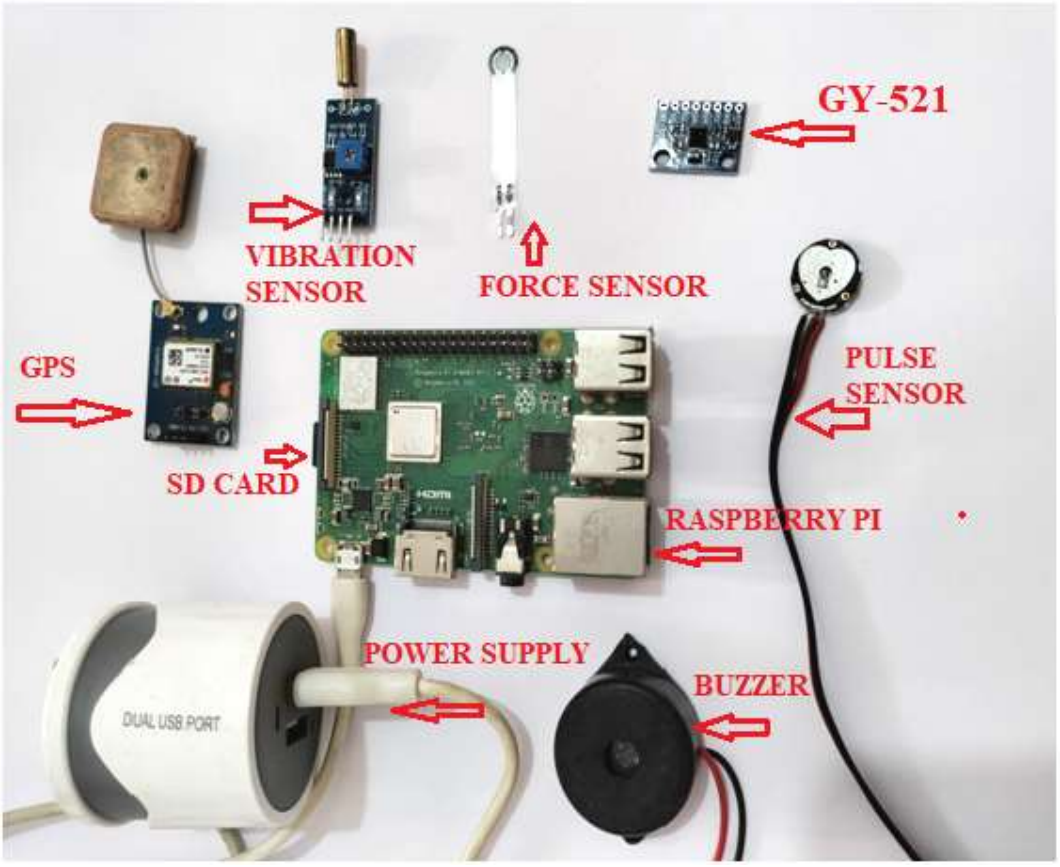


Fig 4 The component module and raspberry of the wearable device.

6. Conclusion:

IoT-based wearable devices for women's safety have the potential to enhance the safety and security of women, especially in emergency situations. However, these prototype devices which will be addressed to ensure their safe and effective use. Moreover, it is essential to educate users on the security risks associated with this devices and how to take necessary precautions to protect their personal information. Security measures, regular updates, and patches, and user awareness are critical to mitigating the security risks associated with these devices and protecting the privacy and safety of their users. Moreover , with proper design and implementation, IoT-based wearable devices for women's safety will provide a valuable tool to enhance the safety and security of women, promoting their empowerment and contributing to a more secure and equitable society.

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