

Design and implementation of cloud based women safety system with enhanced security features

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Abstract

In this modern era, women are educated and equally working with men in every field. Women are not safer as men and may suffer mental and physical harassment. It affects the women's mental as well as physical health. Therefore, to assist women during attacks a system is proposed. The proposed system provides security to women by communicating with the authorities by just one press of a button. The system also records voice and captures the video for further investigation proof. The location of the woman and a message saying "I am in Danger" is sent to the pre-decided phone number. There is also a defense functionality of a pepper spray which can be used by the woman to temporarily shield her from the attacker. This system provides security while traveling alone or late at night. Although this paper focuses on women, this system can be used by anybody irrespective of their gender and age.

Subject Classification: 94XX.

Keywords: Women safety, Embedded, Security, Raspberry Pi.

1. Introduction

The misbehavior against women is increasing day by day at an exponential rate. Women work in different fields like IT sector, media, politics, education, sports, banking etc. She needs to travel sometimes late at night or in secluded areas due to emergencies or part of daily life. Most cases of physical harassment take place when women are alone or while traveling. Ladies feel insecure when they are alone in public transports such as bus, train or auto.

This system can be used for children's safety as well as against any kind of violence. In the proposed system GSM is used to transmit and receive messages, while GPS is used to locate the user. The Raspberry Pi acts as the platform's controller. The device's EMERGENCY button may be hit quickly and quietly. If the switch button is pressed once, the video and voice recording commence. The camera and microphone are used to record the video and sound, respectively. If the danger is greater, the user must press the button twice. The system will send an SMS to the family members with live location through GSM. The live location is recorded by the GPS system. The device also records video using a USB camera and audio with the Raspberry Pi's microphone.

2. Existing Methods

Most of the existing systems use smart phones for sending live location to relatives [1, 2, 3]. Vinarao implemented a system for Rizal Province. Similar system is proposed named as suraksha[4]. This system

notifies police in two ways. Button number 1 sends mobile numbers of relatives to the police. Button number 2 is to call directly to the nearest police station [4,5]. Many times, in case of sudden attack women may not get sufficient time to unlock the smartphone to use a safety app or to call family members. In such a case voice keyword recognition app recognizes voice and records audio as well as sends alert SMS with location to family members. The system named IPROB gets activated by making fast movement of mobile in any direction. The mobile will start capturing the surrounding voice. Based on voice recognition, the system generates a ringtone at the receiver side like HELP YOUR CHILD [6]. Some systems use alert systems based on single touch keys of smartphones. In situations like in parties and in meetings or while traveling alone it generates fake call ringtone [7,8]. Few systems are proposed to provide safety from hidden cameras in public places like hotel rooms, trial rooms and washrooms by detecting infrared rays. In an emergency it alerts the relatives [9]. There are some systems with sensors to monitor health parameters such as heart bit rate, temperature, vibration and pressure on the body to detect uneasy states. In case of an uneasy situation, location will be shared and amplifies the voice of the victim. As well as it starts a loud siren for help. In some devices along with all other features shock systems are embedded in belts, jewellery or on dresses [10,11]. P. Saikumar proposed a safety system with GSM and GPS with a Taser device. In case of attack Taser can be used, which gives shock to the attacker. It works up to 12 feet away [12]. Many companies have their setup away from main areas of the city. Companies provide public transport to their employees. To provide safety to employees is their responsibility. Another way to provide safety to women employees is to implement safety kits in vehicles [13]. There are some safety products such as SEFLET, PEPPER SPRAY PISTOL, PERSONAL ALARM WRISTLET WITH WHISTLE and SAFETY TORCH WITH SHOCK EFFECT available in the market.

Safelet is a wrist belt safety device which looks like a smart watch. Women, children, senior citizens or anyone who is using this device can contact guardians or friends just pressing one button. It also records the audio of the user's surroundings [14]. Pepper spray pistol is a safety device which is legally approved. In case of an attack, the victim can spray it two times on the attacker's face. It causes irritation in eyes and on skin, tears in eyes, breathing problems for 30 to 40 minutes. These problems are temporary. A Personal Alarm Wristlet with Whistle is a safety device with an alarm and torch. It is of very small size like a key like a keychain. After pulling the chain, a loud alarm gets activated for help. Safety Torch with

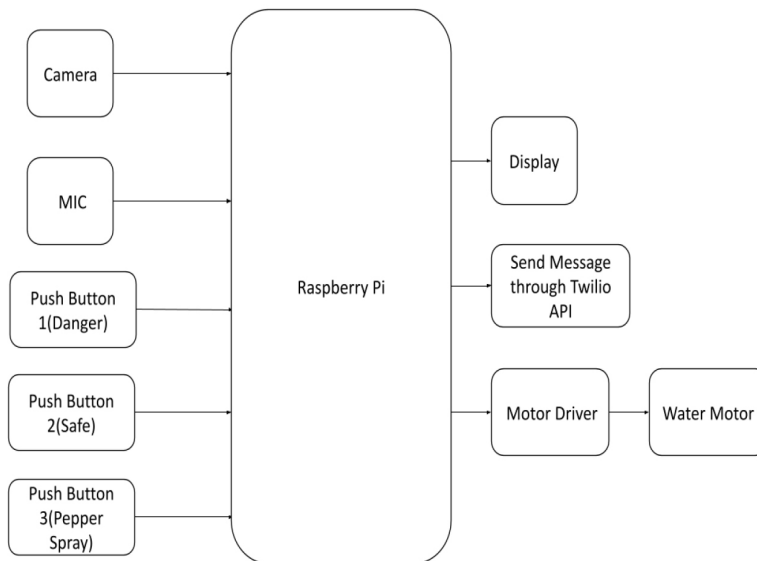


Figure 1

Block diagram of the proposed women safety system

Shock Effect is also available in the market. This torch has LED Flashlight with shock effect.

3. Proposed system

The system is implemented using Raspberry Pi as a central controller. The system offers three push buttons for different modes. The first one is for danger alert, the second one is for pepper spray mechanism and the third one is to reset/ send a safe alert. The system also provides a camera and mic module to record the video and sound as proof for further investigation. Proposed system block diagram is as shown in Figure 1 and flow of system is as shown in Figure 2.

In case of an attack, a woman must press the danger switch button (push button) manually, the raspberry pi will be activated, camera and mic module will be turned on. System will send a danger message and the location on pre-decided cell phone numbers through Twilio platform which is an online message receiving and sending platform. Curl command, which is a python library, determines the latitude and longitude of the location. Link of google map location will be sent to the guardian's phone number (typically the family and the police) via Twilio platform.

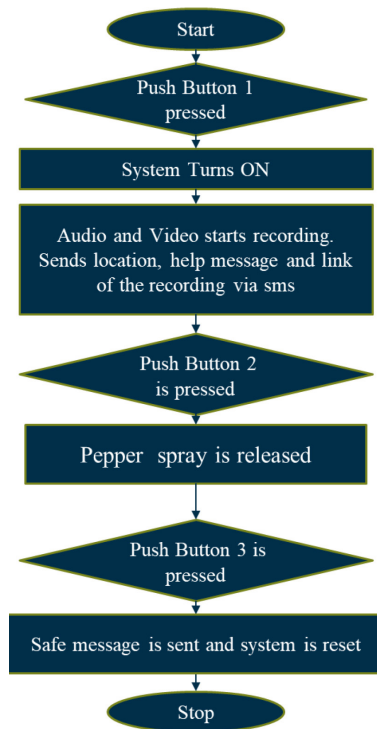


Figure 2
Flowchart of the system

For updating the location, it has two states. The first one is to check whether the safety button is pressed or not. If not, it will update the location within the same message which was sent earlier. In the second state, if the safety button is pressed, it will send the safety message. For recording the audio, a python library called pyaudio is used. cv2 library of OpenCV is used for video recording. The video and audio are recorded for around a minute (the duration is easily changeable) and are uploaded on MEGA which is a cloud service[15,16,17]. The link of uploaded audio and video will also be sent via SMS on our phones via the Twilio platform. There is also a defense functionality, when the woman presses the push button no. 2, the pepper spray will be activated using a subversive motor. Thus, security provided in case of attack. The third button is the safety/ reset switch button which can be used to send a safety message if the sense of danger has passed, or to reset the system.

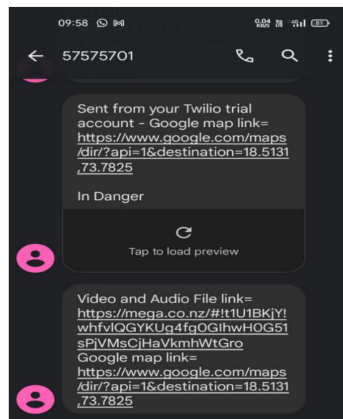


Figure 3

Message received from user for danger mode

Working of the system is explained below:

1. The system is turned ON when the user presses the danger Switch button manually.
2. This switch button 1, when pressed once, gives the signal to the Raspberry Pi that activates the MIC and video camera and simultaneously the location is sent via SMS to the pre-decided phone numbers.
3. Video and audio are uploaded on the Mega Platform (free cloud service).
4. When the switch button 2 is pressed, then the system sprays pepper spray.
5. When the switch button 3 is pressed, then the system sends a safe alert, and the system will reset

4. Main Results

4.1 SMS Alert system

Case I: Danger button

When the danger button is pressed by the user then it will automatically send a message to the authority with current location. In addition to this, the camera starts to capture the video and audio and it will store the data on Mega cloud and its link is sent by SMS as shown in Figure 3

Figure 3 shows the SMS received after the danger button is pressed. SMS include the message “In Danger” and location of the user in google maps link. The link can be opened in google maps. Also, the Mega cloud link for audio and video recording is also sent and is shown in the message.

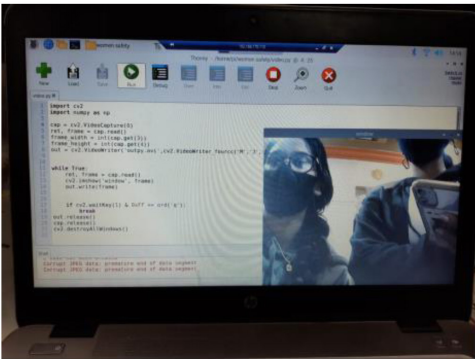


Figure 4
Recorded Video from user in Danger mode

Figure 4 shows software implementation and video recording. When we push the danger button1 from the switch module, it turns on the danger mode and starts recording the audio and video from the system.

Case II: Safe button

When the danger button is pressed 7 times by the user, a safe message is sent to the authority. The result of case II is shown in Figure 5

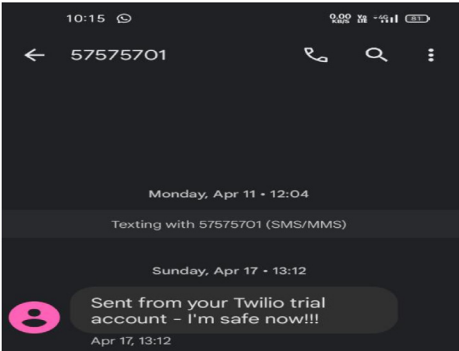


Figure 5
Message received from user for safe mode

Case III: Spray button

When the danger button is pressed by the user, it starts the motor and starts spraying pepper spray.

4.2 Location tracking analysis

When the danger switch is pressed, Audio, video link and location link is shared to emergency contact through SMS. Guardian and police can track users with the help of location links shared. GPS gives longitude and latitude of the user's location.

As per the recorded readings in Table 1, location is nearby from the user. System gives the exact location for small buildings or shops. For the big societies and institutes it gives nearby locations. Longitude, latitude and with the help of recorded video the exact location of the user can be tracked.

Table 1

Sr. No.	Exact Location	Google Map Location	longitude, latitude
1	Indradhanu Apartment, Alkapuri Society, Kothrud, Pune, Maharashtra	GR45+W3R, Alkapuri Society, Kothrud, Pune, Maharashtra	18°30'26.6"N 73°48'27.5"E
2	Building A Motiram Nagar, Warje	NH 48, Motiram Nagar, Warje, Pune, Maharashtra 411058	18°29'11.3"N 73°47'48.6"E
3	MMCOE, Hostel	Sr.No. 18, Plot No. 5/3, CTS No.205 MMCOE,, behind Vandevi Temple, Karve Nagar, Pune, Maharashtra 411052	18°29'27.6"N 73°48'35.1"E
4	E&TC Department MMCOE	FRR5+9QX, Marathwada Mitra Mandal College of Engineering Rd, Hingane Home Colony, Karve Nagar, Pune, Maharashtra 411052	18°29'27.6"N 73°48'34.2"E
5	Sarang A Building Nanded City, Sinhgad Road	Ghule Patil Nagar, Pandurang Industrial Area, Nanded, Pune, Maharashtra 411041	18°27'16.9"N 73°47'26.2"E

Contd...

6	Sterling Homes, Warje Pune	FRP3+4FM, near Chaitanya Nagri Housing Society, Chaitanya Nagri Housing Society, Chaitanya Nagari, Phase 2, Warje, Pune, Maharashtra 411058	18°29'07.6"N 73°48'13.3"E
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5. Conclusion

The system consists of Danger mode, safe mode and pepper spray mode. In danger mode, the system starts recording video and audio, and also sends the location of the user through SMS. The video and audio recordings are uploaded on Mega cloud and its link is sent by SMS to the emergency contact. In safe mode, the 'I'm safe now' message is sent to the emergency contact and in pepper spray mode, the pepper spray is sprayed. This system is independent from the mobile phone of the user. As in many cases of kidnapping or attacks, mobile phones are taken away by kidnappers or attackers.

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