Chapter 9
Intelligent Children Safety and Security Wearable Shield Using IoT

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Abstract Social security has been a major concern with the growing number of assaults on girl children and women. Though the local and the union governments are taking ample measures in making strong legislations that shall award harsh punishments to the culprits, there is a need to design a smart system that is pro-active, user friendly, and sufficiently automated. The electronic system suggested here ensures safety and security of the girl child/women who uses it. During any untoward situation, the touch sensor in the proposed system monitors the temperature of the subject (the girl child/women who uses the smart system) and also her heart rate. The micro electro mechanical system (MEMS) module in the system monitors the motions of the subject. The audio detector module detects the voice of the specific person. The

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subject's location is determined by the GPS module, and the same is communicated to a predefined contact number with the help of the Wi-Fi module. The responses of the subject in various moods and emotions such as anger, disgust, fear, joy, sad, surprise, and normal have been measured.

9.1 Introduction

Women security endeavors to handle a cultural worry that has been annihilating the existences of uncountable people and their family members. The information being open world over empowered by the advantages of distributed computing by continuously monitoring the individual. The information can be downloaded onto any far-off station for observing and examination of casualty. The precision of which increases with proceeded with use and the machine learning algorithms for making the device intelligent. This device is used to improve the degree of wellbeing of ladies and girls. However, the extension for improved exactness is promising and used for accurate recognition of dangerous situations.

Research in wearable device for child safety [1] is discussed. Smart security using IoT is designed by Harikiran et al. Vehicle tracking is implemented. Smart security is designed using IoT and KNN algorithm in [2]. In [3], emotional facial boosts are monitored for the mentally disturbed people and normal people for a Brazilian database with the help of an eye tracker gadget [4]. In [5], the focus is on detecting the depression with the concept of emotional computer science which is a subcategory of artificial intelligence that finds the human emotions. A case study was proposed for prediction algorithm to detect depression level in [6]. The paper [7] is discussed about different methodologies to depressive indications. In [8], wearable sensor-based system review was carried out. An healthcare system for detection [9] was discussed for safety.

The work is planned to organize with the following key points:

- Women and child safety will be automatically monitored and controlled frequently for the societal issues.
- If the temperature and pulse rate are abnormal for the women and child in the unsecured situations are monitored through various sensors and immediately record the observations
- The prediction of violence is identified for reducing the physical attacks, if the situations become worse in victim's environment.
- Heart beat sensor, temperature sensor, and MEMS accelerometer, panic button are used in the coat and monitoring the person who is under problem.
- WiFi module, GPS module and audio detector modules are used in the safety device and inbuilt in coat to provide safety to women children.

9.2 Proposed Design

Your child security wearable gadget is fit for go about as a keen gadget. It furnishes data to guardians with the genuine time location, encompassing temperature, UV radiation record, and SOS light, audio, pulse rate accompanied by Distress alarm buzzer for finding the child's surrounding issues and how well the child has to safeguard by neighbor of the kid. Figure 9.1 shows the proposed block diagram and states the circuit diagram of the design. This is method in which it focuses mainly on a safety device to provide safety and security for the children and women while confronting unsafe situations.

It is achieved by the following steps.

Step 1: A control switch is enabled using the predefined reference value that controls microcontroller.
Step 2: Microcontroller starts recording the victim's location using GPS module with necessary parameter.
Step 3: GSM sends the messages to authorized person whose contact numbers stored in the SIM with the location subsequent a call to those phone numbers at particular intervals.

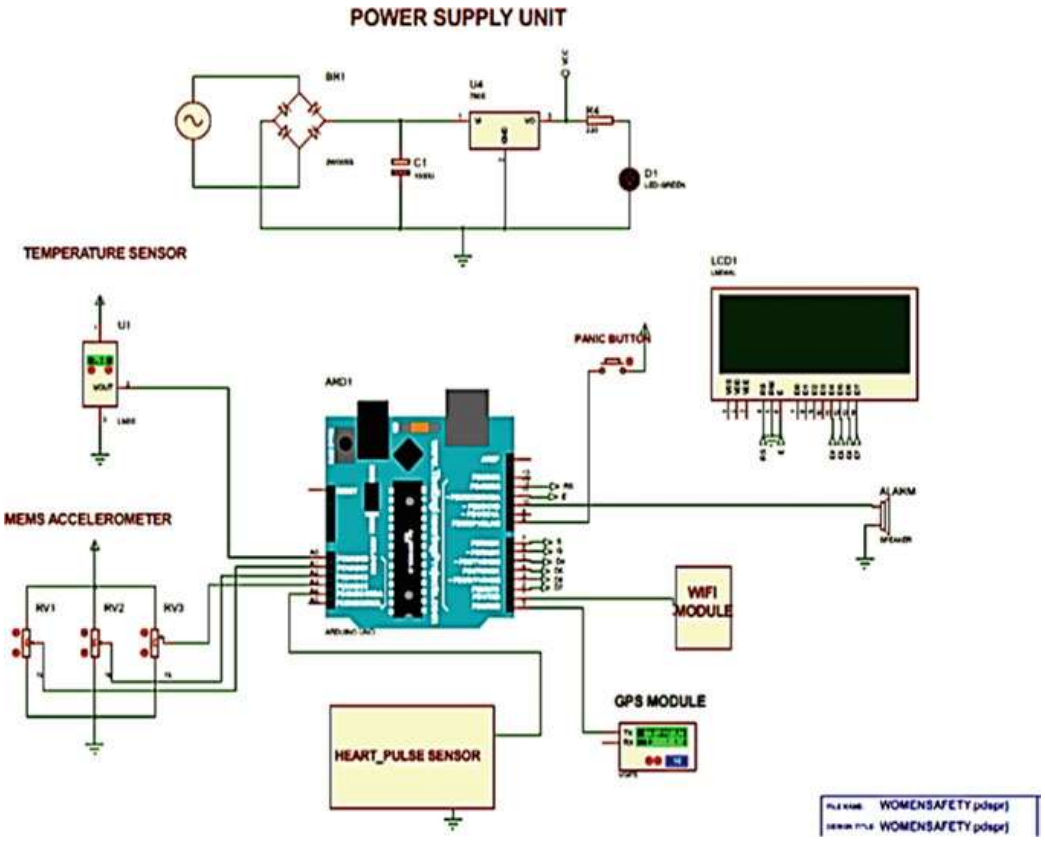

Fig. 9.1 Proposed method block diagram

Step 4: When the call was not reached to contact them, immediately the call forwarded to law enforcement agency.
Step 5: Device will lead subsequent announcement to the contact numbers during time slots.
Step 6: When the authorized person calls to device, then the device will direct the target's location of parent.

The wearable safety device was implemented in [10]. The rescue system was designed in [11]. The challenges for safety device are also encountered in [12].

The four main modes that have been recognized can typically be divided into walking, running, sitting motionless, and using a method of transportation. In comparison with other wearable systems that feature sensors, such as those in the arms and/or legs, the vest's implementation has several restrictions in terms of how the movement data is acquired. Other, more specialized activities, such as eating, using stairs, falling, lying down, etc., can also be recognized using arm and leg sensors. When compared to other methods of gathering movement data, the vest's implementation has some disadvantages. Such wearable devices with sensors, such as those worn in the arms and/or legs. Contrarily, the parts of our other vest are attached to a different piece of fabric so that a good location for the delicate parts may be more easily evaluated to provide the best wearability and functionality. Another benefit of wearing a vest is its usability (currently available safety vests). The two most common identified modes are typically walking and running. Another benefit of wearing a vest is its practicality (safety vests are currently common in nurseries) and extensibility, which makes it possible to add more sensors in the future and use them for applications like context awareness, functional accuracy, and intelligent reasoning.

The beat rate can be estimated by using beat sensor. Heartbeat sensor is an all-around planned attachment and play pulse sensor. The sensor cuts onto a fingertip or to ear cartilage and the other side plugs right into MCU unit with the use of some jumper links. It connects a straightforward optical pulse sensor with improvement and clamor wiping away circuitry making it quick and simple to acquire trustworthy heartbeat readings. Primary component of the sensor contacts with the skin. Other part which has a tiny spherical valve is available to radiation from LED.

9.3 Results and Discussion

It is a wearable coat device, and it consists of many components where GPS tracks the location and message to parent/guardian. It not only tracks the location, it monitors the temperature rate, heartbeat rate, and it also monitors the children/women movement using MEMS accelerometer and wearable safety coat along with the safety device. It consists of many components where GPS tracks the location and message to parent/guardian. It not only tracks the location, it monitors the temperature rate and heartbeat rate, and it monitors the children/women movement using MEMS accelerometer.

Fig. 9.2 Application for the safety

Figure 9.2 shows the application developed for the safety. Temperature and pulse rate results are monitored through this app.

Specific Keypad is available in the coat for identifying the wearable person. Sometimes it can be redirected by the unknown/danger people. It is mandatory to monitor whether the same person is wearing or different person. At that time, GPS and sensors cannot provide the correct persons location or details. When the coat is removed from the person, alarm comes for indication, and message and location will be shared by device. Simultaneously, another person wears the coat, and the device in the coat asks passcode to turn the device ON. If it is not provided properly, person cannot be tracked as well the final location would be sent to the authorized person. Filter bank for considering the power consumption is also developed in [13–16].

Table 9.1 states the security function execution time in terms of seconds. The function time is compared for various sample sizes. The results show that it is changing the time by means of sample by sample. The reactions of women under various conditions such as angry, disgust, fear, happy, sad, surprise, and neural have been measured, and it is stated in Fig. 9.3 using confusion matrix. The level values of predicted and time are compared and highlighted. The situations are monitored for the analysis of human tolerances. During unsafe situation how they are reacted and how much pressure level varies in those conditions will be observed. Figure 9.4 shows the various emotions based on the prediction. Message can be received from the wearable if any emergency situation faced by children.

Table 9.1 Security function execution time

Sample size (MB)	Time (s)
Below 10	3.8
20	2.9
30	3.1
40	4.0
Above 50	4.8

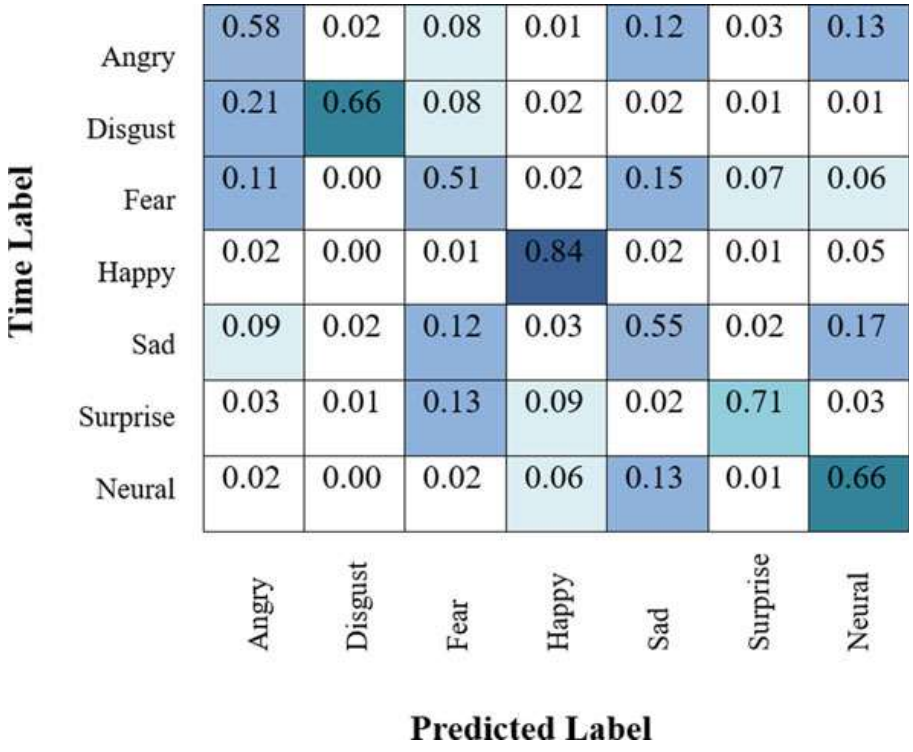

Fig. 9.3 Confusion matrix

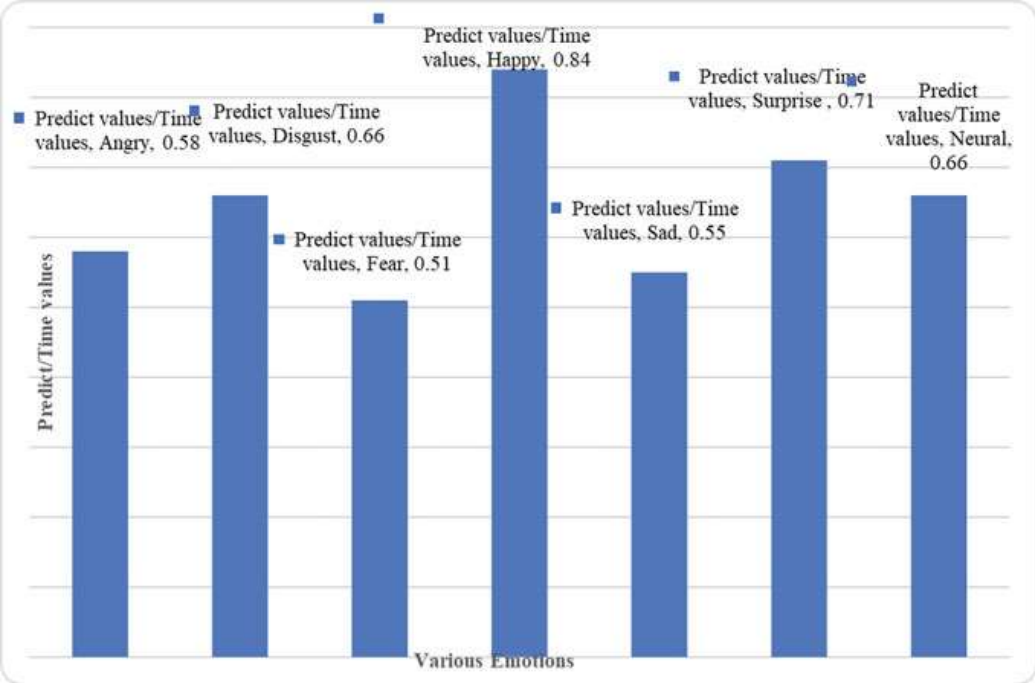

Fig. 9.4 Predict/time values

9.4 Conclusion

The existing safety application for women and children comes out with concept for producing safe environment for women and children in the society and allows them to travel anyplace fear free, and it helps to make safety for women and children. Proposed wearable safety gadget is an assistance to a women or children as well as elder folks who are in risky scenario. This proposed wearable device is essential for all the situations. The wearable device with web and mobile app was developed. The main disadvantage is that the device gets turned OFF once the coat is removed from the person. The final location will be sent to the authorized person. The device is designed because it can be used by others, and it causes the authorized person to track someone instead of their ward. The passcode to turn ON the device is only option to identify the person who needs safety. The reactions of women under various conditions such as angry, disgust, fear, happy, sad, surprise, and neural were monitored and stated out in the confusion matrix. The future work can be designed with fingerprint or other technologies to turn ON the device.

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