DESIGNAND IMPLEMENTATION OF SELF-SECURITY SYSTEM FOR WOMEN USING IOT

[1]Ch.Dhana Lakshmi, [2]M. Anuradha, [3]M. Swarna Ankitha, [4]K.Tejaswini, [5]P. Saranya
[1,2,3,4,5] Department of Electronics & Communication Engineering, Vignan's Institute of Engineering for Women, Visakhapatnam, India

ABSTRACT
In today's world, most of the women and children's safety is a major concern in the society. At first, the techniques used by the police department while handling the caseswere a major issue. They have someinconveniences,like not knowing the victim's exact location or whether the crime happenedor not, and then, due to a lack of evidence, the police stopthe investigation. This paper is focused on a new IoT-based device to ensure women's safety and security.In this paper, an IoT-based women's safety device is proposed and implemented for effective self-alert and protection. The proposed device is a safety module that provides self-security, evidence collection, and tracking of the victim's location. The device contains an Arduino Uno microcontroller with a flex sensor for self-security, a SIM800L module for tracking the information by sending a message and making a call, and an ESP32camfor capturing live images of the victim's surroundings. Women can carry this compact device with them easily and comfortably.Also,the device is affordable at a reasonable price. This project focuses on a safety system that is designed to serve the purpose of providing security and safety to the women so that they never feel helpless while facing such social challenges.
Keywords: IOT device; flex sensor; women's safety; IOT-based evidence collection; attackerimage; victim location; security device.

INTRODUCTION

In the present scenario, women's safety has become one of the most common issues in society,and even though strictactions are taken against criminals, the problem still exists.According to the National Crime Records Bureau,one woman is physically abused by every 20 minutes in India.Incidents of reported physical abuse cases increasedby 10% from 2019 to 2020.Though we have advanced technologies, there is no accurate solution for the problems faced by woman.The safety and security of a women can never be at rest, no matter what new device is on the market or a new application is available;there is always an advancement that should be added to it.This paper involves a few preventive methods and applications in order to avoid the problems faced bywomen. It is not only about prevention, but it also helps the women to deal with the problems faced in day-to-day life and to achieve fair justice and morality in the society.There cannot be a cop or person always guarding a woman, but there area fewsafety measures that they can carry with them easily and use at the time of threat to let the nearby people or cops know that they are facing physical harassment and need support. Victims' location is received by the pre-saved contact number, which makes it an easy task for their identification. Due to rapid advancements in embedded systems,IOT devices are becoming more popular day by day because of their flexibility and interactivity.

LITERATURE SURVEY

Many of the scientists have proposed and contributed their work to ensure women's safety by developing different IOT-based devices. U. Rai et al. [1] developed a safety device using a Raspberry Pi with a GPS module and a panic button. When a girl presses the panic button when she is in danger, the device sends its location so that it can identify the victim's location by using the GPS module. But the drawback of this is that it is very large, and Raspberry needs internet to capture the victim's location. T. Sen et al. [2] developed a women's safety device with the Raspberry Pi. The device contains a huge architecture with a nerve simulator. The authors developed an Android application and local server to maximize women's safety. The

problem with this device is that it is too large to carry around easily, and sometimes a nerve stimulator may harm the person. A.Z.M. Tahmiduletal [3] proposed an application for wearable devices. So the function of the device is to send SMS, and it can trace the victim's location to the given police head quarters or pre-saved number. The limitation of this application is that many of the girls from rural areas are not familiar with mobile applications, or they may not have smart phones. S.R. Mahmud [4] proposed a smart mobile application called "BONITAA," which consists of various features such as SMS and location sending via GSM, health support, medical support, counselling, and self-defense tips for rape victims. To acknowledge the problem of rural women, they developed the "Bangla" language in their application and tried to make it user-friendly. V. Sharma et al. [5] developed a smart shoe to ensure women's safety. They used the Raspberry Pi and Arduino Uno microcontrollers to implement their system. Firstly, equipment can be damaged, and live streaming cannot be possible while running from danger. Besides, the use of an Arduino microcontroller rather than a Raspberry Pi is insufficient. Also, the shockwave generation of 400 kV can kill a human within a few minutes. N. Islam [6] proposed a device for supporting the women in danger. The device is designed to send SMS and location information to the relatives of the victim. The device is too large, with its AAA-size batteries and its large LCD screen. M.R. Ruman et al. [7] developed a safety device for women's safety that can send the location of the victim so she can be rescued early. The device contains a shock generator, and the system is huge to carry. B.Sai Yaswanth [8] developed a device for women using the kNN algorithm and IOT that can be operated by an authorized person in order to avoid getting false information. The drawback of this is that women who are not familiar with the application may not relish its facilities. In order to avoid these limitations, we have developed a device to provide self-security to the women whenever they are in danger, and the women can use this compact device with their undergarments easily and comfortably. Also, the device cost is lower so that people of every income level can afford it at a reasonable price.

[9] Women's protection is a major issue in every day and age and it's especially required for each person to be acting over such an issue. This paper consists of a "GPS, GSM, screaming circuit and pressure monitoring system along with buzzer" based on ladies security framework that gives the mix of GPS gadget especially to track the area by giving alarm with the help of screaming circuit and messages to catch the victim. The system is designed in such a method that it resembles a usual hand held belt which track the locality using GPS and sends the messages using GSM to 3 contact numbers including police department control area. Screaming alarm acts as real time clock to call for help and generates electric shock for self defence. By using this system the consumer do not need a Smartphone anything like other applications that have been developed earlier. The belt provided with these features will help women in handcuffed situation at any emergency conditions

PROPOSED SYSTEM FRAME WORK AND SYSTEM DESIGN

In this section, we have discussed the overall framework of our women's safety device.
The framework contains two types of system design.

WORKING FRAMEWORK OF PROPOSED SYSTEM

At first, when we start the device, the flex sensor will activate the Arduino Uno, and it will initialise the SIM800L module. When the flex sensor is less than 800, the system sends the HTTP POST request using the "AT" attention command, then sends the message to the pre-saved contact number and captures images from the ESP32 cam and sends them to MAIL-ID. When the flex sensor is greater than 870, the system will make a call to the pre-saved contact number. Calls are received with high voice quality, they can be transmitted, and it captures images from the ESP32 cam and sends them to Telegram account.

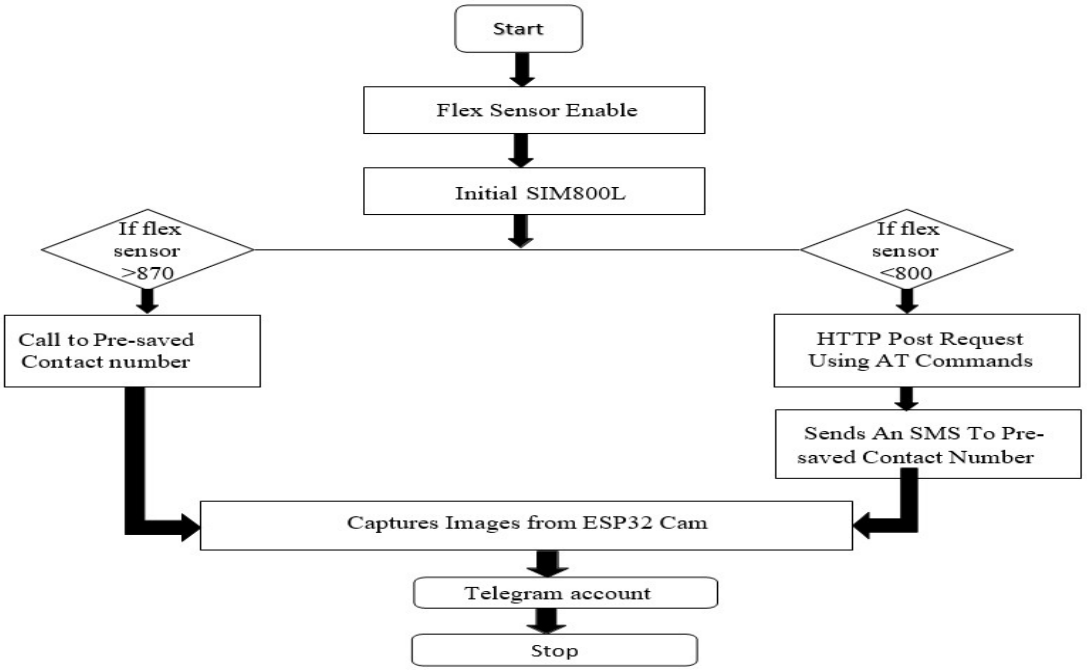


Fig.1.The overall working framework of our proposed "self-security system for women using IOT.

Block Diagram and Components of Proposed System:

The block diagram of the frame work in fig:2 illustrates overall hardware design required for developing the gadget.

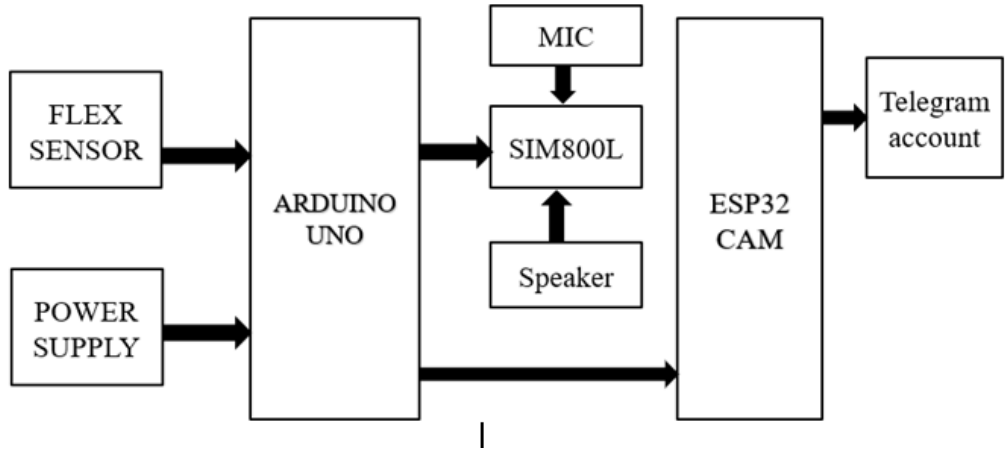
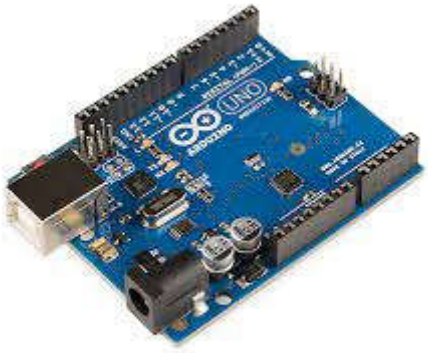


Fig.2. The block diagram of our proposed "self-security system for women using IOT.



3.1. Arduino UNO

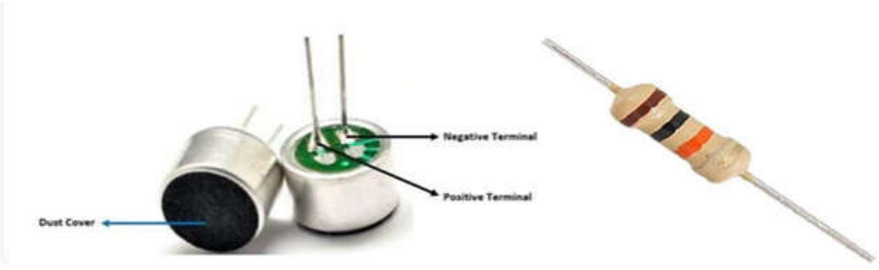
3.2. SIM800L

3.3.Flex sensor

3.4.ESP32 Cam

3.5. Buck converter

3.6.Speaker



3.7.Microphone 3.8.10kohm Resistor

Fig. 3. The figure shows the necessary components that we have used for developing"Arduino-based self-security system for women using IOT.

3.1. ARDUINO UNO: Arduino Uno is a microcontroller based on the ATmega328P. "UNO" means one in Latin. It is having 14 digital input/output pins, 6 can be used for PWM outputs and 6 analog pins. Operating Voltage is 5V for Arduino uno. It is low-cost, flexible, and easy to use.

3.2. SIM800L Module: We have used the SIM800L GSM/GPRS module for calling and sending SMS functionalities. The module is attached to the Microcontroller. This module has a small form factor, and a Subscriber Identify Module (SIM) is attached to it.

3.3. FLEX SENSOR: Flex sensor is a variable resistor. The sensor resistance is lowest when it is on a flat surface, increases when we bend it slowly, and reaches its maximum when it is at a 90-degree angle. Flex sensor is a thin copper cladding on a plastic material substrate like acetate.

3.4. ESP32 CAM: The ESP32-CAM is a small, low-power consumption camera module with an Itano OV2640 camera and a TF card slot on board.

3.5. BUCK CONVERTER: Buck Converter Module LM2596 Power Supply is a step-down (buck) switching regulator, capable of driving a 3-A load with excellent line and load These implementations are available in fixed output voltages of 3.3V, 5V, and 12V, and an adjustable output version.

3.6. Condenser Microphone and Speaker: We have used a condenser microphone and a speaker to transmit the voice through the safety device so that the victims family members can hear the sounds around the prey.

3.7.Resistance and Some Wires: We have used a 10K resistance for voltage. Moreover, some wires were used for making connections to all the components.

IMPLEMENTATION DETAILS OF PROPOSED SYSTEM

In this paper, we have discussed the step-by-step procedure of the overall hardware implementation of our self-security system for women using IOT.

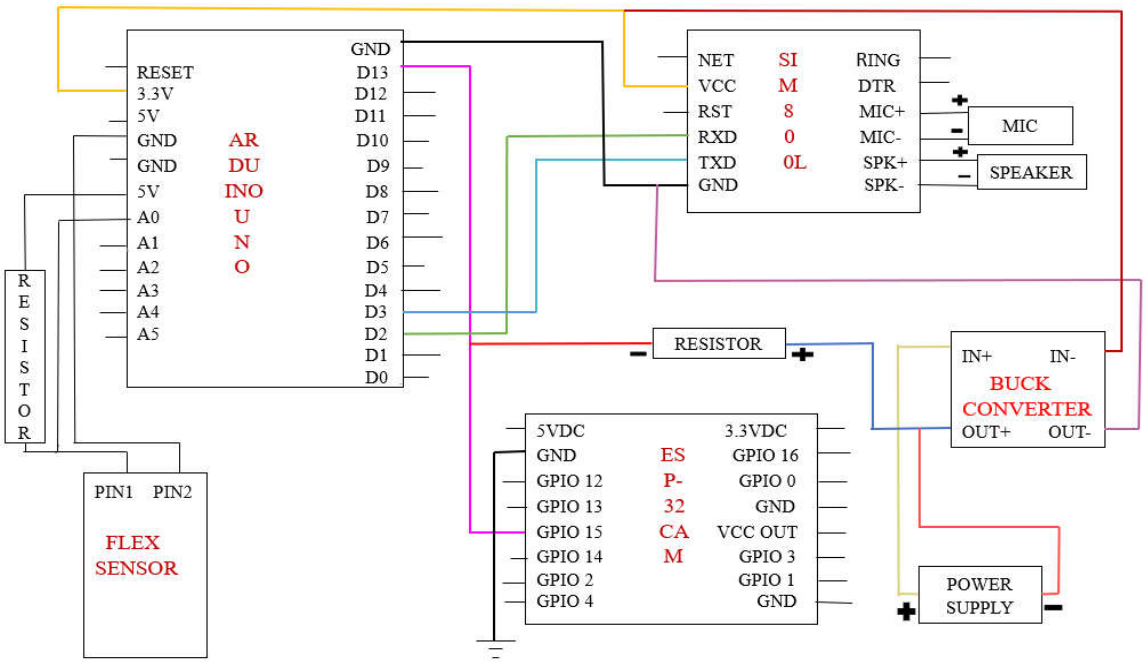


Fig.4. Circuit diagram of self-security system for women using IOT.

First of all, we need the Arduino Uno microcontroller to connect all peripherals because it is the main part of the system and controls all other hardware. Here in Fig. 4, we can see that SIM800L has several pins. The SIM RXD pin, which is the receiver pin of the SIM800L, is connected with the Arduino's digital Input-Output (I/O) 02 pin for serial communication. The SIM TXD pin, which is the transmitter pin of the SIM800L, is connected with PWM and interrupt digital pin 03 for sending data to the peripherals. We have used an adapter for the power supply and a Buck converter for the load regulation. The positive wire of the adapter is connected to the Buck Converter positive IN+, and the negative wire is connected to the negative IN-. It regulates load and gives 3.1 volts to the SIM800L module and 5 volts to the ESP32CAM. A 10k resistor is also used for the voltage regulation. The SIM800L module has MIC positive and negative pins to connect the condenser microphone and SPK positive and negative pins to connect the speaker. The analog pin of the Arduino microcontroller, A0, is connected to the Flex Sensor to read the analog values. The SerialClock (SCK) was connected to the ESP32 CAM GPIO15 pin. And the ground pin of the ESP32CAM is connected to ground.

The pictorial view of Fig. 5 illustrates the overall view of the self-security system for women using IOT and shows that

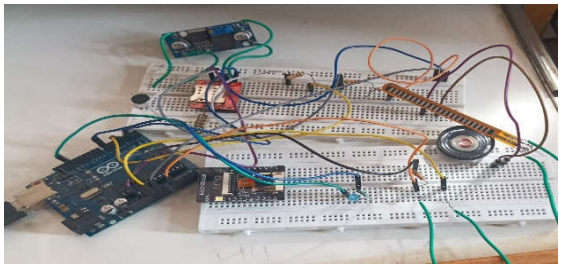
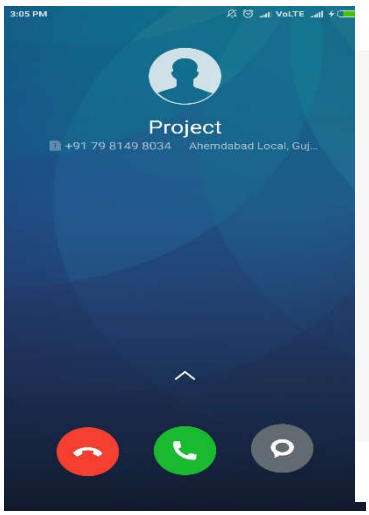


Fig.5. The developed system of self-security system for women using IOT

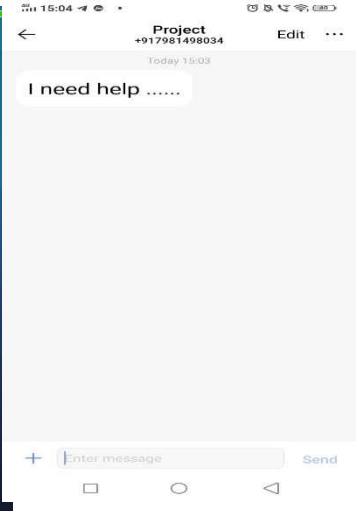
RESULT

In this section, we have discussed the methodology and results of our Arduino-based self-security system for women using IOT. When the flex sensor crosses its threshold value, the SIM800L module calls

"+91XXXXXXXXXX" to the pre-saved contact number through the cell phone antenna and sends an SMS to the pre-saved contact number, and by GPRS technology,it sends an SMS with the captured images to the pre-saved mail-ID.The contact person can contact or help the prey according to the message or call received and the captured images received. Fig. 5 illustrates the form factor of our device, which is too small in size to carry anywhere easily. Here, Figs. 6a, 6b, and 6c show the calling mechanism, SMS received, and captured images. Moreover, our device is so much power efficient and low cost.



6.a.Makingcall



6.b.Sending SMS

6.c.Captured images

CONCLUSION

This exploration work plays an important part in providing the fastest way to safety for women. The developed system will deal with dangerous issues faced by women in recent history and will help to break them through using safety bias. This work will be concentrated on developing a low-cost device to help women, and by using a microcontroller with sensors to locate the victim's position, this can be a valuable tool in helping people protect themselves in potentially dangerous situations. This system helps tomaintain gender equivalency by furnishing a safe terrain to women in the society and allows them to work till at nights move singly. Anyone before doing any crime against the women will be advised and cautioned by the nearby people, and it helps to reduce the crime rate against the women.

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