iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 6 **Issue:** V **Month of publication:** May 2018

DOI: http://doi.org/10.22214/ijraset.2018.5347

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 6 Issue V, May 2018- Available at www.ijraset.com

Home Theft Detection Using Speech Recognition

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Abstract: ***Home automation systems have become more efficient and cost effective in recent years due to the availability of cheaper hardware and relentless work of start-ups striving to make a dent in this industry. The advancement of technologies like Bluetooth, Wi-Fi, RF, ZigBee, WiMAX, Zwave, etc. paved way for developers to explore many alternatives to design smart home system. On the other hand, that many options also increases the ways in which security breaches can occur. Hence, maintaining security and integrity of such automation systems to prevent theft has not only become an area of interest but also an area of need. One such method which is hard to circumvent is speech recognition – easily integrated with the home automation system and requiring minimum user interaction. There are advantages and disadvantages to this method like any other and, are addressed in this paper. The sheer range of options available to help secure semi-automated or fully-automated home systems makes it cumbersome to address every point of failure. The following study helps an individual to choose a best fit method that suits his/her requirements based on the home automation system.***
Key Words: Home automation systems, Internet of things, speech recognition

I. INTRODUCTION

Home automation with respect to internet of things is the way the devices and appliances network together to provide a seamless control over the aspects of our home.[1][4]There has been a significant development in the field of home automation from the existing protocols [1]. The main task is to pick the right protocol from existing protocols which suits best for an individual. Home automation helps an individual control the desired appliances through wireless/wired communication and provides security. The existing systems are based on technologies such as Bluetooth, Zigbee, WiMax, cloud computing etc. The main issue with these automation systems are the area coverage and connectivity [2][3]. Bluetooth is a wireless automation protocol. The problem with using Bluetooth technology is the range it covers. The area range for communication covered by a Bluetooth automation protocol is 10 to 20 metres. Once a device is disconnected, reconnecting the Bluetooth becomes a task. Only a single user can be connected at a time and if more users are to be connected the whole code of the automation system is to be changed making it complex. In order to make things simpler, we use voice commands to control the devices in home automation. Speech recognition is a growing field with lots of research happening in this field[5].The devices can be automated to unlock the door of the house. By using motion and temperature sensors we can control the fans and lights. One of the most prominent fields in Artificial Intelligence is Natural langu ge processing. It helps the machine to understand the text how we humans do. The proposed system uses Wi-Fi based protocol. It is a local area network protocol. It controls the devices through voice commands as well as text. This paper entails a system using the AVR development board which can be controlled with the help of Google assistance. All the home appliances can be controlled on the mobile or the desktop/laptop. Speech recognition is used to control all the devices including the main door to make home automation more efficient and user friendly.

II. PROPOSED SYSTEM

A. Architecture of the proposed system

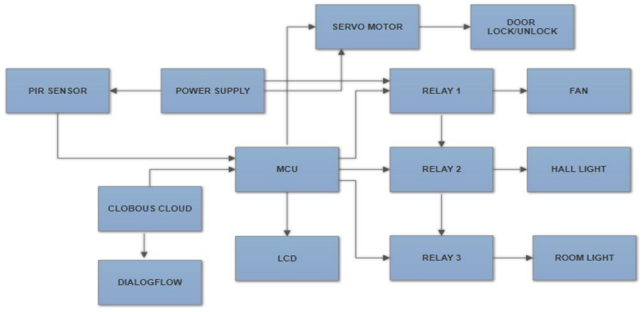


Fig1. Block diagram for the system

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B. Required Components

1) *ESP8266 Wi-Fi module:* ESP8266 is a Wi-Fi module which contains a self contained SOC with integrated with TCP/IP protocol. They can give access to any microcontroller to the Wi-Fi network. It is capable of either offloading all Wi-Fi networking functions from another application process or hosting an application. The ESP8266 comes with a set of AT command set firmware and it is an extremely cost effective board a growing community.
2) *AVR32 Development Board:* The AVR32 development board is made from double sided PCB board in order to provide extra strength to the joints of the connector for increased reliability. This board works with the voltage of 7 to 15V of AC or DC power supply. . It consists of three switches for boot loading, reset and power. All the ports of the of the AVR32 module are connected to a 10 pin standard FRC connectors. There are open pads for connecting the microcontroller pins to any external device.
3) *DS18B20 Temperature Sensor:* The temperature sensor is built in with a 12bit ADC which can be easily connected to the AVR32 development board .It communicates over a one-wire bus and can operate in two modes, normal or parasite mode. In the range -10 deg C to + 85 deg C it has a quoted accuracy of +/- 5deg C.
4) *PIR sensors:* PIR sensors are used to detect heat from their surroundings which is emitted by humans and animals. When there is a person in the field of vision of the sensor, it detects a change in the infrared energy. The PIR sensors have a range of approximately 6 meters.
5) *Relay:* Relay is a switch that opens and closes circuits electronically. They control the circuit by opening and closing contacts of another circuit .They are generally used to switch smaller currents in a control circuit and do not usually control the power of devices except for small motors.
6) *Dialog flow:* It is an end to end development suite by Google for conversational interfaces for websites, mobile applications, messaging platforms and IoT devices. It is used to have interactions with the user. It's driven by machine learning to recognize the intent of what the user wants to say.

III. IMPLEMENTATION

Step 1: The AVR32 development board is registered with the Clobous cloud and the Wi-Fi connections are established through the ESP8266 Wi-Fi module. The sensors, lights and fan connections are made as shown in Fig 1.

Step 2: The AVR32 microcontroller fetches the data from the sensors and displays it on the LCD screen . There are two modes programmed for this module. One is the auto mode and the other is the manual mode.

Step 3: When the module is in auto mode it checks for the temperature and displays it on the LCD. It also shows the status of the door , lights and fan . When in auto mode , the PIR sensor checks for the presence of a human, if a presence
is detected the lights are switched on automatically as shown in Fig 2 .The fan switches on automatically when the temperature is greater than or equal to 26 degrees as shown in Fig.3. The flow chart of this process is given in Fig 5.

Step 4: When the module is in manual mode , the user is in control of the appliances. When the user locks the door and if the PIR detects the presence of a human then the LCD displays a Intruder alert message for 5 seconds as shown in Fig.4 and sends a message to the user.



Fig 2. Auto mode

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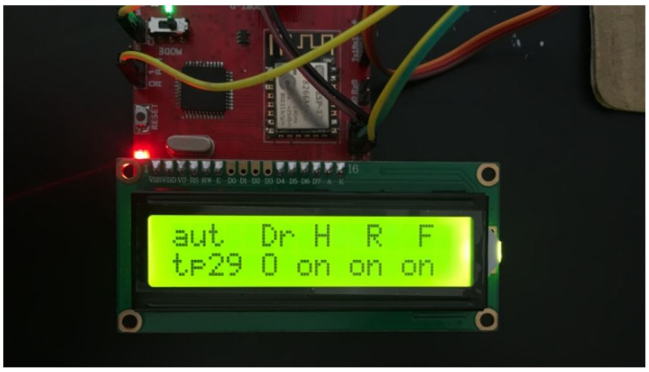


Fig 3. Auto mode with temperature greater than 26 degrees



Fig 4. Intruder Alert

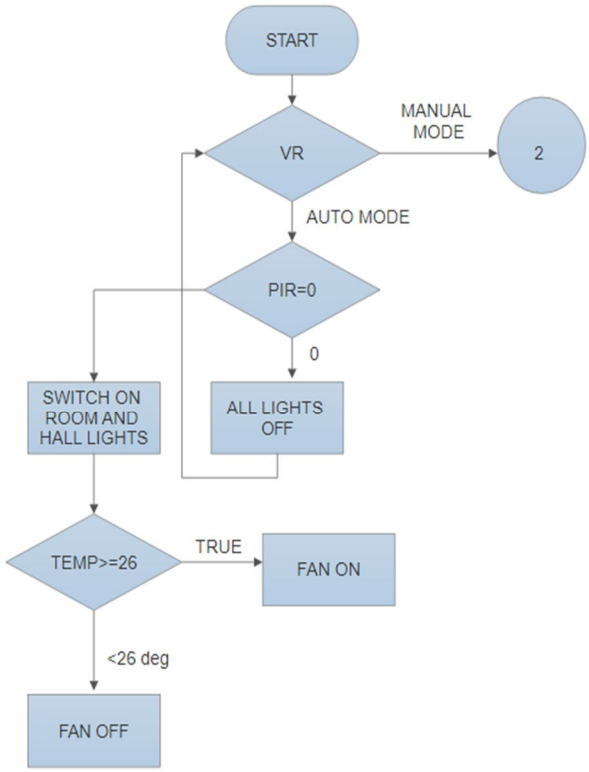


Fig 5. Flow chart for auto mode

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Step 5: Implementation of the speech recognition module

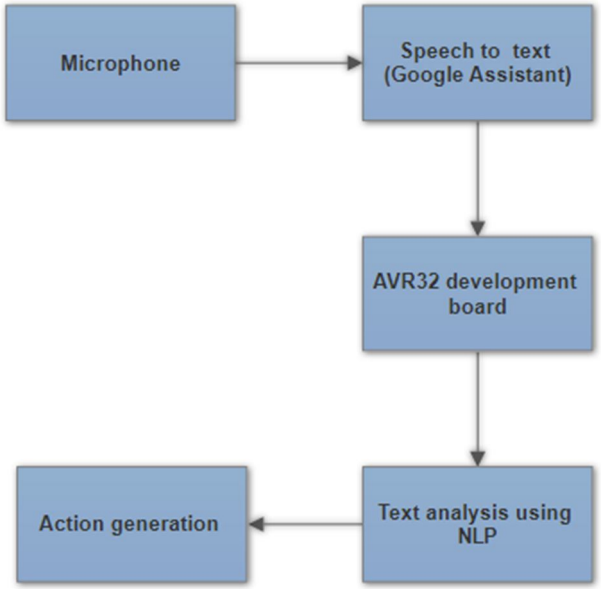


Fig 6. Block diagram for speech recognition module

The speech recognition module is implemented using Dialog flow intents and the Google assistant. The voice commands are accepted by the assistant which are made as intents and they are used to give commands via speech or text using the Google assistant as shown in Fig 6.

IV. CODE

```
char response[50], result[20];

void lcddisp()

{

lcd_gotoxy(0,0);
lcd_string(mod);
lcd_gotoxy(5,0);
lcd_string("Dr");
lcd_gotoxy(8,0);
lcd_string("H");
lcd_gotoxy(11,0);
lcd_string("R");
lcd_gotoxy(14,0);
lcd_string("F");
lcd_gotoxy(0,1);
lcd_string("tp");


lcd_gotoxy(7,1);
lcd_string(hall);
lcd_gotoxy(10,1);
lcd_string(room);
lcd_gotoxy(13,1);
lcd_string(fan);
lcd_gotoxy(2,1);
lcd_num(t);
lcd_gotoxy(5,1);
lcd_string(d);

}


    while (1)
    {
        t=read_temp();
        a=read(portc,0);
```

Code snippet 1

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```
        hall="off";room="off";fan="off";lcddisp();_delay_ms(400);
      }
      wifi_http("http://api.clobous.com/x14079/data/retrieve?vr",response);
      jsonparser(response,"vr",result);
      if(compare(result,"autom")==1){mode=0;}
      else if(compare(result,"manm")==1){mode=1;mod="man";lcddisp();_delay_ms(400);}
}
if(mode==1)
{
   wifi_http("http://api.clobous.com/x14079/data/retrieve?vr",response);
   jsonparser(response,"vr",result);
      if(compare(result,"hon")==1)
      {
         hall="on ";lcddisp();_delay_ms(400);
         write(portb,2,h);
      }
      if(compare(result,"hoff")==1)
      {
         hall="off";lcddisp();_delay_ms(400);
         write(portb,2,l);
      }
      if(compare(result,"Ron")==1)
      {
```

Code snippet 2

The code snippet 1 consists of the LCD display programming and the code snippet 2 consists of data retrieval from the cloud .

V. TESTING

These are the results for the testing phase . The testing is done with one room light ,one hall light and one fan . For testing we also considered the auto mode and manual mode . We have also tried testing for the door locking and unlocking mechanism.

A. Test case 1

Command: Change from auto mode to manual mode

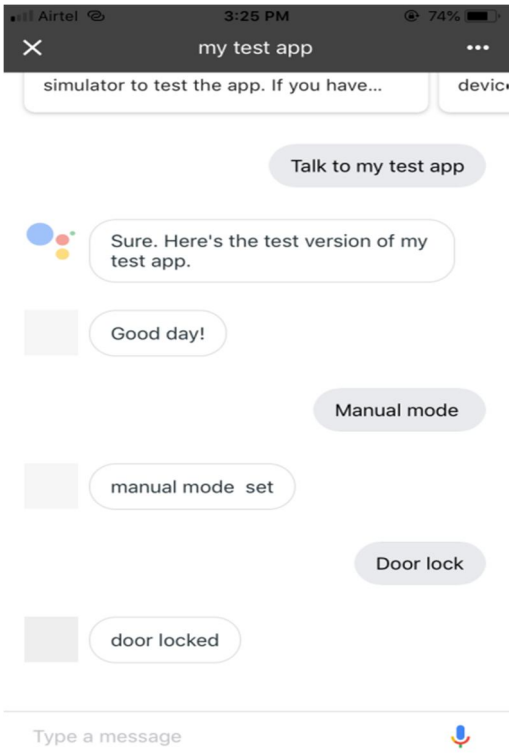


Fig 7. Output for Test case 1

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B. Test case 2:

Command: Switch on the hall lights

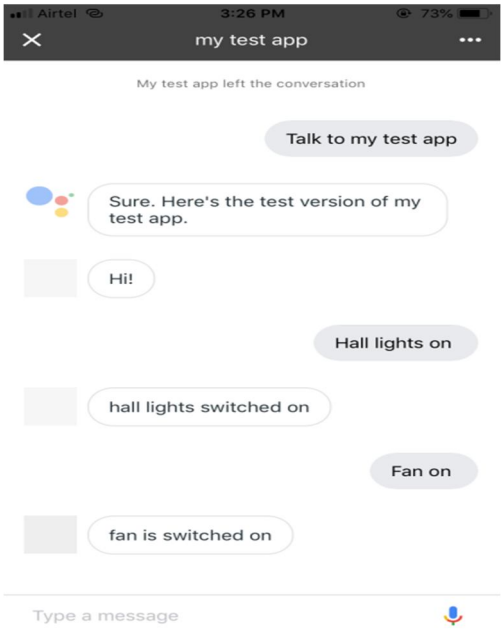


Fig 8.Output for Test case 2

C. Test case 3

Command : Switch on room lights

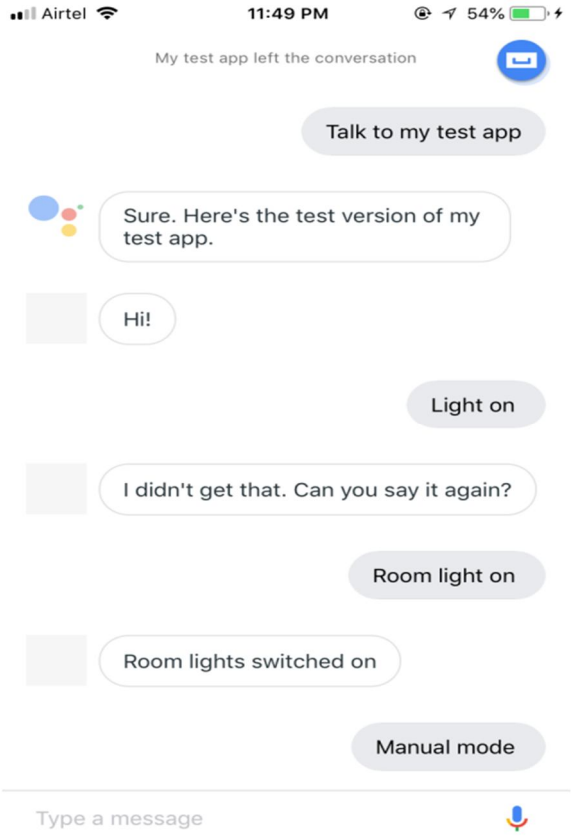


Fig 9 . Output for test case 3

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D. Test case 4

Command : Change to auto mode

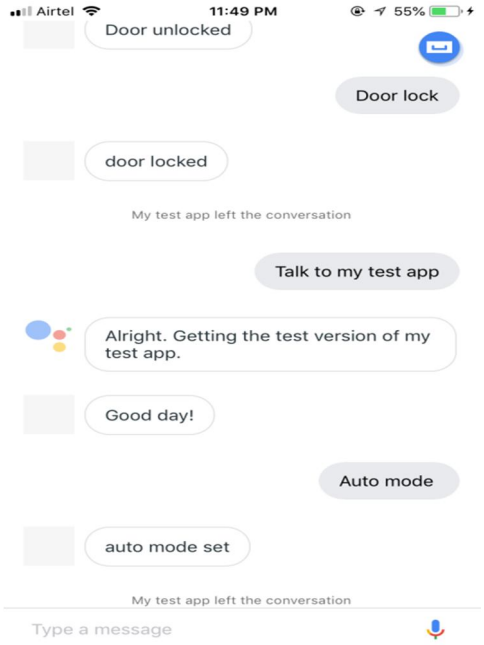


Fig 10.Output for Test case 4

VI. RESULTS

The proposed system has a cloud server and a voice command option to control the devices at home .The home automation system and the mobile device/PC should be connected to the same Wi-Fi. The devices can be controlled by using the registered email ID and password to enable security against unwanted users and to reduce unnecessary traffic in the network.

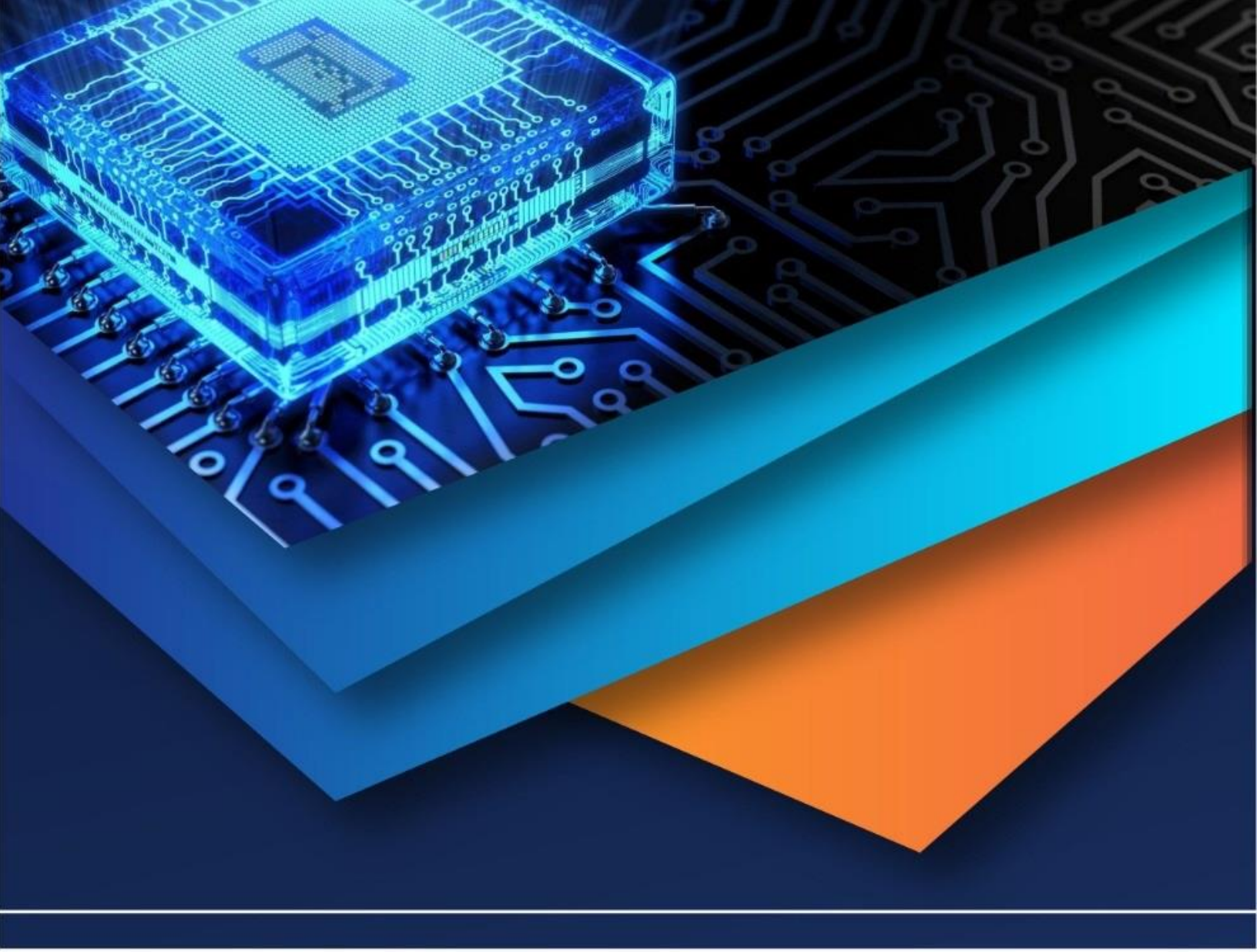
VII. CONCLUSION

Home automation system is designed and implemented using Google assistance and has been discussed .In the work, we have developed a system which controls major appliances in a house. The user can interact with the system through text or by using voice commands. Hence , this system is now more convenient to control the devices at home. In the future, we are planning to make the following advancements to the system : To be able to control more appliances such as windows,speakers and important appliances. To integrate the system with a fire alarm system for safety purpose . Making the system intelligent by using machine learning .

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