Implementation of Women's Self-Security System Using IoT-Based Device

Sonia Das, M. R. Pooja, and K. S. Anusha

1 Introduction

In the world, the major issue for most girls is thier protection from abuse. Despite the fact that technology is evolving and many new devices are being developed, women are still facing problems [1, 2]. Crimes against women are still rising and many women have been killed and/or harassed. There is a strict law in our country, yet a number of cases continue to be reported in police stations every day. Keeping this in mind, we have built a system for women's safety [3, 4]. The basic idea is to convey emergency alert messages involving location to parents and near by police stations, so as to avoid the incidents [5].

The device has different sensors like Alarm Buzzer, sensors for measuring pulse rate, Global Positioning system (GPS) and Global system for mobile communication (GSM). All sensors are concerned with Raspberry PI, which is a controller [6–8]. Women can make use of an alert button, when they feel unsafe. When it has been activated, the buzzer will make a sound to grab the attention of people those who are near to the victim and will send out an emergency SMS and location to predefined contacts, which is already programmed in [9].

The message, which will be received by the parents, will enable them to view the location. The device works automatically, when pulse rate meets the threshold value [10, 11]. Python programming language is used to programme these sensors. The goal is to create an all-in-one security system based on IoT [12–15]. In our work, when the intruder tries to do something, the device will produce a shock and a pepper spray will also be activated; so that women can easily escape from the critical situation. The device produces two self-defence mechanisms in order to save

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women, and also, the receiver shall be able to view a live video. If one fails, the other self-defence mechanism will save the women. This enables us to catch the intruder with proof and also can save the women through the self-defence mechanism.

2 Existing System

In India, the status of women has changed a lot in the last few years. They are competing equally with men, so the history of women has been eventful. Though they are equally strong, a certain percentage of women are assaulted and murdered every day. Some of the women are suffering mentally as well as physically. So, in this regard, people have come up with creative ideas. Various mobile phone applications are as follows:

[15] B.Vijaylakshmi et al. built an app. When women sense danger, they touch the app, which will record the audio for some seconds and transmit along with the location, or only an alert message.

[16] Niti shree, the author, designed a system that tracks women all the time. This mobile app tracks only the vehicle which the women use.

[8] Swapnali N.Gadhave et al. have built an app which shows the safety score based on the area the person is travelling in. That will be known as safe or dangerous area. When she goes through an unsafe area, it alerts the user with a warning message. The user can take a friend or family with her. The app also provides an alternative route to reach destination safely.

[17] Hung Nguyen et al. have created a mobile app that may be used to alert people in danger by tapping a button twice. This process initiates and sends a location or a message of a vehicle. This cycle will be repeated every two minutes. It is only for tracking the vehicle.

[18] Shubham Sharma et al. built a device. When women are in danger, they have to press and hold on the trigger button, and the system will be activated and send an SMS and location to parents with the use of a microcontroller.

[19] Ms. Deepali M et al. build a device that senses the danger upon which a buzzer may be pressed that would send a warning message to the parents as well as a location to a local police station. Some of the sensors will collect the data, if appears with irregular values then that information will also be sent.

[20] Prof. R.A. Jain et al. built a device, which takes and sends the photo of the offender to the parents and the nearest police station along with SMS and location.

[21] Orlando Arias et al. have built a smart watch. A woman when in danger can press the button, which sends the status of her to the defined contacts along with the message and address.

[22] J. H. Ziegeldorf et al. They created a smart watch and utilized it to store a few contacts. The device was activated when SOS button is pressed for 2 seconds. It then sends out an emergency message like “I am in Danger” with beep sound

to the receiver and further shares the user's location. It continuously records the oxygen level and also sends out an intruder Image.

Major Drawbacks of the Existing System

(i) Some of the systems require human intervention.
(ii) The mobile phone can be dropped at some point of time and the app may not work thereafter.
(iii) When they press the buzzer, only at that time alert message will be sent. At certain times, she may not be able to activate the button.
(iv) The system does not provide defence application for women to escape from the critical situation.
(v) The system doesn't provide complete solution to the existing problem.
(vi) The system lacks smart features like capturing and live video of culprit.
(vii) Some of the data is not useful, like every 2 minutes, the process will be repeated.

3 Proposed System

The harassment of women is still increasing, even though technologies have evolved. Because there was no self-defence mechanism to escape from that critical condition, women had to wait till parents and police reach the spot. So keeping this in mind, in the system here we produce two self-defence mechanisms, one is pepper spray and another one is shock circuit. When one fails, the other defence mechanism will work to help a woman escape from that situation. The block diagram of the proposed system is as shown in Fig. 1.

(a) **Battery:** To power the circuit, a rechargeable battery of 12v will be used.
(b) **Raspberry PI:** It is a small PC. It is integrated with the pulse rate sensors, GPS and camera modules. The emergency message will be sent automatically to pre-defined contacts. With the use of an SD card, it can store all the information concerned.
(c) **GPS module:** It is a location tracker which will track the current location if the usesr. The information is used to know the exact location like street, area or nearby junction and that will facilitate to reach the location. If GPS is not working, then it will send longitude and latitude co-ordinates through email or SMS.
(d) **GSM module:** It is used for the communication between computer and GPRS system. The Sim card is inserted within the mobile phones. To receive and send the SMS, the GSM sim card should be registered to the system. It is known as Machine to Machine communication.
(e) **Buzzer:** The buzzer is the device that produces sound in the opposite direction. This is beneficial in two ways: Firstly, it is utilized to warn those who are related to the victim, and secondly, it turns on the device by delivering an alert message and its position to the phone numbers specified.

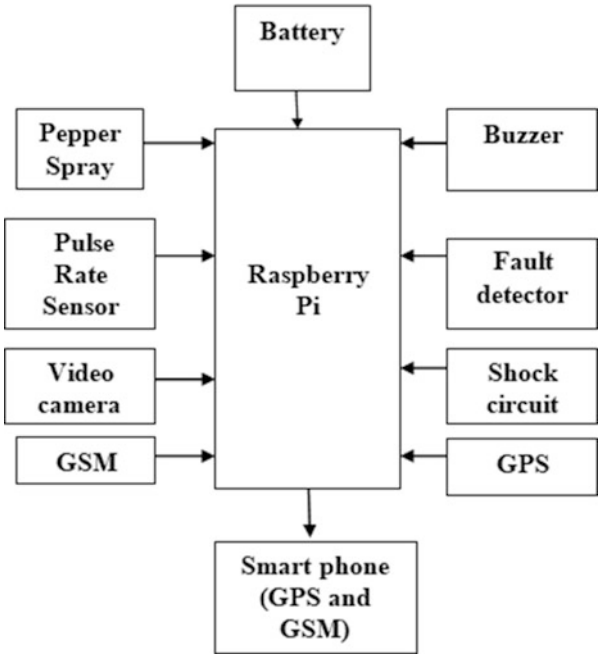


Fig. 1 Block diagram

(f) **Pepper spray:** Pepper spray helps in self-defence mechanism, where, in a critical situation, it may be sprayed on the intruder's face and thus help to escape from that situation immediately.
(g) **Shock circuit:** It is another self-defence mechanism. If one fails, the other will help to escape from that situation. The shock circuit will help by giving shock to the intruder in the critical condition.
(h) **Video camera:** While women sense danger, SMS and location will be sent, and along with it, the receiver can view the live video and can take immediate action. The live video helps us to collect the proof on the intruder, rather than having to explain to the police.
(i) **Pulse rate sensor:** This sensor will check the pulse continuously; if it reaches irregular values, then the device is automatically activated and sends out an alert SMS and location.
(j) **Fault detector:** This will help us to find the fault in the system. If the system has some fault, it will alert us through some messages.
(k) **IOT module:** It is a network of physical devices, things and alternate things like sensors and actuators. It allows us to gather the information and also to exchange the information. It also allows objects to be sensed and remotely controls the things without human intervention.

Applications of Proposed System

(i) Used for the safety of women.
(ii) Used as evidence to punish with an accurate documentation.
(iii) Used for the purpose of kid surveillance.
(iv) Used for the system of vehicle tracking.
(v) Used to keep handicapped individuals safe.
(vi) Used for aged persons.

4 Methodology

The system is functioning in two scenarios: when a woman feels unsafe, she will press the buzzer, and when she does not feel unsafe, she will not touch the buzzer, or when she is unable to press the buzzer for some reason, the other procedure is used. It detects the pulse rate and automatically begins the system – it operates the same way when the buzzer is pressed. The working of both the scenarios is as follows:

First Scenario The device gets activated by tapping an emergency button. The IOT device, which will retrieve the location by GPS, will be updated in Raspberry PI and that will initiate and send message to the pre-defined contacts through GSM [23, 24]. With the alert message an option will be provided for to view the live video.

Second Scenario If pulse rate sensor reaches an irregular value, then the device automatically gets activated. The irregular values will be sent to raspberry PI, the raspberry PI will then send the alert message to pre-defined contacts. The system model and the flow diagram are as shown in Figs. 2 and 3, respectively.

Women's Security System's Workflow

Step 1: Start.
Step 2: Emergency button is pressed [Buzzer].
Step 3: When GPS detects a signal, it begins calculating the user's current values and sends the location via SMS to pre-defined contacts using GSM. Live video can also be viewed.
Step 4: If pulse rate reaches irregular values, then it automatically sends the SMS and location to the contacts. Live video can also be viewed by the receiver.
Step 5: Pepper Spray is turned ON, to spray the pepper on the intruder.
Step 6: Shock circuit is turned ON, to apply shock to the attacker.
Step 7: The buzzer has been activated to alert the individuals in the area.
Step 8: Stop.

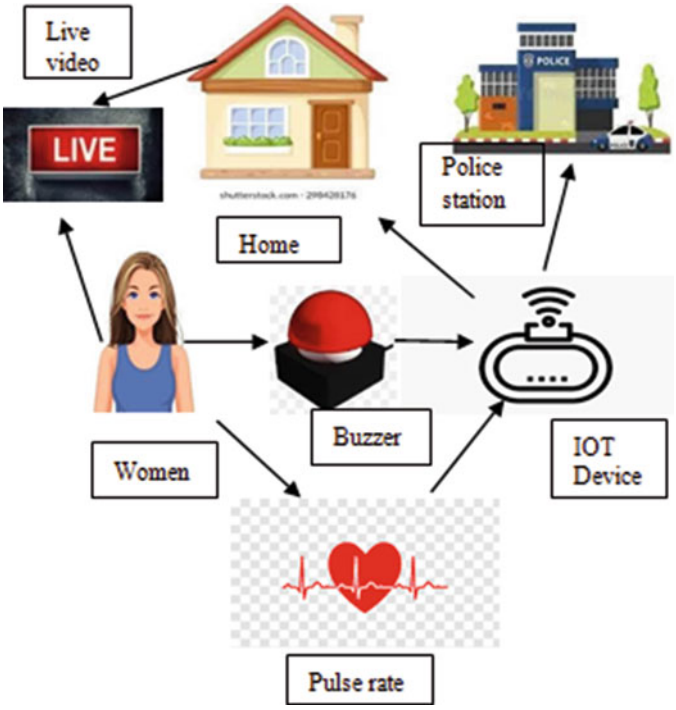


Fig. 2 System model

Advantages of the Proposed System

(i) Women can go anywhere with security device.
(ii) Intruders will be found easily with proof.
(iii) An automated system without human intervention.
(iv) Easy and convenient to operate.
(v) A low-cost device with greater performance.
(vi) Data with greater accuracy and quick response in emergency.
(vii) It is environment-friendly.
(viii) Detects fault in the system.

5 Result and Discussion

The purpose is to provide safety for women in critical situations. The system has switches 1 and 2; when the device is on, it displays both the switches.

When the first switch is activated, it sends the alert message, pulse rate, temperature and humidity to the assigned number along with the location. When she feels unsafe, the buzzer will be pressed. Once it gets activated the Raspberry PI

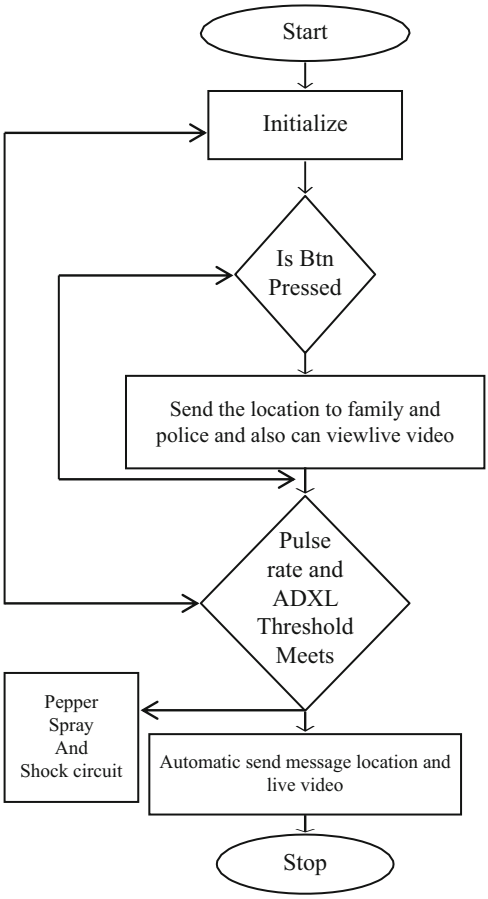


Fig. 3 Flow diagram

gets the commands and it calculates the current values of the user. The calculated values will be sent through SMS, in which raspberry PI stores the values and then sends it through message as in Fig. 4. The message is directed to the pre-defined contacts. The GPS will track the location as in Fig. 5 and update it. Through buzzer sound, the nearby people can save her.

When switch 2 is activated, it makes a live video as shown in Fig. 6 and sprays the pepper spray on the attacker, as in Fig. 7. The woman can thus be saved through the IOT device. If intruder attacks woman or tries to damage the device, it senses the motion and produces shock for the aggressor; for analysis, a bulb is used which lights up on sensing any motion instead of shock producer as in Fig. 8. The proposed model is as shown in Fig. 9.

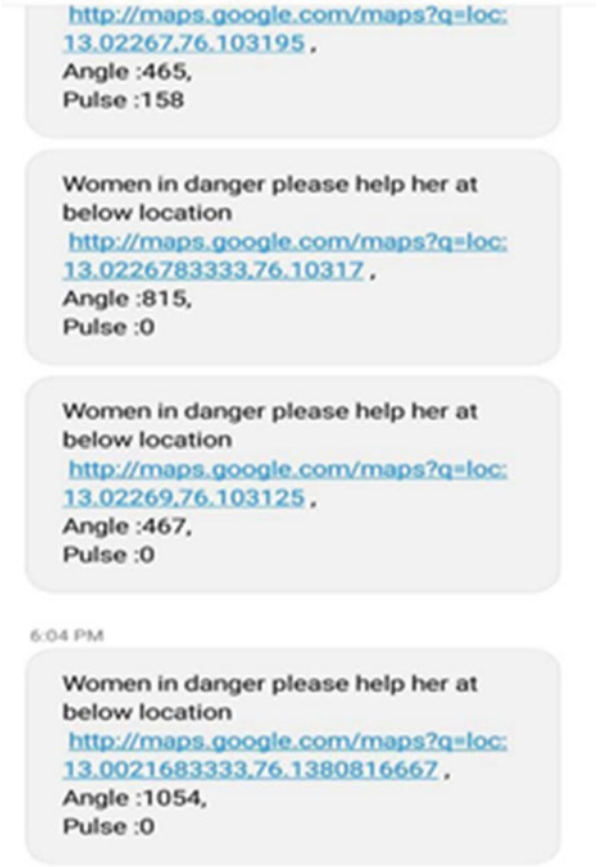
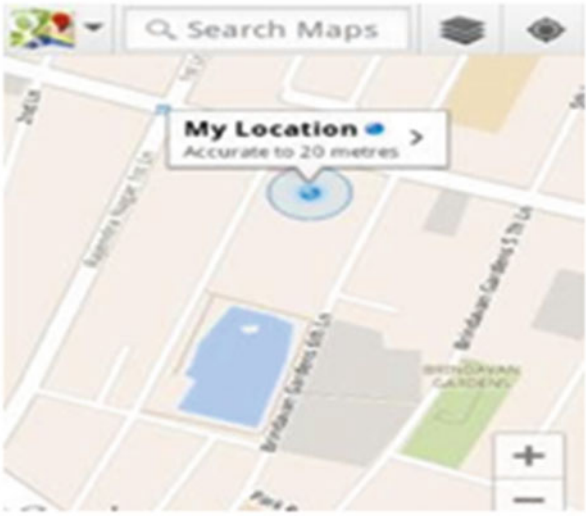


Fig. 4 Tracking the woman through message

Fig. 5 Woman's location



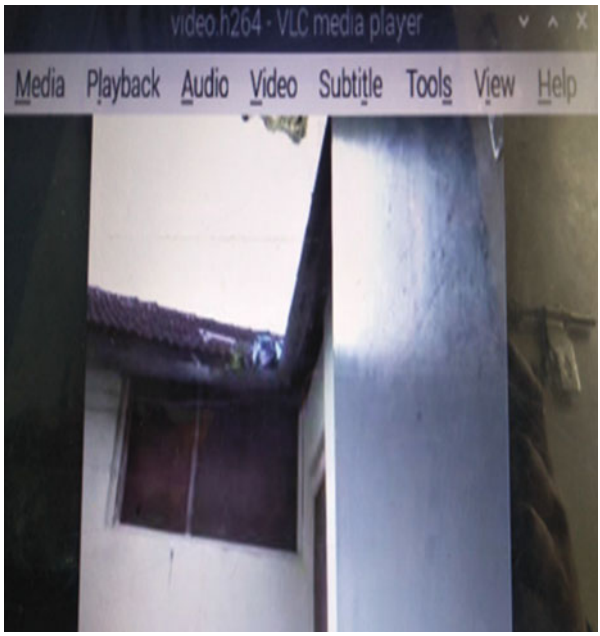


Fig. 6 View of live video

Fig. 7 View of pepper spray

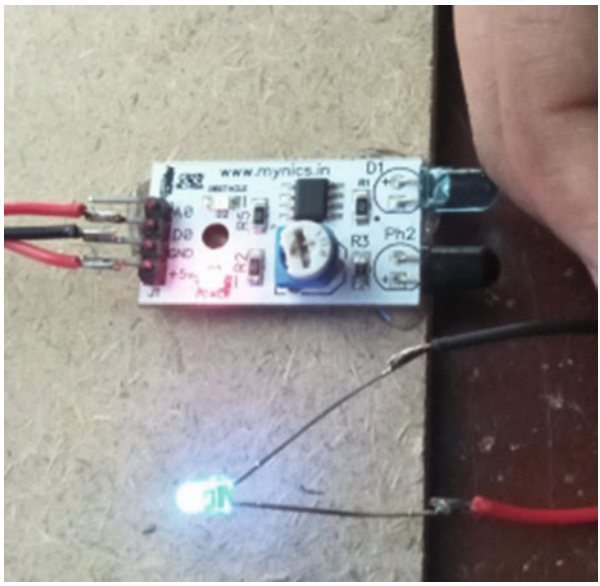


Fig. 8 View of shock LED bulb

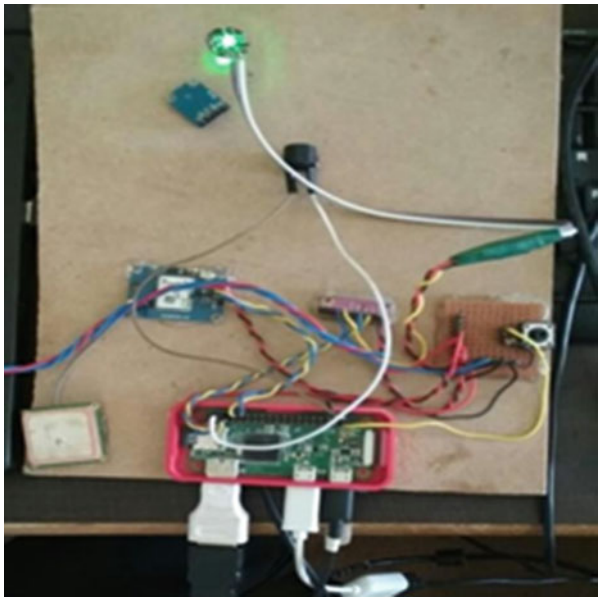


Fig. 9 Proposed model

6 Conclusion

This proposed system ensures protection and security for women. However, with the assistance of wireless technologies, with the secure medium, it would be possible to connect and send alarm messages to pre-specified numbers. The system will aid in the speeding up of the process of ensuring women's safety via the Geolocation tracking mechanism. The system provides security for women by detecting problems automatically, easing intimidations and sends help messages to the kin and to the police station that is nearby by means of IoT. Therefore, crimes of such nature can now be brought to an end with the help of the proposed system.

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