Smart Street Lights using Ultrasonic Sensors and Voice Controlled Lights using Node MCU

BY

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Introduction to Innovative Project

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OBJECTIVE

In this project I will try to implement two innovative methods to reduce electricity consumption:

- Smart Street Lights using Ultrasonic Sensors
- Voice Controlled Lights using NodeMCU

Keywords:

Ultrasonic Sensors
NodeMCU
Adafruit Arduino
Uno

ABSTRACT

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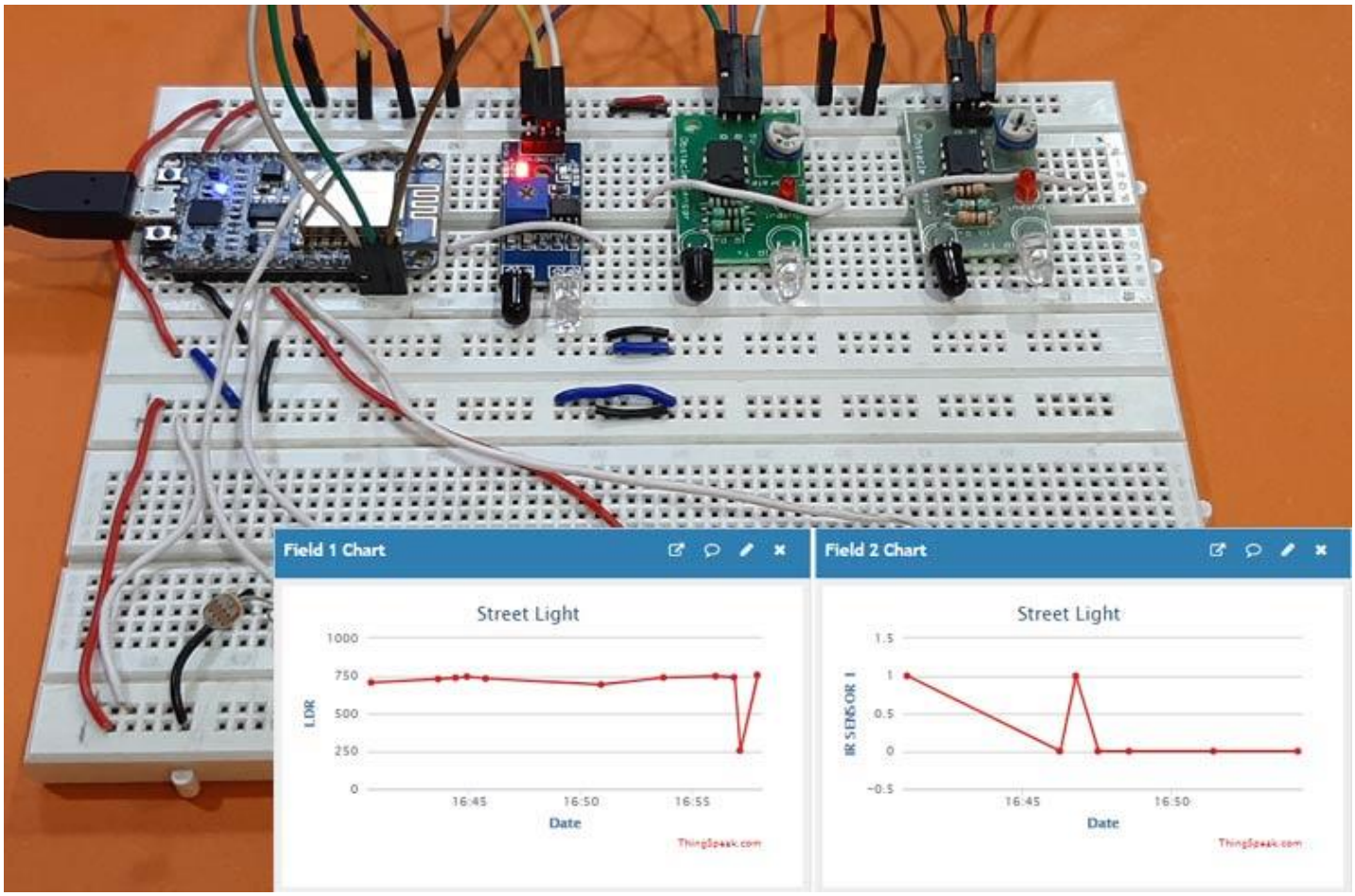
1. Smart Street Lights using Ultrasonic Sensors

This is an example of a functioning model that can detect movement and light up the LEDs appropriately. The technology has emerged as a cutting-edge intelligent city application with significant promise for lowering energy costs and enhancing public safety.

The system shows how two smart city apps may help enhance public safety while also exposing numerous cybersecurity issues.

2. Voice Controlled Lights using NodeMCU

Google assistant is AI (Artificial Intelligence) based voice command service. Using voice, I can interact with google assistant and it can search on the internet, schedule events, set alarms, control appliances, etc.



This service is available on smartphones and Google Home devices.
I can control smart home devices including lights, switches, fans and thermostats using our Google Assistant.

I will build an application which can control home appliances. Here, I will control a 60W bulb using Google Assistant service just by our voice.

This application includes Google assistant along with Adafruit server and IFTTT service.

SOFTWARE AND COMPONENTS

Smart Street Lights using Ultrasonic Sensors

Hardware Components: Ultrasound sensors-2 Resistors

Breadboard Arduino Uno Jumpers LEDs-3

Software Used: Arduino IDE

1. Voice Controlled Lights using Node MCU

Hardware Components:

LED

Jumpers Resistors

Bread Board

Arduino Uno

Software Used:

Node MCU IFTTT

Google Assistant

Adafruit

Motive

This project aims to come up with ways to conserve energy by only using it when it's needed and not waste it. That is why I created intelligent street lights with ultrasonic sensors as a cost-effective alternative to turning. Turn on street lights only if there is a vehicle on the road; otherwise, turn them off. Because more street lights can be placed for the same price and operate on the same amount of energy, more street lights can be installed for the same price and run on the same amount of electricity. Hazardous locations are also covered with cameras and speed calculators.

With minor modifications in the equipment I use in our everyday lives, as the world approaches the era of automation, it becomes simpler to use and saves time and energy. Our voice-based lighting control system provides a sensible solution by making a minor change to current budget groups. It enables users to manage numerous devices with a single application, and they may speak instructions to the gadget even when they are not physically near to it. This will allow us to conserve energy by allowing us to switch off remote devices when I don't have time to do so manually. Even though many gadgets can interact through WiFi, they may be switched on or off by sensing the user's presence outside the first room and in the second room. Chambers, for example. This concept may also be used to cooperatively manage buildings in big cities.

Advantages

- Low cost solution
- Easy installation Saves electricity
- More units running on same amount of electricity
- Widespread camera coverage of dangerous roads at night
- Speed checking meters can be installed, as presence of car is detected

- Less time and energy required to operate devices
- Minor changes in circuitry involved
- Communication betIen devices possible through WiFi
- More automated approach towards daily routines

Disadvantages

As time goes on, people become more sluggish, squander more resources, and strive to make their lives simpler while the environment suffers. Our needs are growing, yet I aren't all contributing equally to the production of the resources I need. People are drawn to technologies without considering their environmental consequences, which have an effect on society and result in an increase in waste such as industrial waste, gases, hazardous chemicals, and pollution. People purchase new phones and update their gadgets every two years. The entire picture is alarming, and I question if such advances are really necessary since they do more damage than benefit. Without suggesting the equivalent environmental effect, our lives have been made easier or created a new concept. This word, too, should be changed to reflect the fact that an invention that damages the environment eventually affects us rather than the innovation itself. I must seek ecologically friendly solutions since they are genuine breakthroughs that can and will be utilized long-term. More individuals are becoming aware of their responsibilities and acting responsibly as a result. The solutions I offer take this into consideration while generating no extra trash or having negative environmental consequences.

PROPOSED MODEL

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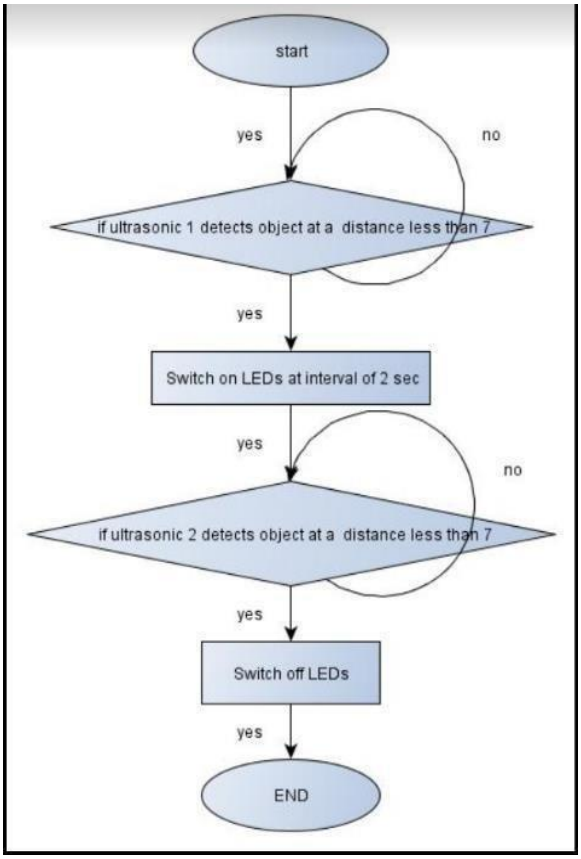
1. Smart Street Lights using Ultrasonic Sensors

Our approach is a tried-and-true way of loIring the energy consumption of street lights, which are a significant source of public energy. I plan to utilize an Arduino board to handle the control system for all street lights in our concept. I'll use passive infrared sensors to monitor activity on the road and attach this board to them. I detect the movement of the first street light on the street using this sensor, which alerts all other street lamps. As a result, all

other street lamps are triggered and switched on one by one for 2 seconds. It remains on until the final traffic signal on the street when the sensors detect movement indicating that the traveler has gone through. Each roadway will be equipped with two ultrasonic sensors, allowing us to conserve electricity.



In this functioning model, I utilized an Arduino UNO that was linked to two ultrasonic sensors, with the trigger (1) wired to the Arduino board's 5 digital pins. Similarly, I connect all of the other pins on the board of our sensors, which read the values of the pins and give the required information to the board. Suppose there is an item in front of the sensor. In that case, the ultrasonic waves will reflect back on the echo pin, which will be high for a long; the wave's duration back into the sensor is the duration of the wave back into the sensor, and then spacing is what gives us our needed value.

After connecting the main components, which are the ultrasonic sensors, I combine some LEDs that serve as our street lighting, so in the program's code, I'll

first take values from the ultrasonic sensor (1), which I found on the street, then calculate them with d = t * s, which will give us the proximity of the object to the first sensor here, I put if the d = t * s, which will provide us with the proximity of the thing to the first sensor here, I, I can monitor the number of vehicles entering a road, and conserve electricity.

2. Voice Controlled Lights using NodeMCU

The stages for implementation are as follows:

I Sign up for an Adafruit account at www.Adafruit.com.

ii) In Adafruit, build a dashboard. This dashboard is a user interface that allows you to control things from a distance.

iii) After you've completed the previous stages, give the board a name and save it.

iv) To operate the OnOff light, build a feed (user interface). Simply pick the toggling feed option from the drop-down menu by clicking on the '+' symbol.

v) A pop-up window displays when you choose toggling the feed.

vi) Create our feed by typing its name (which will appear in the red box). Select the newly generated feed (here is our light) and go to the next stage.

vii) Configure the feed in the next step.

For the button, I use the text 0 (OFF) and 1 (ON) and then click Create. This will add a toggle button to your dashboard that you can use to adjust the lighting.

stuff from afar viii) My dashboard is now ready for Internet of Things (IoT) applications such as home automation.

IFTTT (If This Then That) is a (If This Then That)

If This Then That, or IFTTT, is a free Ib-based tool for building applets, which are strings of basic conditional statements. Changes in other online services, such as Gmail, Facebook, Telegram, Instagram, or Pinterest, may trigger an applet.

When a user tIets with a hashtag, for example, an applet may send an email message, or when someone tags a user in a picture on Facebook, an applet can copy a photo from Facebook to the user's archive.

IFTTT

I used IFTTT to integrate the Google Assistant and Adafruit chain services. So, when I ask Google Assistant to turn on or off the lights in my home, I say, "OK Google, turn on or off the lights." The message is then translated by IFTTT and sent to the Adafruit dashboard as an intelligible command for the newly formed feed.

The steps to set up IFTTT are as follows:

i) The first step is to set up an account with IFTTT.

Note: Use the same email address you used for Adafruit to create an IFTTT account.

ii) After you've created an account, go to My Applets and choose New Applet.

iii) After choosing a new applet, I will be sent to a new page where I must click this.

iv) Next, search for Google Assistant and choose it, then write speech phrases that will be used as commands for the Google Assistant.

v) I may add any phrase that is appropriate for our application; as you can see, the words entered in the previous fields are for turning on the light; to turn it off, I must build a new applet with other terms.

vi) I now arrive at a new screen, where I must choose the option to link Google Assistant to Adafruit.

ix) After that, look for Adafruit and pick it.

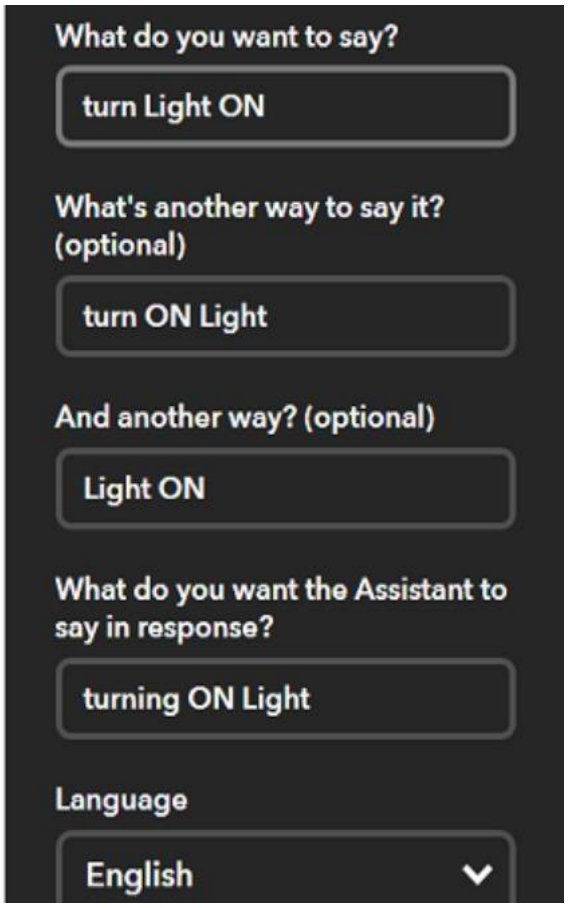
x) Select the action that sends a feed to your Adafruit IO once you've chosen Adafruit.

xi) In the Adafruit dashboard, specify which data should be sent to which feed.

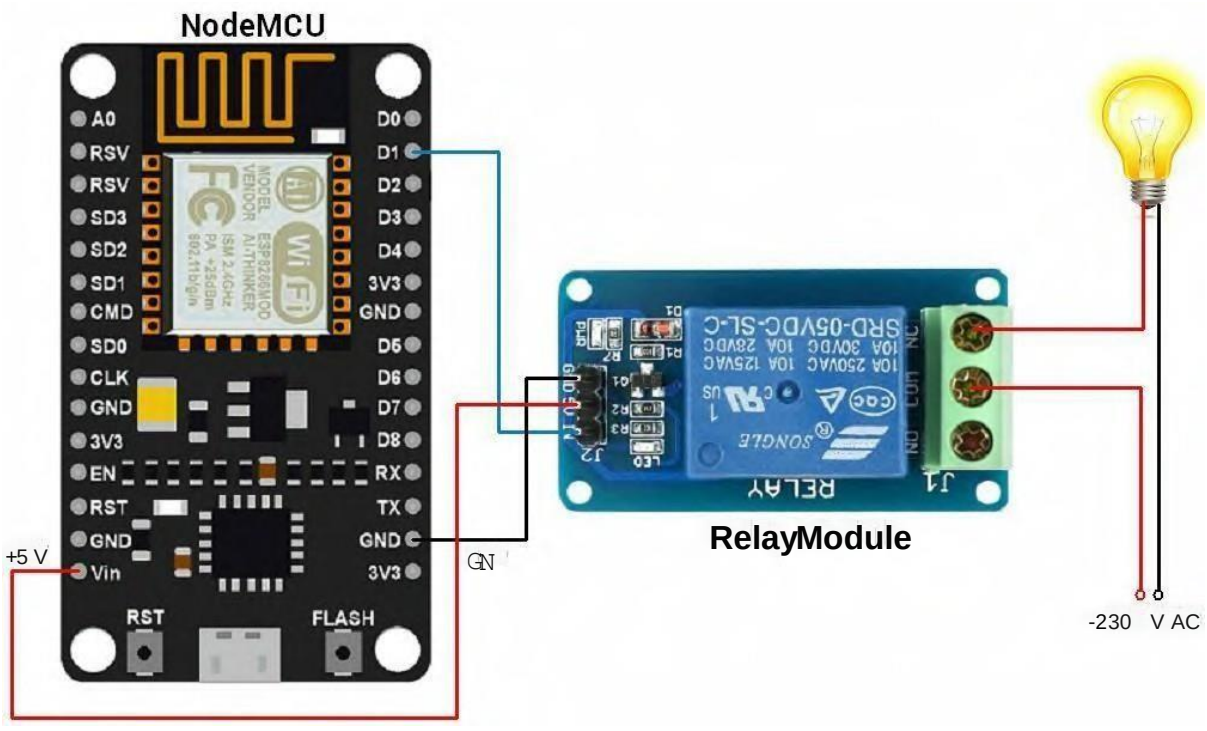
xii) Select Create Action from the drop-down menu.

So, when I use Google Assistant on my phone and say something like "Ok Google, turn the LED," the IFTTT applet gets the instruction and transmits the data "1" to the Adafruit feed. On the Adafruit board,

which is constantly monitored by the microcontroller, this will set off the event (here NodeMCU). Based on the data changes on the Adafruit board, this microcontroller will take action.



Interfacing Diagram:



Libraries used:

Here, I used the Adafruit MQTT library for receiving data from the Adafruit server. To install this library, select option **Sketch -> Include Library -> Manage Libraries.**

In that library, search for Adafruit MQTT and installed it.

Control Home's Light using Google Assistant and NodeMCU

I built an IoT based application in which I control the LED remotely using AI based Google Assistant.

Here, I used NodeMCU to read data from Adafruit server and act accordingly. LED connected to NodeMCU via relay for controlling it voice command using google assistant.

Arduino IDE Interface Code:

```
#define trigPin1 6
#define echoPin1 5
#define trigPin2 10
#define echoPin2 9

long duration, distance1,distance2, RightSensor,BackSensor,FrontSensor,LeftSensor;

void setup()
{
Serial.begin      (9600);
pinMode(trigPin1, OUTPUT);
pinMode(echoPin1, INPUT);
pinMode(trigPin2, OUTPUT);
pinMode(echoPin2, INPUT);
}

void loop() {

SonarSensor(trigPin1, echoPin1);
RightSensor = distance1;
if(distance1<10)
```

```
{


  digitalWrite(7,HIGH);

delay(10);
digitalWrite(4,HIGH);
delay(10);
digitalWrite(3,HIGH);
}

SonarSensor(trigPin2,
echoPin2);       LeftSensor       =
distance1; if(distance1<10)
{

  digitalWrite(7,LOW);

delay(10); digitalWrite(4,LOW);
delay(10); digitalWrite(3,LOW);
}

Serial.print(LeftSensor);

Serial.print(" - ");

Serial.println(RightSensor);


}
void SonarSensor(int trigPin,int echoPin)

{

digitalWrite(trigPin, LOW);
delayMicroseconds(2);
digitalWrite(trigPin, HIGH);
delayMicroseconds(10);
digitalWrite(trigPin, LOW); duration
= pulseIn(echoPin, HIGH);
distance1 = (duration/2) / 29.1;

}
```

SUMMARY AND RESULTS

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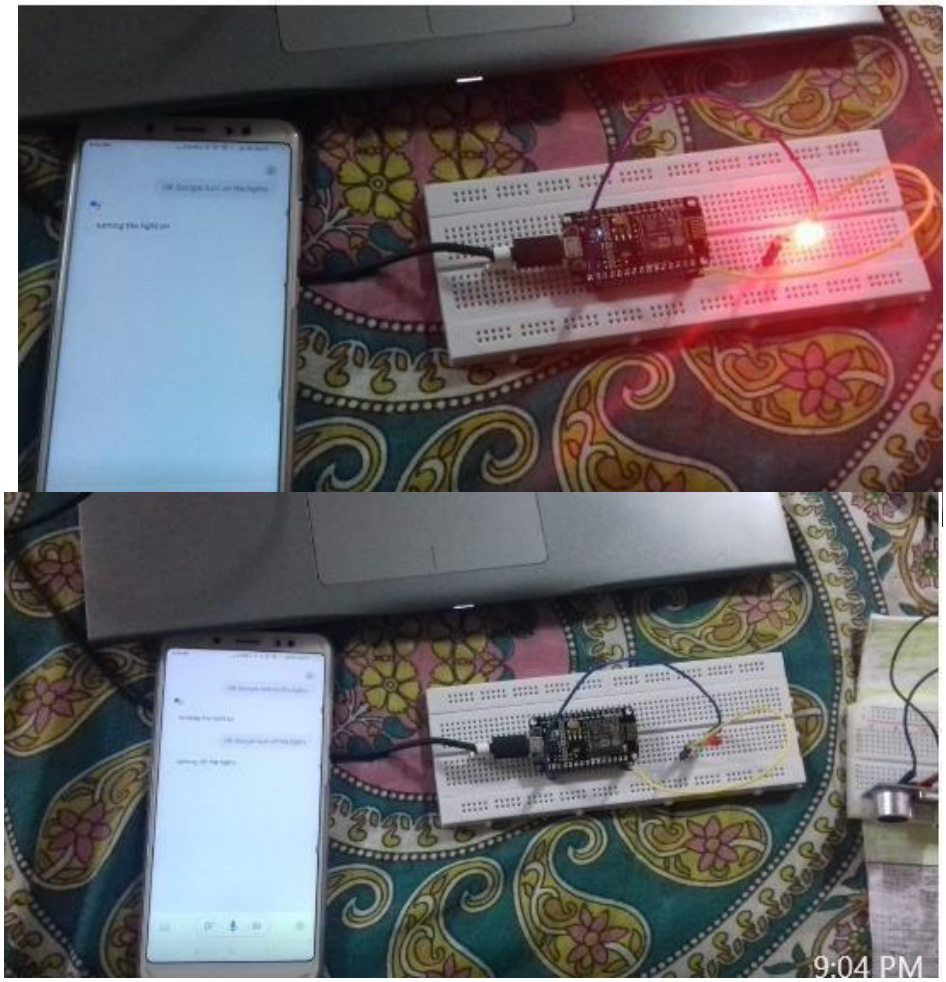
1. Smart Street Lights using Ultrasonic Sensors

Currently, in the whole world, enormous electric energy is consumed by the street lights, which are automatically turn on when it becomes dark and automatically turn off when it becomes bright. This is the huge waste of energy in the whole world and should be changed. The main aim of the proposed model is that lights turn on when needed and light turn off when not needed. Moreover, this system behaves like usual street lights that turn on all night, and can also be used to calculate the amount of traffic at any point of time. The project is designed for LED based street lights. A number of LED streetlights glow for a specific distance ahead, on sensing an approaching vehicle and then switches OFF once the vehicle passes by. Thus a lot of energy is saved in this process. Optionally, dimming feature can be used in this system while no vehicles are passing on the road.

2. Voice Controlled Lights using NodeMCU



Today, the world is progressively being overrun by IoT technology, which allows distant objects to be controlled simply by speaking a command or pressing a button, as long as there is a strong WiFi connection in the vicinity. The Google Assistant technology, which can be used in larger areas such as current smart street and smart city concepts and serves as an energy-efficient, environmentally friendly, and cost-effective solution for control and communicates with multiple devices at the same time, can also be connected accordingly in residential buildings