SAFESTRIDES: IoT POWERED SAFETY SYSTEM FOR WOMEN

*Note: Sub-titles are not captured in Xplore and should not be used

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I ABSTRACT:

This explores the impact of appropriate footwear on women's empowerment, specifically focusing on safety aspects. With an increasing emphasis on women's rights and well-being, understanding the role of footwear in enhancing safety becomes paramount. The research investigates the correlation between the choice of footwear and women's confidence, mobility, and overall empowerment. Through surveys, interviews, and observational analyses, the study attempts to pinpoint trends and inclinations in women's footwear selections and their perceived impact on personal safety. Additionally, the research delves into the influence of socio-cultural factors and industry practices on the availability and design of safety-oriented footwear for women. The findings of this study contribute valuable insights for the development of footwear that not only aligns with fashion trends but also fosters a sense of security and empowerment for women in various environments. Ultimately, this research underscores the importance of incorporating safety considerations into footwear design, thereby supporting women's daily experiences to be powerful and uplifting lives.

Keywords:

I INTRODUCTION:

An entire integrated platform in the form of GuardHer and GuardianStep has been developed to serve as a safety system that provides women with pre-cautionary measures. GuardHer and GuardianStep is a combination of software and hardware specifically for Women safety. GuardHer, which is a companion app, allows the user to get registered and create a secure wallet that contains a photo and other key information within passkey protection. This can then be synchronized with the control panel to be ex-ported to the GuardianStep footwear platform. On the other hand, GuardianStep consists of a pair of shoes with the creative feature of force sensors connected to a Microcontroller unit. The installed force sensors in the footwear works based on the certain threshold value that are activated upon its exceeding. It eventually results in the transmission of the current location to the control panel and to the parental mobile numbers. Moreover, a brief vibration motor response signals legitimate alert to the user. False alarms can also be controlled disgracefully if the users do not deactivate the vibration motor via the application after entering their access-key. A circumstance whereby a user does not deactivate after a certain period the user profile is automatically transmitted to the control panel and the nearest police stations for almost immediate remedies. In merging gender equality, women empowerment, and smart mobility, the "GUARDHER" and "GUARDIANSTEP" product offer a holistic solution. By providing women with a secure platform and integrating safety features into their footwear, it not only promotes their autonomy but also ensures their safety in mobility, fostering a society where women can move freely with confidence and empowerment.

II BLOCK DIAGRAM:

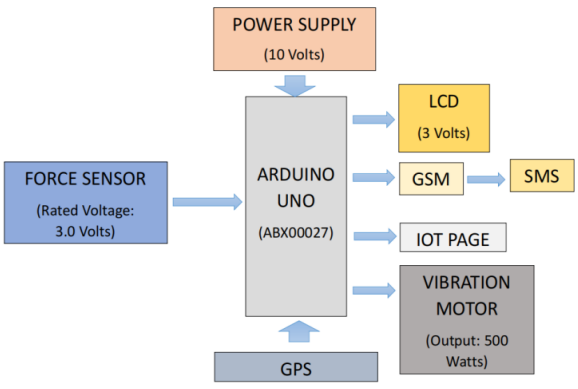

Fig 2.1 Conventional Block Diagram

III BLOCK DIAGRAM OF SOFTWARE:

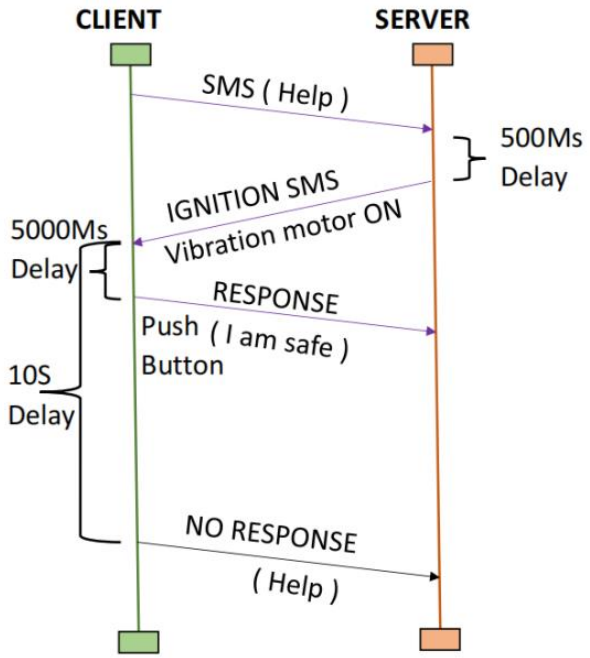

Fig 3.1 Proposed Block Diagram of Software Block

BLOCK DIAGRAM OF SOFTWARE DESCRIPTION

The diagram represents the interaction between a client (user) and a server (GUARD HER application) in a women safety system. Initially, the client sends a help SMS to the server, which processes the request with a 500ms delay. The server then responds by sending an "IGNITION SMS" back to the client, triggering the vibration motor on the client's device to alert the user. The client has a 5-second window to respond by pushing a button indicating their safety, which sends a "I am safe" message back to the server. The server waits for up to 10 seconds for this response. If no response is received within this time frame, the server interprets this as the user being in potential danger and continues the help request. This sequence ensures a prompt and automated response to a help request while providing the user with an opportunity to indicate safety if the situation is resolved.

IV SIMULATION CIRCUITS AND RESULTS:

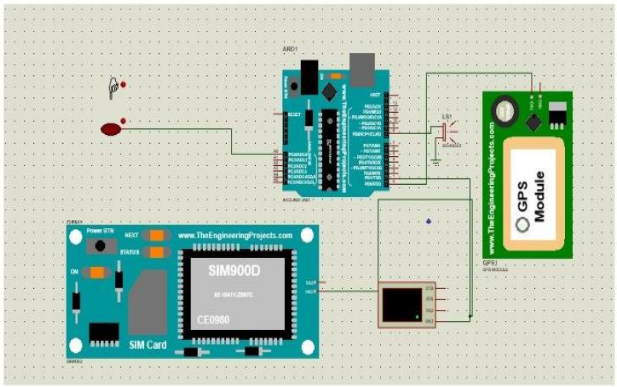

Fig 4.1 Simulation circuit

In the simulation circuit Fig 4.1, a comprehensive setup comprising a microcontroller, pressure sensor, GPS module, GSM module, and virtual module is illustrated. The pressure sensor interfaces with the microcontroller's analog side, while a buzzer connects to a digital pin. Upon applying pressure to the pressure sensor, the microcontroller analyzes the signal's magnitude against a predefined threshold.

4.2 SIMULATION OUTPUT

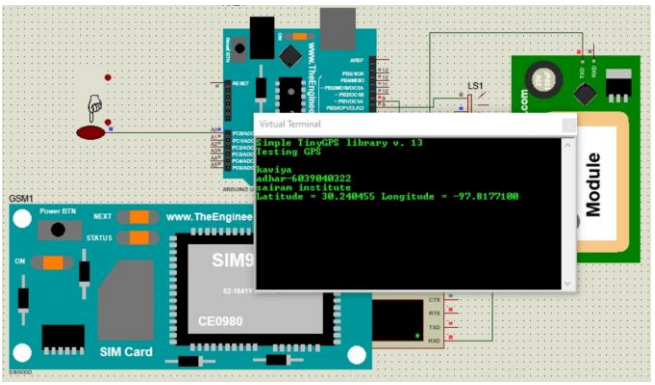

Fig 4.2 Simulated wave form of PV panel (current and voltage)

SIMULATION OUTPUT DESCRIPTION

In the Fig 4.2 of Simulation circuit output after receiving the distress signal, our system swiftly evaluates the data, ensuring it surpasses the predetermined threshold value. Upon confirmation, if the threshold value exceeded then the buzzer is triggered and details of the user will be sent to the control room/admin page. Simultaneously, the microcontroller initiates data transmission, sending the user's latitude and longitude coordinates via the GSM module to the control room. Leveraging this data with Google Maps integration, we can accurately pinpoint the user's current location, facilitating rapid response and assistance in critical situations.

V SOTWARE AND RESULTS:

5.1 USER LOGIN PAGE

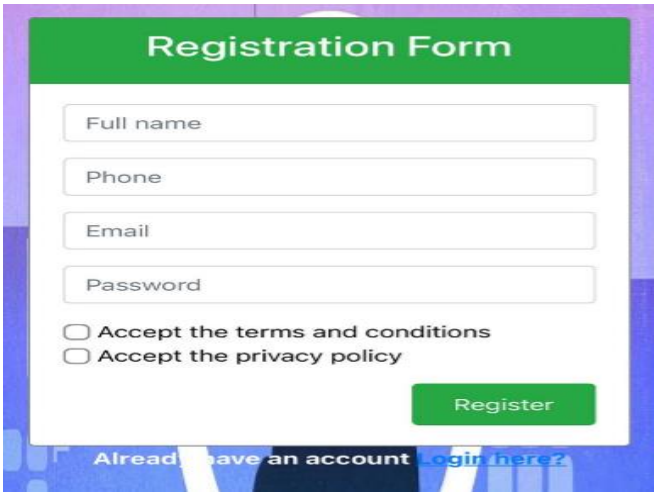

Fig 5.1 User login page

As shown in Fig 5.1, the user has to register with their personal details then login with the same mail id and password. All the details in the registration form is mandatory and the user can't skip any of the required information.

5.2 USER WEBPAGE

S.No	Pressure	Safety status	Latitude	Longitude	Reading time
1	4	No problem	13.141216690041775	79.9982681818026	26-04-2024 02:45:25pm
2	4	No problem	13.141216690041775	79.9982681818026	26-04-2024 02:45:21pm
3	4	No problem	13.141216690041775	79.9982681818026	26-04-2024 02:45:17pm
4	4	No problem	13.141216690041775	79.9982681818026	26-04-2024 02:45:15pm

Fig 5.2 Location and pressure value

Current location and pressure value of the user as shown in Fig 5.2 will be updated for every 5 seconds in the web page. This helps the parent/guardian to enter into the webpage and track the location of the user. If the threshold value of 300 is reached, the safety status will be turned into "I need Help", otherwise it shows as "No problem" which assures the parents/guardians that the user is safe. So, this web page gives the detail about the user location and pressure value accurately which will be updated for every consecutive time period corresponds to the date of activity.

5.3 WALLET – PROFILE OF THE USER

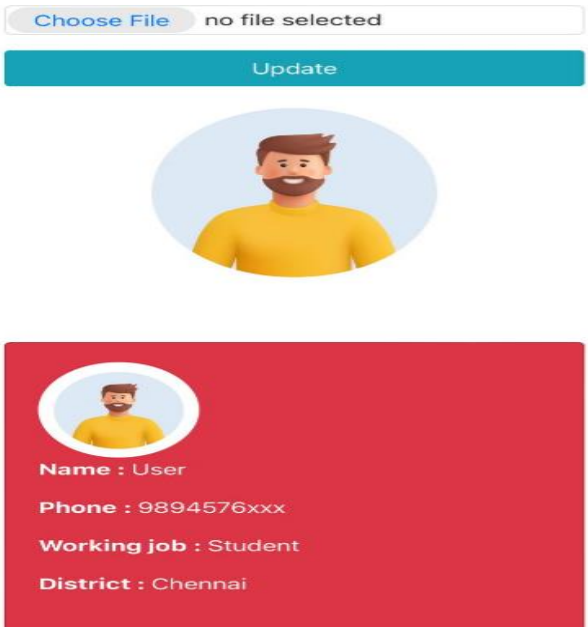

Fig 5.3 Personal profile of the user

As shown in Fig 5.3, users create a digital wallet by filling in details such as their photo, name, phone number, occupation, and district. This information forms a profile that is stored on the user's web page within her wallet. Access to the wallet is secured by a password created by the user. In an emergency situation, when a pressure value exceeds a predetermined threshold, the user's personal profile is automatically sent to the admin page or control room for immediate assistance.

5.4 ADMIN LOGIN PAGE

Fig 5.4 Admin login page

There is a separate web page where the admin can login using their given mail id and password as shown in Fig 5.4. Here admin page access will be given to the control room where they can view the emergency profiles from the different users.

5.5 CONCEPT OF DELAY TIME

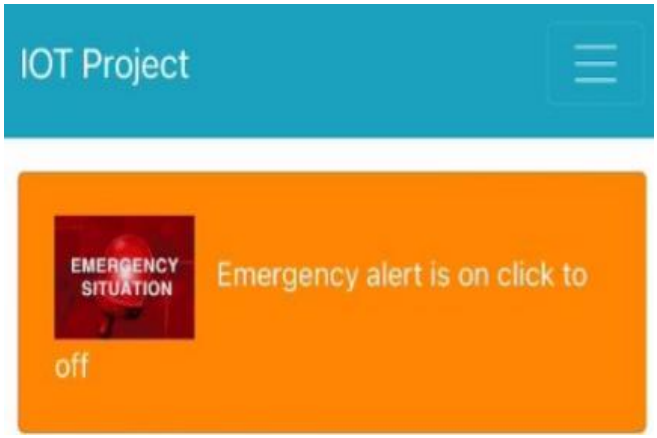

Fig 5.5 Delay time – Turn Off button

If the user unknowingly activates the pressure sensor, she can turn it off by entering her wallet password and then click the "Emergency alert button" to off condition as shown in Fig 5.5 within a delay time of 45seconds. If its turned off then it indicates in the control panel/admin page that the user is safe during the particular time interval.

5.6 OVERVIEW OF EMERGENCY PROFILES

Fig 5.6 Overview of Emergency profiles

Once the user gives a pressure that exceeds the actual threshold value, then the personal profile in her wallet will be sent to the control room. It can we viewed in the admin web page under the emergency messages column. Additional to the user profile, her current location with the activation time and date will be sent to the admin web page as shown in Fig 6.1.

VI HARDWARE AND RESULTS

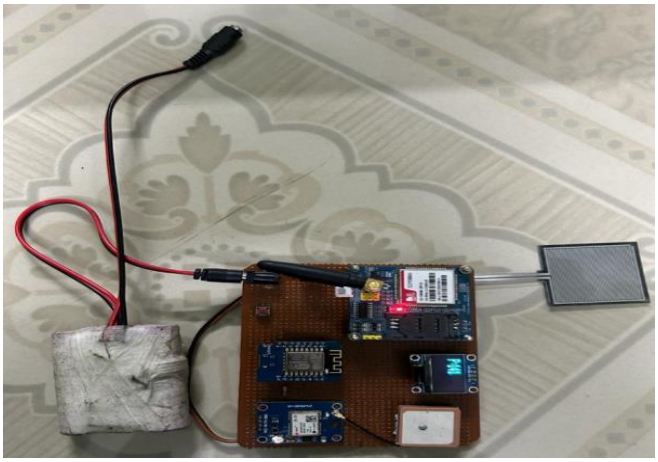

Fig 6.1 Hardware Kit

"GUARDIANSTEP" is a footwear integrated with a force sensor which gets activated once the user gives the pressure beyond the threshold limit with their foot. To distinguish the activation, the pressure threshold will be fixed slightly beyond the actual walking or running pressure by the foot. After the activation the current location of the user will be sent to the control panel as well as to the registered mobile number (parents/guardians). Then also the vibration motor which is fixed in their footwear gets activated to confirm the false alerts. If it is a false alert (randomly the sensor gets activated) the user can "Of' the vibration motor by entering into our application and to provide their particular Passkey they had given. If else the motor is destroyed or not turned off within a specific time limit, the profile in their wallet automatically sent to the control panel and the nearby police stations will get the needed information about the user with their photo. This footwear helps in faster recovery.

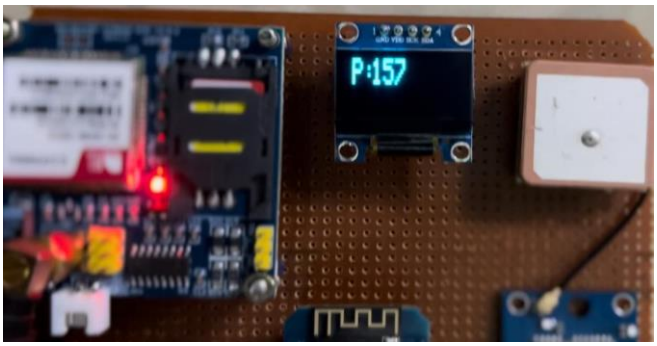

Fig 6.2 Normal pressure value

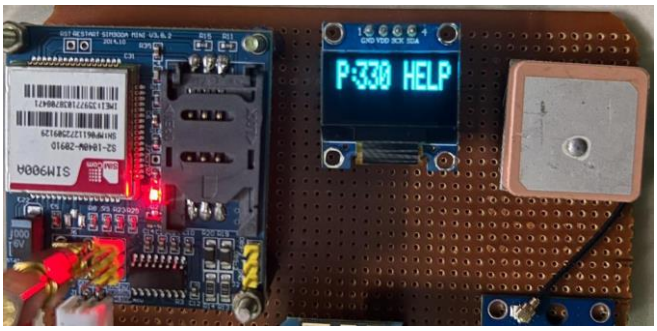

Fig 6.3 Threshold pressure value

Fig 6.2 depicts the normal pressure value that will be maintained by the pressure sensor in the footwear, which shows that the user is safe. But once the threshold value of "330" is reached, then it will display as "HELP" as shown in Fig 6.3. In that situation the profile of the user will be delivered to the admin page automatically for fast recovery and immediate action.

VII 3-D MODEL OF FOOTWEAR

Fig 7.1 3-D model with software

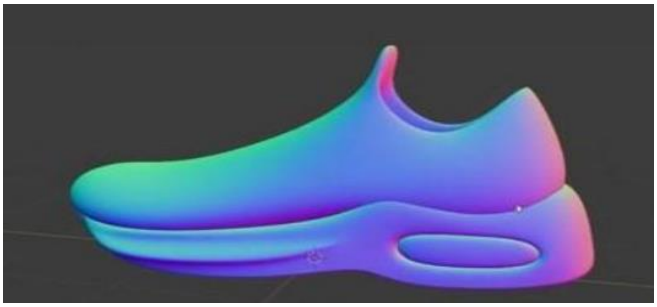

Fig 7.2 3-D Model of footwear

3-D model as shown in Fig 7.1, Fig 7.2 is created in Blender software which offers powerful tools for modeling, sculpting, animation, rendering, and more. As this 3-D model depicts the Real-Time working product, a separate space is given in between the base of foot and the bottom of footwear where the force sensor will get placed. By considering the main two factors: safety of sensor and comfort in activation, it would be better to fix the sensor in that oval like chassis.

VIII CONCLUSION

The products "GUARDHER" and "GUARDIANSTEP" are combined with technology and provide a system-embedded solution to the proactive safety needs of women. They offer personal security through discrete technology integration in both an application and footwear. This kind of solution caters not only to the exigencies pertaining to personal security but further aids in bringing about a greater social change through awareness and empowerment. Furthermore, the management of technological risk also undertakes to ensure that the environmental impact that can be caused by conventional security measures is minimized.

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