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Womens Safety Device with GPS Tracking and Alert

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Abstract: ***Nowadays, the amount of violence against women has increased by many fold due to the greater exposure of women in every field of life. It has now become a major issue. The crime rate is on the spike. The recent spate of crimes against women, particularly rape instances, has been terrifying. Women's safety in India has become a contentious issue as a result of such crimes. Despite international agreements, new legislation, and gender movement, women continue to be particularly susceptible to assault. Looking towards all these issues, we proposed a device which will be really very helpful to women. The system serves four main purposes, first to send the victim's location to the preprogrammed contact numbers with the help of GPS and GSM. Secondly, she can turn the buzzer on so that nearby people can help her to get out of the situation. Storing the women's pulse rate to ThingSpeak cloud with the help of WiFi ESP8266 and sending the same data to registered contact numbers will be the third main purpose of this device. Along with this the fourth main purpose is that she can give a shock to the abuser just by turning the other switch on and touching the device to the abuser's body so that current will pass through him. That shock will not kill the abuser but women will get a chance to escape from the location.***

Keywords: ***Safety, GPS, GSM, ThingSpeak Cloud, WiFiESP8266, Shock.***

I. INTRODUCTION

The proposed concept is to build a safety device which will generate an emergency alarm and send a message to the user's friend, family or to the police. This will also help women or concerned during her trouble and keep others alert. By this process location tracking becomes easy.

"848 Indian Women Are Harassed, Raped, and Killed Every Day!!" according to statistics. So, to properly combat this, we developed an approach in which women can self-manage any uncertain event. A day when the media will broadcast more of women's success rather than harassment, that will be a feat achievement!

For a well groomed 21st century, self protection became a priority which can be achieved with the help of user friendly safety device provided with GPS tracking and alert.

Our emergency kit is provided with a main switch since by pressing it, the battery will supply required voltage to the preprogrammed controller and the components that are directly connected to arduino Nano such as GSM, GPS, LCD Display, Pulse sensor as well as shock circuit will start working accordingly. Hence, the proposed device interfaced with IOT will be continuously communicating with Smartphones.

II. RELATED WORK

In 2018, "IoT Based Child and Woman Safety" was proposed in the International Journal of Computer Science and Mobile Computing (IJCSMC). Raspberry Pi 3 Model B is used to build the entire system. Python programming is used to interface all the sensors and hardware components. The model includes Raspberry Pi, Voice Recognition, GPS, GSM and MySql database[1].

In 2016, "Smart Security Solution for Women based on Internet Of Things(IOT)" was proposed in the International Conference on Electrical, Electronics,and Optimization Techniques (ICEEOT). The proposed design addresses significant difficulties that women have experienced in the recent past and proposes technology solutions to address them. This software has access to GPS and Messaging services which are pre-programmed. Also includes Bluetooth 4.0 BLE (Bluetooth Low Energy) in order to reduce power use[2].

In 2020, "A NOVEL APPROACH TO PROVIDE PROTECTION FOR WOMEN BY USING SMART SECURITY DEVICE" was published in International Research Journal of Engineering and Technology (IRJET). The purpose of this project is to be built and detect the location as well as health condition of the person. It also covers a victim-safe and secure electronic system that includes an Arduino controller and sensors including temperature, pulse rate sensor, and sound sensor[3].

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In 2020, "SMART GADGET FOR WOMEN SAFETY" was published in JOURNAL OF CRITICAL REVIEWS. This proposed system serves two purposes, first to send the image of the culprit to the family member by connecting to the internet of the user's phone, and second is self defense by flashing led light into the eyes of the culprit. However the live location can be traced using a GPS module. The system utilizes elements like Raspberry pi, GPS, Panic Button, USB Camera[4].

In 2016, "Women Safety Device and Application-FEMME", was proposed in Indian Journal of Science and Technology. In this paper they used an ARM controller and an android application in which both the device and the smart phone are synchronized using Bluetooth, hence both can be triggered independently[5].

In 2014, "SMART GIRLS SECURITY SYSTEM", was proposed in International Journal of Application or Innovation in Engineering & Management (IJAIEM). When enabled, the system looks like a regular belt and uses GPS to follow the victim's whereabouts while also sending emergency messages over GSM (Global System for Mobile communication). The system also incorporates a screaming alarm that uses real-time clock [6].

In 2014, G.Bharathi and L. Ramurthy from Vemu Institute of Technology proposed "Children Tracking System Using Arm7 Microcontroller" in International Journal of Industrial Electronics and Electrical Engineering. It was a very basic system which was able to provide only the location of the user via GSM.[7]

In 2016, "A Review on IOT Based Smart GPS Device for Child and Women Safety Applications" was proposed in the International Journal of Engineering Research and General Science. It proposed the concept of providing data over a web server[8].

III. THEORETICAL DESCRIPTION

Methodology

The proposed device will build a circuit(an emergency kit) that can easily be carried by the victim, using which location tracking as well as alert will be issued whenever and wherever required.

Main components used are arduino Nano interface with GSM and GPS module for sending messages and getting the location coordinates respectively. So, the person associated with the device can ensure security, by switching the circuit on.

A circuit is provided with two more features namely, shock circuit and a buzzer. Both the components are provided with separate buttons for instantaneous shielding.

In the proposed device, health monitoring is achieved using pulse sensor. Whose output will be displayed on the Thingspeak cloud using WiFi ESP8266 module. The pulse rate of a woman will be monitored continuously and sent via SMS with location coordinates.

IV. HARDWARE COMPONENTS

1) *Power Supply:* We have used a battery of 12V as a power supply. This supply battery is connected to the Arduino Nano controller. Positive terminal connected to the Vcc pin and the negative terminal connected to the GND pin.
2) *Atmega328:* Whole assembly is controlled and managed using a preprogrammed controller Arduino Nano within a device. Atmega328p microcontroller Ic is preprogrammed such that the connection provided at different pin no.s will work at exact time the instruction is supplied.A GSM/GPS module is connected at pin no. D2 and D3. The transmitter and receiver of the wifi module at pin no. D0 and D1 , a shock circuit with relay at pin no D6, buzzer at D7, also pin no B0 to B5 connected to LCD board, A pulse sensor is connected to analog pin at A0. switch
3) *GSM Module:* The GSM module used is SIM800c. It has a low power consumption and can send voice SMS and data. AT commands interface with auto baud rate detection, send and receive sms and calls using pin no. D2 of controller. It has embedded TCP/UDP protocol.

The AT commands used are as follows:

a) AT+CMGS - This command is used to send text messages.
b) AT+CMGF - It sets the GSM modem in Text mode.
c) AT+CIPSTART - Establish TCP connection
d) AT+CIPCLOSE - close TCP connection
e) AT+RST - used to reset the module
f) AT+CWMODE - Set the Wi-Fi mode
g) AT+CWJAP - Connect to an AP
h) AT+CIPSEND - Send data in normal transmission mode/ wifi normal transmission mode

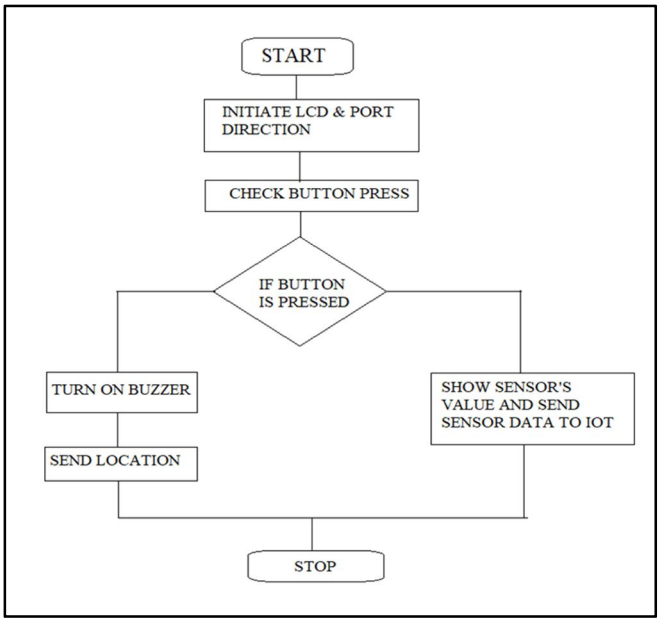
4) *GPS Module:* GPS (Global positioning system) is used to get the position of the gadget in terms of latitude and longitude. Here a SIM28ML GPS Module is used to receive the GPS data using pin no. D3 of the controller. It is a low power consumption device which is provided with a battery backup.

5) *Buzzer:* A Buzzer is provided with a separate key. By pressing it, the buzzer will produce a continuous beeping sound. There are 2 wires used for connections. one is connected to the D6 (Digital pin) and the other one is at the ground of the controller.
6) *Shock Circuit:* This device includes a shock circuit which is a part of mosquito repellent bat's shock circuitry. A separate key is used for activation of the same.If an unexpected action is notified then by turning the switch on, a shock in milliamps will be supplied,that will move the culprit apart. The circuit outputs a maximum of 2400 V with 100mA current.
7) *Pulse Sensor:* Pulse wave is the change in volume of blood vessels that occurs when the heart pumps blood & detector that monitors volume changes called Pulse sensor.
   There are three wire connections made to check pulse rate using plug and play sensor(pulse sensor) as follows
   BLUE wire = 5V(vcc)
   GREEN wire = GND
   PURPLE wire = Signal/data pin (A0 pin)
8) *Wifi ESP8266:* Wifi ESP8266 module is used to collect a pulse sensor's data and store it to the Thingspeak cloud with the help of the internet. The change in pulse will be visible in a graphical manner onto a monitor with absolute wireless connectivity using WIFI ESP8266.The transmitter is connected to the D0 pin and the receiver is connected to the D1 pin of the controller. Here, Esp8266 works with supply of 3.3v
9) *LCD Board:* Here, the connections are made such that the power supply as well as controllers are connected to the LCD. As soon as an alert message is sent by the controller, it will display on LCD. We have used the I2C module to make the connections efficiently. Following are the pins used for connections :
   A4 pin = SDA(Serial Data Line)
   A5 pin= SCL(System Control Layer)
   VCC = 5V
   GND

V. SOFTWARE COMPONENTS

1) *Thingspeak:* ThingSpeak is an open data platform of IOT, that enables collect, store, analyze, visualize and act on data from the cloud. Here data will be transferred from pulse sensor to Thingspeak using Wifi ESP8226. It will represent the results in a graphical manner such that pulse rate on y axis and change in time on x axis.
2) *Arduino IDE:* The proposed device is basically a controller based emergency kit which works when preprogrammed instructions guide a path accordingly. Since for management as well as controlling the application a "c language" code has been introduced to controller using arduino IDE(integrated development environment)

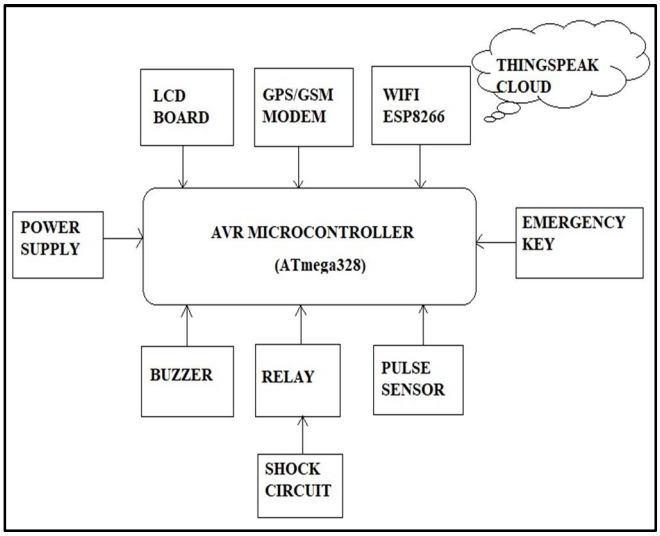
VI. FLOWCHART



VII. ALGORITHM

1) Define the pins for the LCD and ESP module.
2) Set the connections for ThingSpeak, pulse sensor, buzzer and relay.
3) Give proper connection to the shock switch, tracking key and buzzer key.
4) Declare the contact numbers to which the message will be sent.
5) Now create a loop that does the following:
a) Set all pin modes.
b) Setup baud rate as 115200 for serially sending data and 9600 for ESP8266.
c) Set pins for LCD to print the message and set cursor to position (0,1). Respectives variables of switches must get their data
d) Now, calculate the values of pulse rate in BPM and to print its value on LCD set the cursor to (0,0) position.
e) Now check the condition, if the tracking key is pressed then firstly print the value of pulse rate. After that location sending process will start, LCD will display the message as "location sending".
f) Fetch the contact numbers from SIM card memory and take the data from the GPS module. Convert this data of GPS into a google URL and attach the same URL with an emergency message. Send this message to registered contact numbers.
g) As the process gets completed, the LCD will display the message as "Location Sent".
h) Another condition to check is whether the buzzer key is pressed or not. If it is pressed then the Pulse Rate will be displayed on LCD and buzzer will start beeping and simultaneously the location will be sent again.

VIII. BLOCK DIAGRAM



IX. WORKING

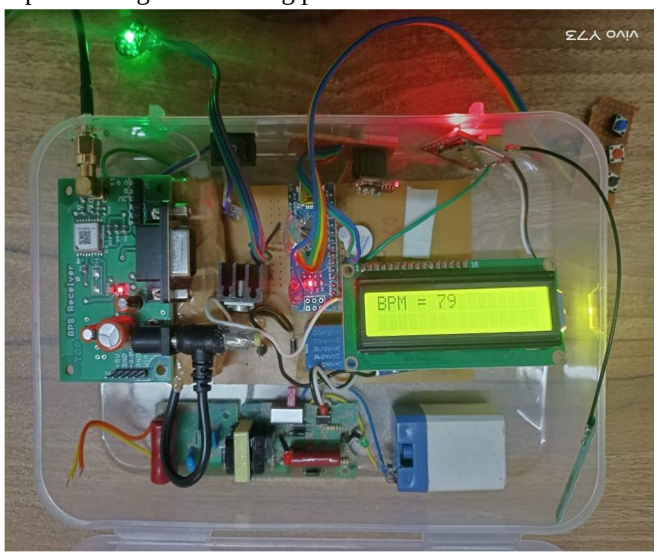
1) The proposed device consists of a system that ensures security and real time notification to the near and dear in case of emergency. As soon as the emergency button is pressed the device ensures continuous monitoring of location as well as security in the form of 2400V stun current.
2) The emergency key is directly connected to the atmega328 controller of Arduino Nano. This activates the controller and sends alerts to other devices interfaced with it.
3) The location coordinates of that instant will be collected using the GPS module and will be sent via text message mode with the help of AT commands of the GSM module.
4) The LCD connected to arduino Nano will display a message “location sending” while tracing the location and “ location sent” after coordinates are sent.
5) Here, a pulse sensor is an expandable device. In this case, as soon as the main switch is pressed, the pulse rate will be calculated. The numerical value of pulse rate will directly be displayed on LCD and graphical representation will be shown on thingspeak cloud using a well-known wireless protocol “wifi ESP8266”. This graph will results the change in pulse rate(y axis) after every minute(w.r.t x axis). Now,In addition to GPS location, user’s concerned will receive a pulse rate in BPM via text.
6) The process of sending location coordinates as well as pulse rate will take place within a gap of one minute . but, these parameters can be achieved within a gap of 2/3 minutes by adding required delay.

7) For more protection our kit includes two more parameters viz., a buzzer and shock circuit. These two components are heaving separate buttons. In that case, to alert nearby people by pressing a button the buzzer will produce a continuous beeping sound and with that the location will be sent.

8) For shock circuit,a mosquito repellent bat's shock circuitry is used. For instantaneous protection a separate button is provided which will generate a shock in milliamps , enough to move apart. And by this process the whole circuit will work in accordance. The required power will be supplied to all components as per need using a 12v main supply.

X. RESULTS AND DISCUSSION

The section presents the results of proposed design considering performance of hardware as well as software.



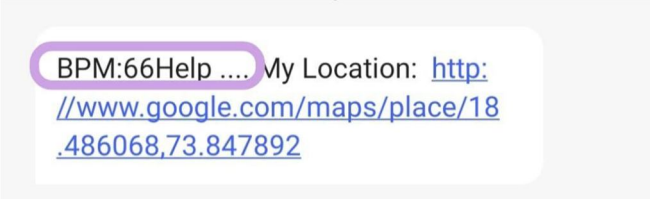
Here, a complete hardware set is shown in the table below. To initiate the working it is required to connect the battery with a GPS module as it is a battery powered device. For configuring the device, the main switch is made on. The connection for the antenna of the GPS and GSM module is verified whether they are configured properly or not.



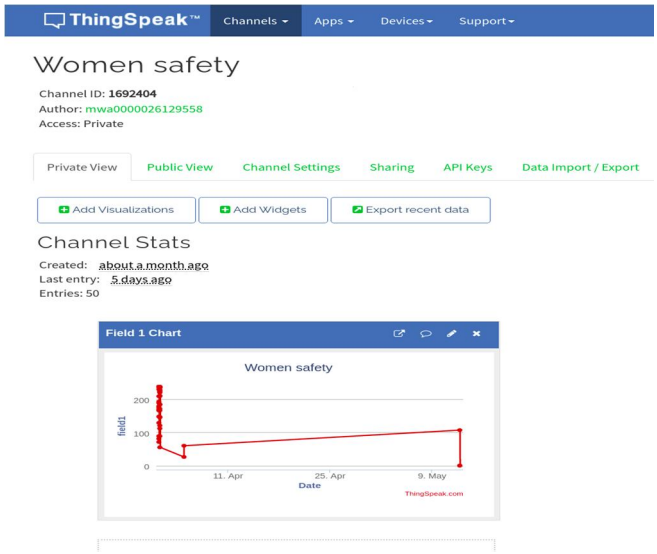
As soon as the circuit initiates working, the LCD shows the message "Women safety Device".



As the black key is pressed, it will send location via SMS. The process begins and it will print “location sending” on LCD and “location sent” after completion of sending message for that interval. After that it will send the victim's location with the delay of one minute continuously, and will repeat the same process till the circuit is on.



Since the pulse sensor is connected to the victim's body continuously the change in pulse rate will directly update on the LCD board. The same results will be sent to a predefined number via SMS which is going to include the location coordinates of victim latitude and longitudinally.



Now, to collect, store, analyze and visualize the results of the pulse sensor graphically the thingspeak cloud is used. Therefore, The change in pulse rate with respect to time (in minute) is displayed.

By pressing the buzzer key it helps to keep others alert about panic situations by producing a beeping sound as soon as the key is pressed and at the same time location coordinates are getting sent.

Here for more protection, a shock circuit is provided which will generate a shock in milliamps , enough to move apart. It outputs the stun upto 2400v, 100mA

XI. CONCLUSIONS

The idea provided here being first of its kind plays a crucial role for ensuring the Safety of Women that is automatically the fastest way possible. The proposed design will address significant challenges that women have experienced in the recent past and will assist in their resolution through technologically sound devices. With more research and invention, this concept could be utilized in a variety of security domains.

XII. ACKNOWLEDGMENTS

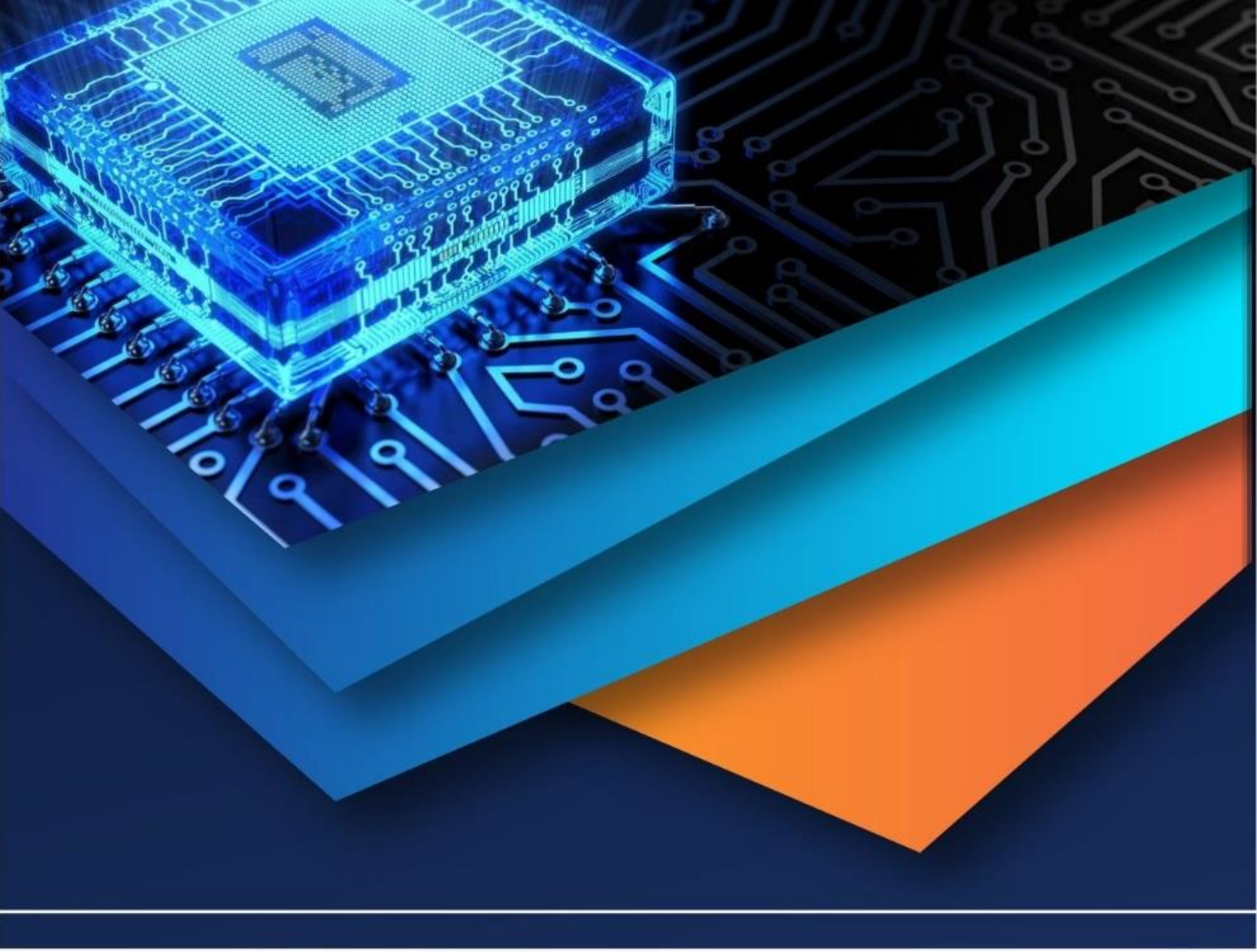
It is my great pleasure in expressing sincere and deep gratitude towards my guide Dr.S.P. Gopnarayan (Assistant Professor, Diploma, B.E. (E&TC), M.E. (E&TC)(Microwave), Ph.D (Pursuing)) for the key guidance, adequate support, time and constant encouragement towards the project also to persue additional studies in Women's Safety Device. We would like to express our deepest gratitude to Dr. M. P. Sardey, Department Head and Project Coordinator Prof. C. K. Bhange, and the entire personnel of the department of Electronics and Telecommunication Engineering at AISSMS IOIT, Pune, for their valuable support.

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