

FULL HOME AUTOMATION SYSTEM WITH THE NODEMCU ESP8266 BOARD AND THE NEW BLYNK APP

Project Report submitted by

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under the Guidance of

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in the partial fulfillment for the award of the degree of

BACHELOR OF TECHNOLOGY

in

ELECTRONICS AND COMMUNICATION ENGINEERING



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2021-2022.**

CERTIFICATE

This is to certify that the work which is being presented in the B.Tech MiniProject Report on “ FULL HOME AUTOMATION SYSTEM WITH THE NODEMCU ESP8266 BOARD AND THE NEW BLYNK APP” submitted by B.MAHITHA,Y.PRASANNA,J.NAGA SWATHI, bearing ID No:R170758,R170962,R170765 to the Rajiv Gandhi University of Knowledge and Technologies (RGUKT),RK VALLEY in the fulfilment of the requirements for award of the Bachelor of Technology in Electronics and Communication Engineering.

Results embodied in this have not been submitted to any other university/institution for award of degree.

Head of the Department, Dept of ECE,
Mr.Shaik MOHAMMED RAFI,
Assistant professor.

Project Guide,
N.MOHAN RAJ,
Assitant professor.

DECLARATION BY STUDENT

We certify that,The work made in this report has been done by me under the guidance of my supervisor. We have confirmed to the norms and guidelines given in the ethical code of conduct of the institute. Whenever we have used materials(data, theoritical analysis, figures and text) from other sources, we have given due credit to them by siting them in the text of the report and giving their details in the references. Furher, we have taken permission from the copyright owners of the sources, whenever necessary.

Project submitted by,
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ACKNOWLEDMENT

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Project overview :

In this Project ,describes the overall notion of the IOT based sensing systems and monitoring systems for implementing an automated home. The proposed prototype uses Node MCU board with internet being remotely controlled by Android OS smart phone. Node MCU is the heart of this system and it can perform as a micro web server and it acts as an interface for the wide range of hardware modules. To control lights, fans and other home appliances which are connected to the relay system, the system offers switching functionalities. It is also used for environmental monitoring by sensing and analyzing data about temperature and humidity. Another notifying feature in this system designed is the intrusion detection which is offered by this system using motion sensor.

All these activities are controlled by using Android mobile app- Blynk.

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ABSTRACT :

Internet of Things is composed of things that have unique identities and are connected to each other over internet .It is simply connecting and monitoring various devices and sensors through Internet. This paved the way for home automation and monitoring which makes human life more comfortable and secured. This paper describes the overall notion of the IOT based sensing systems and monitoring systems for implementing an automated home. The proposed prototype uses Node MCU board with internet being remotely controlled by Android OS smart phone. Node MCU is the heart of this system and it can perform as a micro web server and it acts as an interface for the wide range of hardware modules. To control lights, fans and other home appliances which are connected to the relay system, the system offers switching functionalities. It is also used for environmental monitoring by sensing and analyzing data about temperature and humidity. Another notifying feature in this system designed is the intrusion detection which is offered by this system using motion sensor.

All these activities are controlled by using Android mobile app- Blynk.

INTRODUCTION :

IoT (Internet of Things) is the environment in which physical items interact with each other and user-to-computer communications, machine – to- machine communications are enabled and this communication is extended to “things”

[1]The IOT devices have the capacity to exchange the contents depending upon the control of function in a specified manner. The benefit of IOT networks is that they can separate and create information by designating, filtering, handling and extracting the data.

[2] IOT plays a virtual role of creating smart environments by connecting to the internet.

[3].Also as IoT deals with large quantity of data received from different sensors which are deployed in the smart environment, sufficient care has to be taken for efficient maintaining, securing and for storing this collected data

[4].This system also works for the security purpose, if any inevitable incident happens, the user will immediately receive alert message in their smart phone.

Working Principle:

Home automation works via a network of devices that are connected to the Internet through different communication protocols, i.e Wi-Fi, Bluetooth, ZigBee, and others. Through electronic interfaces, the devices can be managed remotely through controllers, either a voice assistant like Alexa or Google Assistant or an app. Many of these IoT devices have sensors that monitor changes in motion, temperature, and light so the user can gain information about the device's surroundings. To make physical changes to the device, the user triggers actuators, the physical mechanisms like smart light switches, motorized valves or motors that allows devices to be controlled remotely.

Home automation works on three levels

Monitoring: Monitoring means that users can check in on their devices remotely through an app.

Control: Control means that the user can control these devices remotely, like panning a security camera to see more of a living space.

Automation: Finally, automation means setting up devices to trigger one another, like having a smart siren go off whenever an armed security camera detects motion. A. COMPONENTS REQUIRED

COMPONENTS:

- 1) NODE MCU ESP8266
- 2) DHT-11 sensor
- 3) Ultrasonic sensor
- 4) MQ 2 sensor
- 5) PIR sensor
- 6) LCD Display and I2C Module
- 7) 2-Channel Relay
- 8) Mobile phone
- 9) Power supply board
- 10) Bread Board
- 11) 5V Buzzer
- 12) Jumper Wires

Software required:-

- 13) Blynk App

COMPONENTS EXPLANATION :

NODE MCU ESP8266

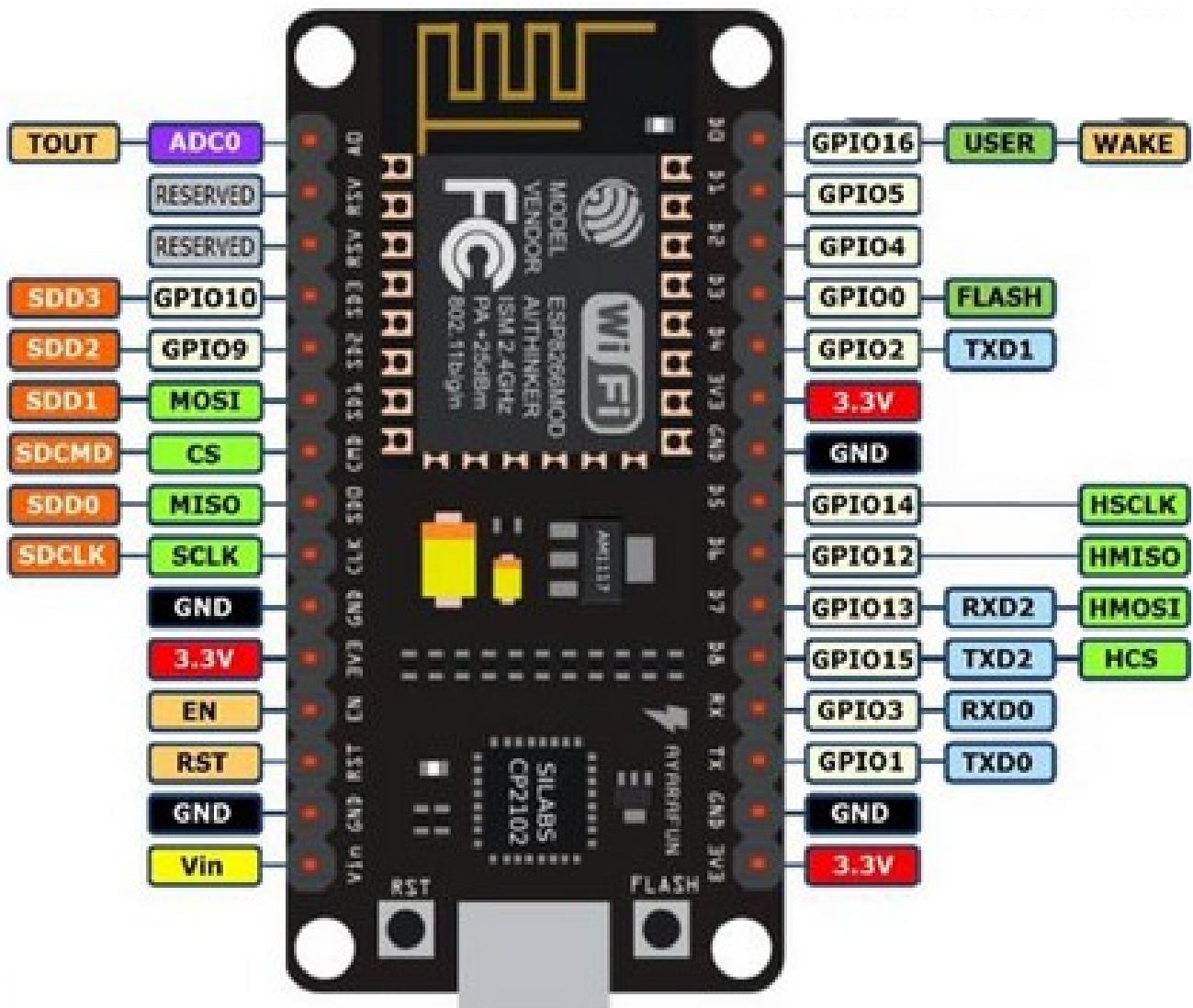


fig 1.NODE MCU ESP8266

NodeMCU is an open source platform based on ESP8266 which can connect objects and let data transfer using the Wi-Fi protocol.

It has 17 GPIO pins (11 are digital I/O pins),out of which one pin is an analog pin,4 pins support PWM ,2 paires are for UART(UART0 and UART1) and supports 1 for SPI and 1 for I2C protocol.

NodeMCU ESP8299 has 128kb of Ram,4MB of Flash memory, and a maximum clock speed of 160MHZ(80-160).The operating current is 80mA(average)

Two push buttons(RST and FLASH) ,one 5-3.3 v regulator,USB to TTL converter,ESP 12e chip ,LED and Antenna are available.

Two pins are reserved for general purpose and MISO,CS,SCLK,MOSI are for serial communication.

Four Ground pins,3 pins for Vcc and one pin is for Vin.
These are the pins available in NodeMCU 8266

The general features of this board are as follows:

- Easy to use
- Programmability with Arduino IDE or LUA languages
- Available as an access point or station
- practicable in Event-driven API applications
- Having an internal antenna
- Containing 13 GPIO pins, 10 PWM channels, I2C, SPI, ADC, UART, and 1-Wire

ULTRASONIC SENSOR:



fig 2. Ultrasonic Sensor

Pin 1 - VCC
Pin 2 - Trigger Pin
Pin 3 - Echo Pin
Pin 4 - GND

- We can use this sensor for mainly measuring distance. Therefore, we can get the water level in the water tank. But I recommended, please use a waterproof ultrasonic sensor. You can use it for a long time.

The main process of this sensor is to calculate the distance to an obstacle. The sensor emits a wave and calculates the distance by the time it takes to reflect in the face of an obstacle. For example, the reader system and the bats used this method. This ultrasonic sensor includes two knobs. One knob emits a pulse and the other knob detects the pulse. This sensor cannot be used for long distances. The maximum value is 25-30 cm. It will not be satisfied with the values beyond that. It is more suitable for short distances. If you need long-distance sensors, there are various sensors available in the market. Waterproof sensors are also available in the market. Below is how the ultrasonic sensor works with the Arduino board. The components required for this project and how to purchase these components are given below. we can use the serial monitor to watch the sensor readings.

PIR SENSOR

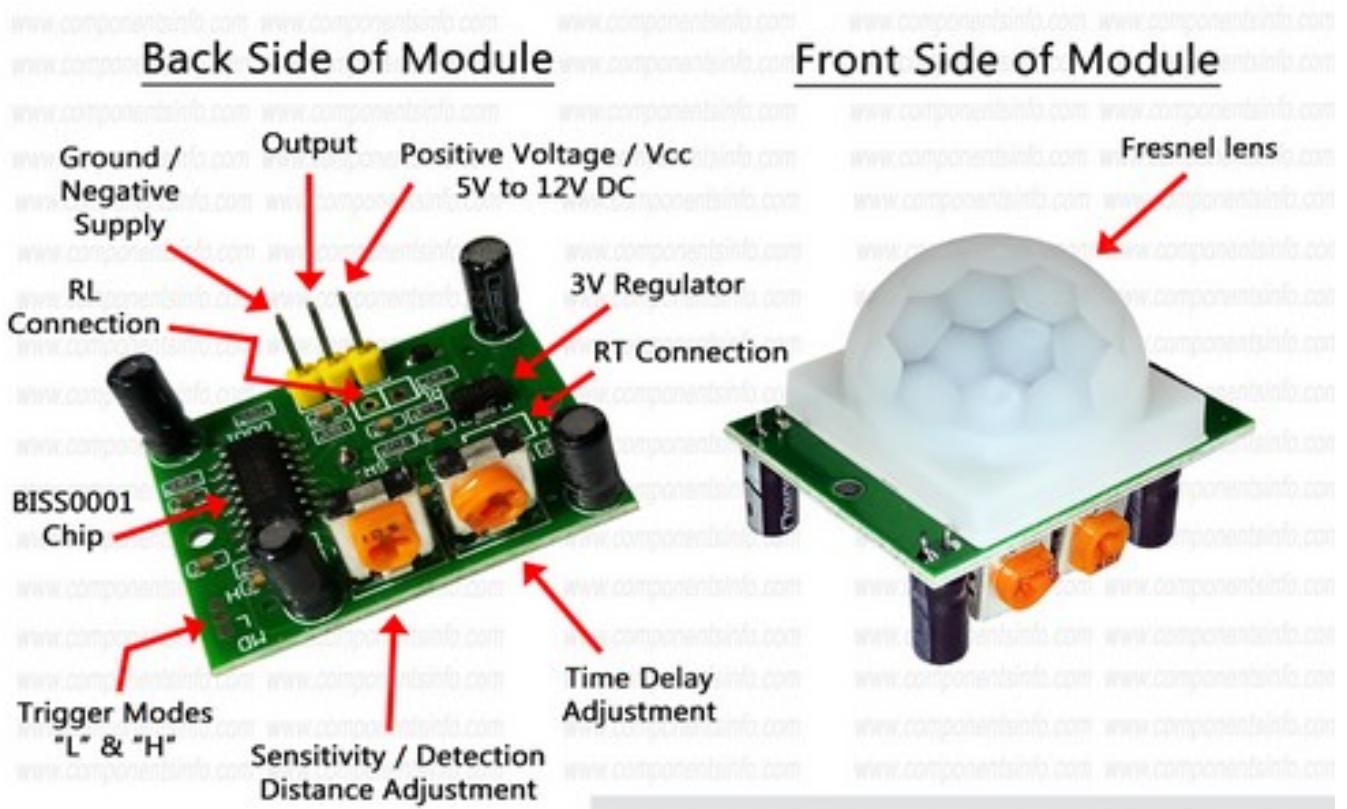


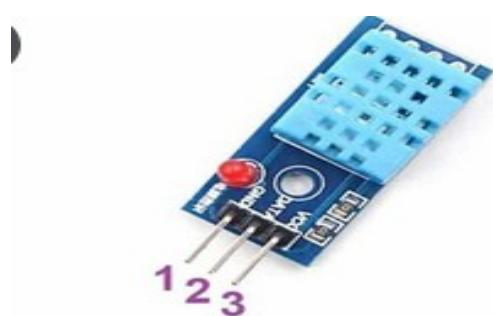
fig 3.PIR sensor

- We can use this sensor for detecting motions. I think this sensor is most suitable for this task. Because, It has a better sensing range, lower cost, and is more effective.
- The PIR sensor emits a digital signal when a person or something is in motion. It operates from 7 meters to 160 degrees.

- The PIR sensor is covered with a plastic hemispherical cover. Due to the plastic cover, a motion of up to 160 degrees is applied to the PIR sensor.
- You can remove the plastic cover and look at the sensor. This sensor has two preset. One preset changes the distance and the other preset changes the delay time. Delay time is how long the signal should be given by the sensor. The PIR sensor has three pins. The middle pin is used to receive the signal. The other pins are used to power the sensor.
- The PIR sensor emits digital signals. Gives a digital value of 1 when a movement occurs and 0 when it does not. Okay, let's do the project step by step using the PIR sensor. The required components are as follows.

DHT-11 sensor

- Through this sensor, we can get the temperature and humidity values. Also, if you want to get more accurate values, please use the DHT22 sensor.



Pin 1- GND
Pin 2- DATA
Pin 3- VCC

fig 4. DHT -11 sensor

- The DHT 11 sensor incorporates a substrate containing surface moisture and electrons to measure the humidity level. When water vapor is absorbed from the substrate, ions are released from the substrate, increasing the conductivity between the electrodes. The difference in resistance between the two electrodes is proportional to the relative humidity. Higher relative humidity reduces the resistance between the electrodes and lowers relative humidity increases the resistance between the electrodes. The amount of water vapor can be measured by the electrical resistance between the two electrodes.

DHT 11 sensor details

- Humidity readings with 5% accuracy.
- Temperature readings $\pm 2^{\circ}\text{C}$ accuracy.
- Body size 15.5mm x 12mm x 5.5mm.
- 2.5mA max current use.
- Low cost.

MQ2 SENSOR

Pin1: VCC
Pin2: GND
Pin3: AO
Pin4: DO



fig 5. MQ2 sensor

- The sensor is made of 6 pins with a stainless steel mesh cover on the outside. This mesh is designed so that only air particles can pass through. Also, this iron mesh connects to the sensor body using a stainless steel ring. These sensors belong to the metal oxide semiconductor type. That is, when a gas enters the sensor, the concentration of the gas is detected according to the degree to which the resistance of the sensor element changes.

- When this sensor is powered on, the tin dioxide heats up to a high temperature. At that point, oxygen is absorbed to the surface. Then, when the gas we are measuring is brought close to this sensor, it reacts with the tin dioxide to reduce the surface absorption of oxygen. After, the electrons are released into the tin dioxide. Then the current flows freely. In this case, the resistance difference can be received as an analog or digital value through the voltage divider circuit in the module to which this sensor is connected.

16x2 LCD DISPLAY



figure 6: lcd display module pin diagram

- LCD stands for Liquid Crystal Display, and this display is made using liquid crystal technology.
- In this project, we have a 16×2 LCD display which means we can display a max of 32 ASCII characters on this at a time. The LCD module has 16 pins but we will use all the pins in this project.

- The LCD module can be used in two different modes, the first is 4-bit

mode and the second is 8-bit mode.

- We will use the 4-bit mode in this project, therefore, we have to connect only 4 data pins of the LCD module.

- The major difference between 8-bit mode and 4-bit mode is, an ASCII character is 8 bit long so when we use 8-bit mode, LCD will process the data in single instruction but in 4-bit mode, microcontroller will send 2 chunks of 4 bits and the LCD will process that in two instructions.

- There are two registers in the LCD module: The Data register and the Command register.

- When the RS(Register Select) pin is set to logic high, the data register mode is selected, and when it is set to logic low, the command register mode is selected.

- The RS pin will be set to logic high to display the data on the LCD.

The operating power supply will be 5 volts for the LCD module.

I2C Module:-



fig7:I2C module

- I2C is a **synchronous, multi slave, multi master packet switched, single-ended serial bus**. ie. multiple chips can be connect to the same bus. I2C uses only two bidirectional open collector or open drain lines, Serial Data Line (SDA) and Serial Clock Line (SCL), pulled up with resistors

- I2C is short for Inter-IC. And it is a type of BUS. This is designed by Philips semiconductors. I2C is a synchronous, multi slave, multi master packet switched, single-ended serial bus. ie. multiple chips can be connect to the same bus. I2C uses only two bidirectional open collector or open drain lines, Serial Data Line (SDA) and Serial Clock Line (SCL), pulled up with resistors. Typical voltages used are +5 V or +3.3 V, although systems with other voltages are permitted

2-Channel Relay

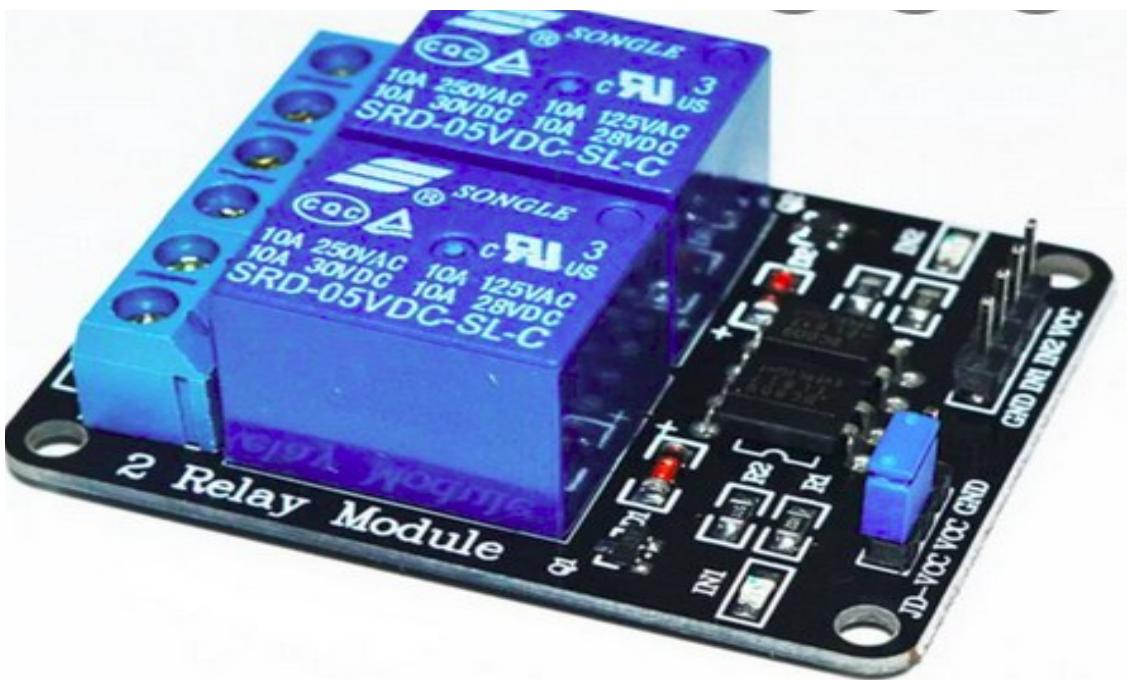


fig 8. 2– Channel Relay

- I used a two-channel relay module for this system. It depends on your appliance in the home. We can buy them 1-channel, 2-channel, 4-channel, 6-channel, 8-channel, and 16-channel in the market.
- Pins 1 and 2 are used to power this component. It is mentioned above on this device. We can get different types of relays like 5v, 6v, 9v, etc. The third pin must give us the potential we need to get the output. It can supply AC or DC voltage. However, the current available through this is shown at the top of the relay. That is, when the value is exceeded, the relay will burn out. Therefore, use devices with less current than the specified level. we can get outputs using 4 and 5 pins. The four-pin is called Normally close(NC) and the five-pin is called Normally open(NO). The four-pin is usually connected to the 3rd pin. The 5th pin connects to the 3rd pin when the relay is activated.

BREAD BOARD:

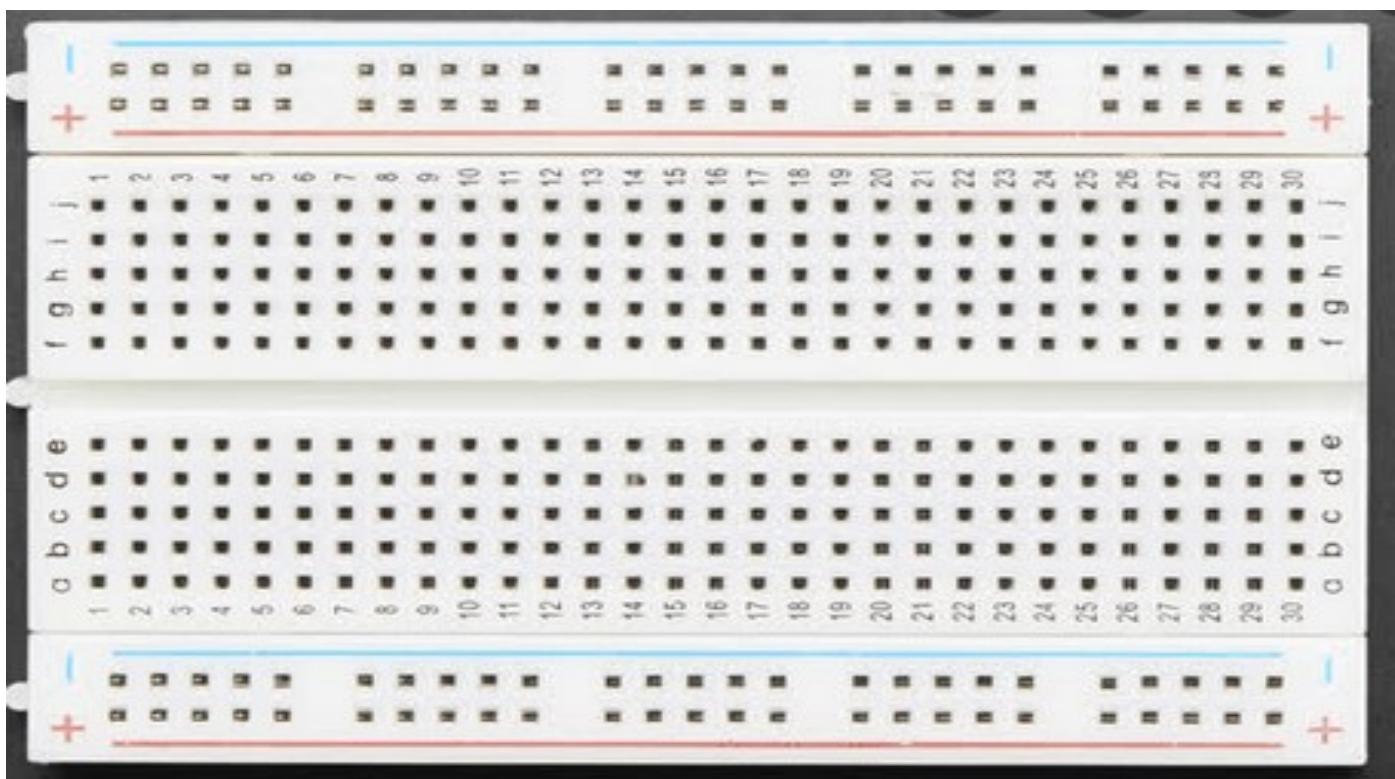


fig 9. Bread Board

- A Breadboard is simply a board for prototyping or building circuits on. It allows you to place components and connections on the board to make circuits without soldering. The holes in the breadboard take care of your connections by physically holding onto parts or wires where you put them and electrically connecting them inside the board. The ease of use and speed are great for learning and quick prototyping of simple circuits.
More complex circuits and high frequency circuits are less suited to breadboarding. Breadboard circuits are also not ideal for long term use like circuits built on perfboard (protoboard) or PCB (printed circuit board), but they also don't have the soldering (protoboard), or design and manufacturing costs (PCBs)

BLOCK DIAGRAM:

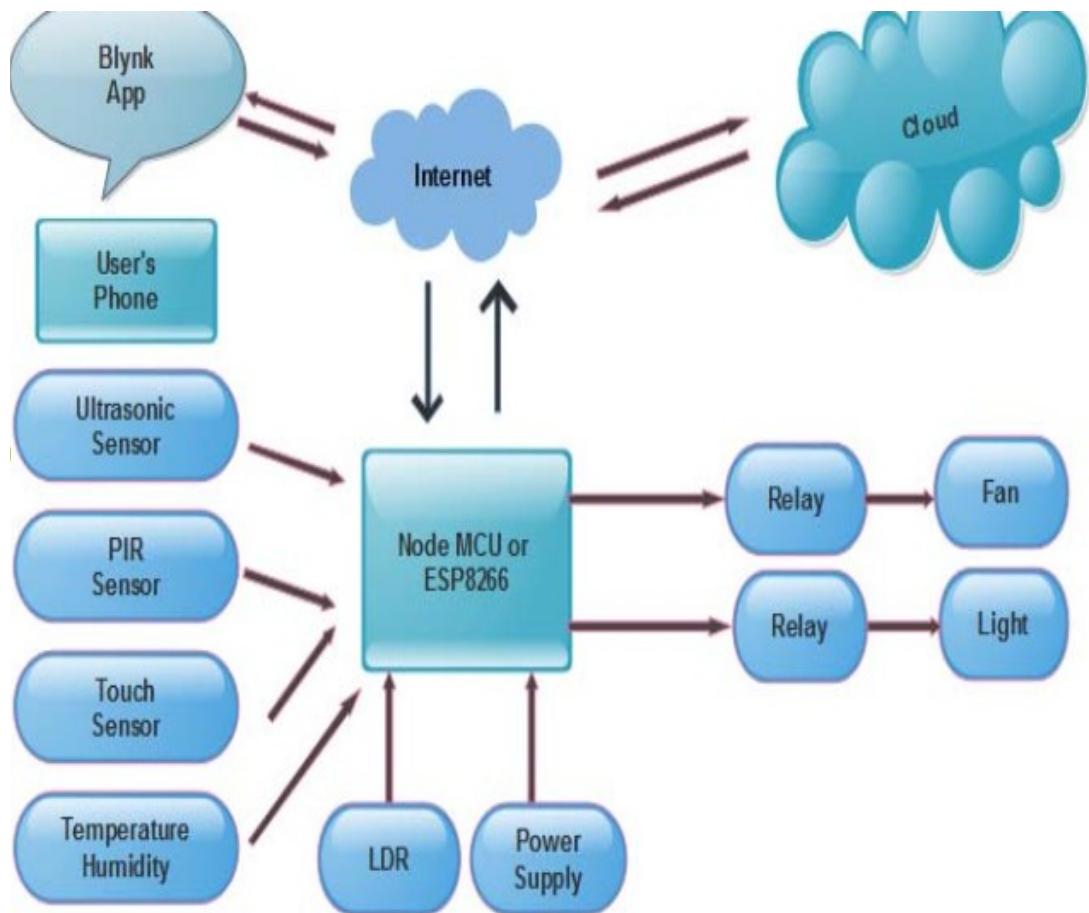


fig10.Block Diagram

CIRCIUT DIAGRAM:

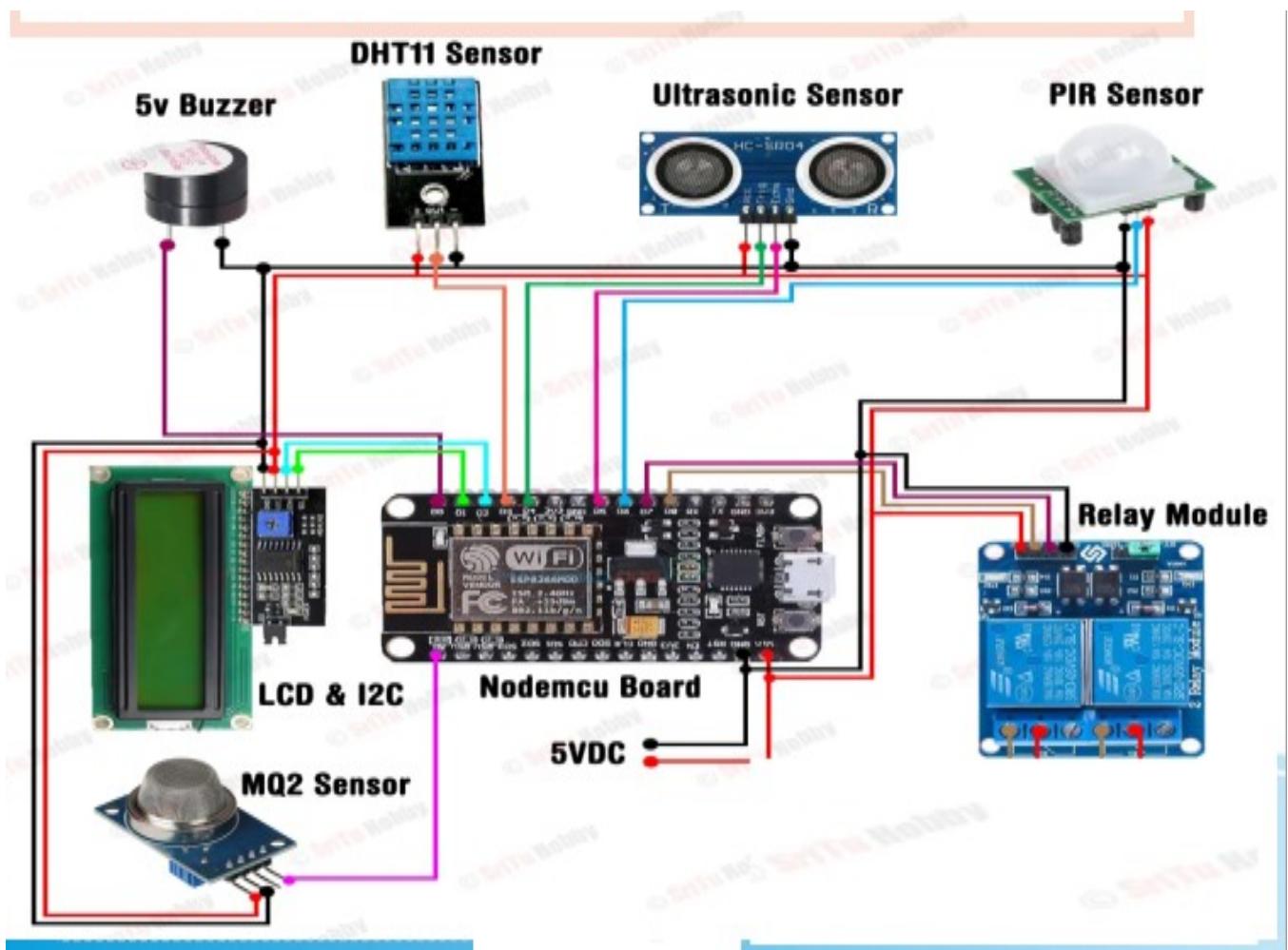


fig11.Circuit Diagram

PROCEDURE:

- 1)All Grounds and all Vcc s connected respectively.
- 2)The LCD and I2C module connected sequentially.
- 3)The I2C module SDA ,SCL pins are connected with D2 and D1 pins respectively.
- 4)5V Buzzer + connected to D0 pins.
- 5)DHT11 sensor Data pin is connected with D3 pin.
- 6)Ultrasonic sensor trigger,echo pins are connected with D4 and D5 pins.
- 7)Output pin of PIR sensor connected with D6 pin.
- 8)5v of power supply applied to vin pin of Nodemcu.
- 9)MQ2 sensor A0 connected with A0 pin.
- 10)The pins of IN1 and IN2 of Relay module is connecten to D7 and D8 pins.
- 11)connect to the computer

OK, the circuit is done. Now let's set up the Blynk app web dashboard. For that, first you have to create an account on the Blynk platform.

BLYNK APP WEB DASHBOARD:

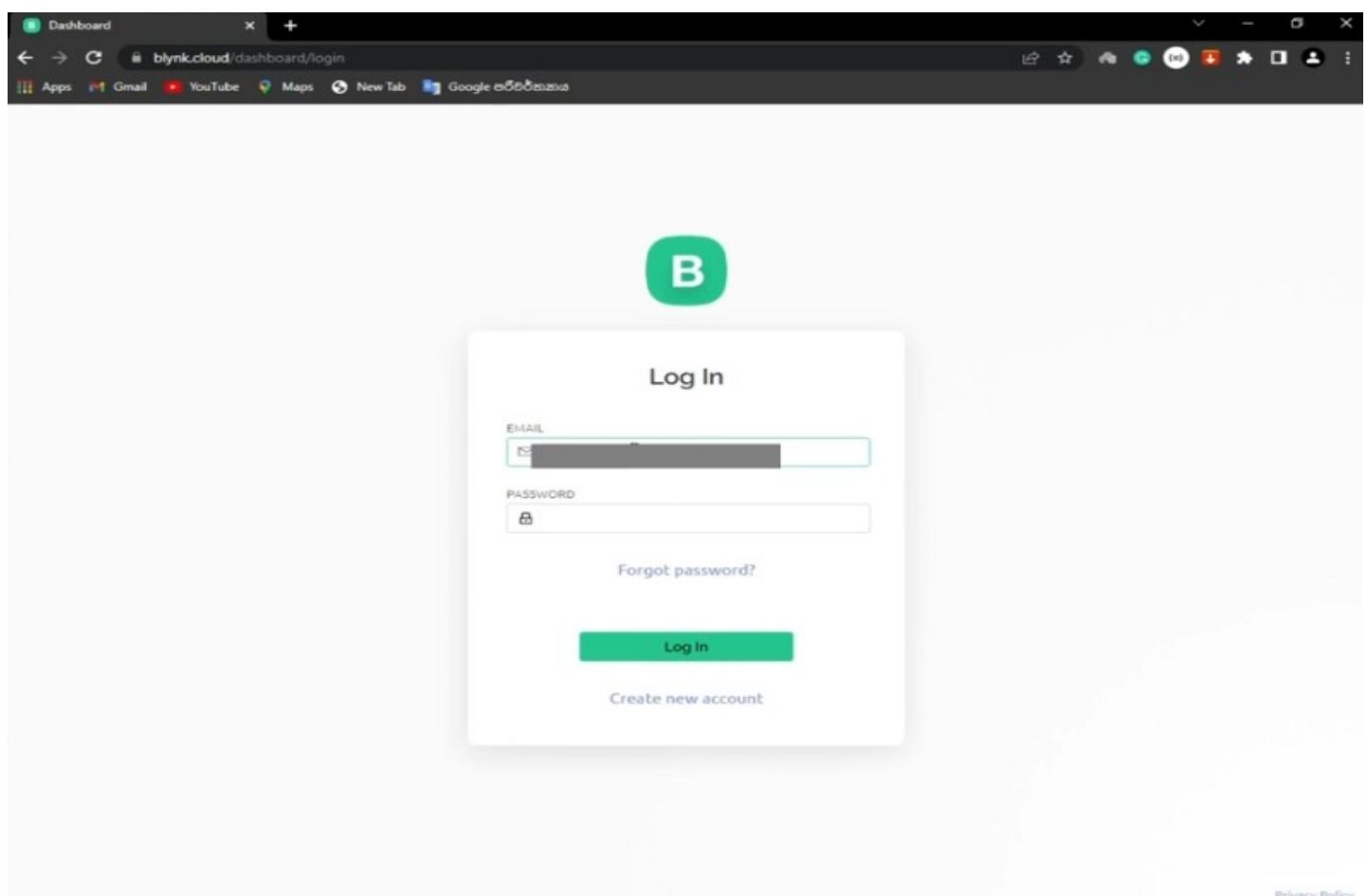


fig12.Sign in to account

Then, sign in to our account and create a new account on blynk app for the purpose of homeautomation monitering.

Creating of new Templates:

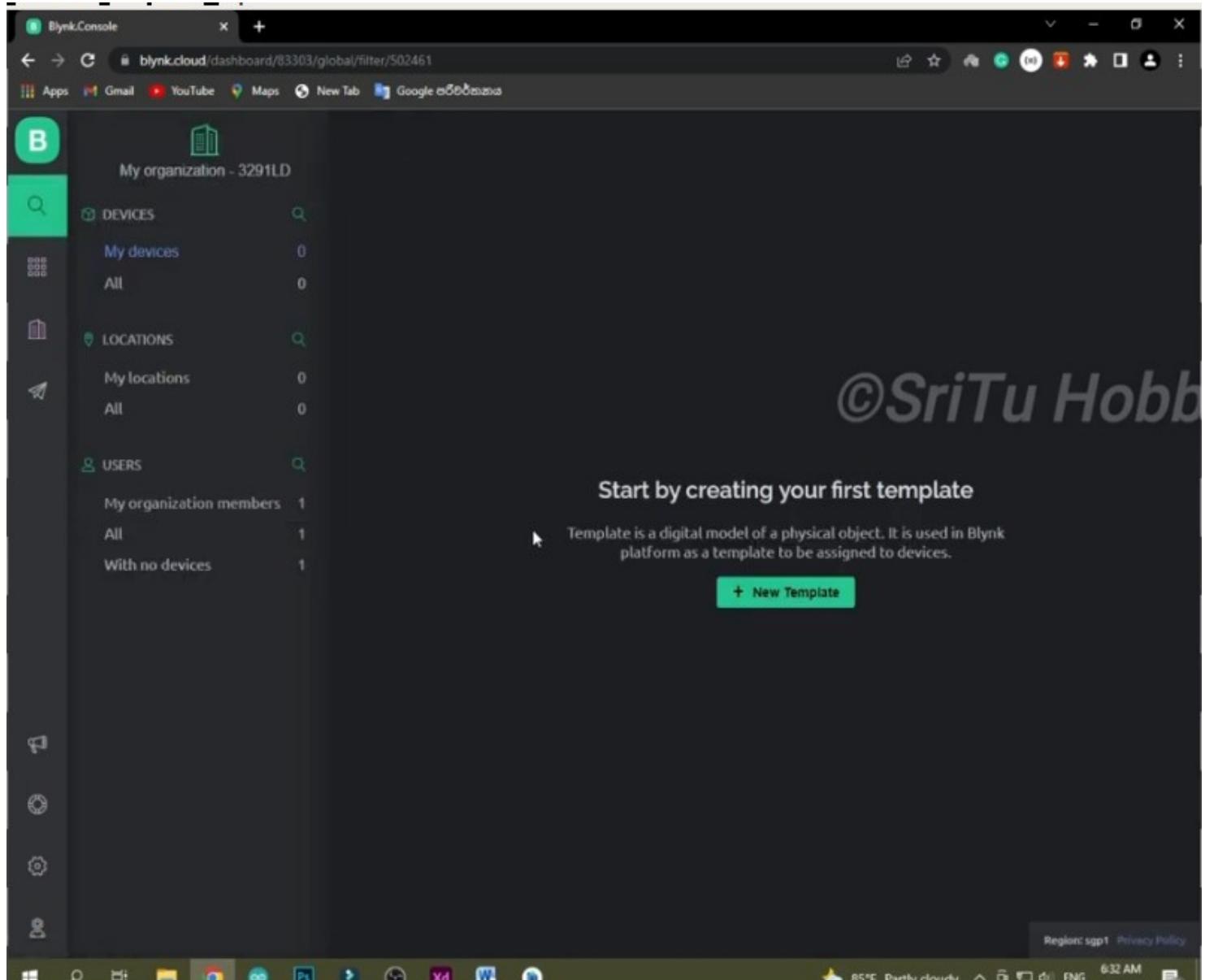


fig13.Creating new template

In this we can create the new template .We can give the our project template by clicking on the new template.

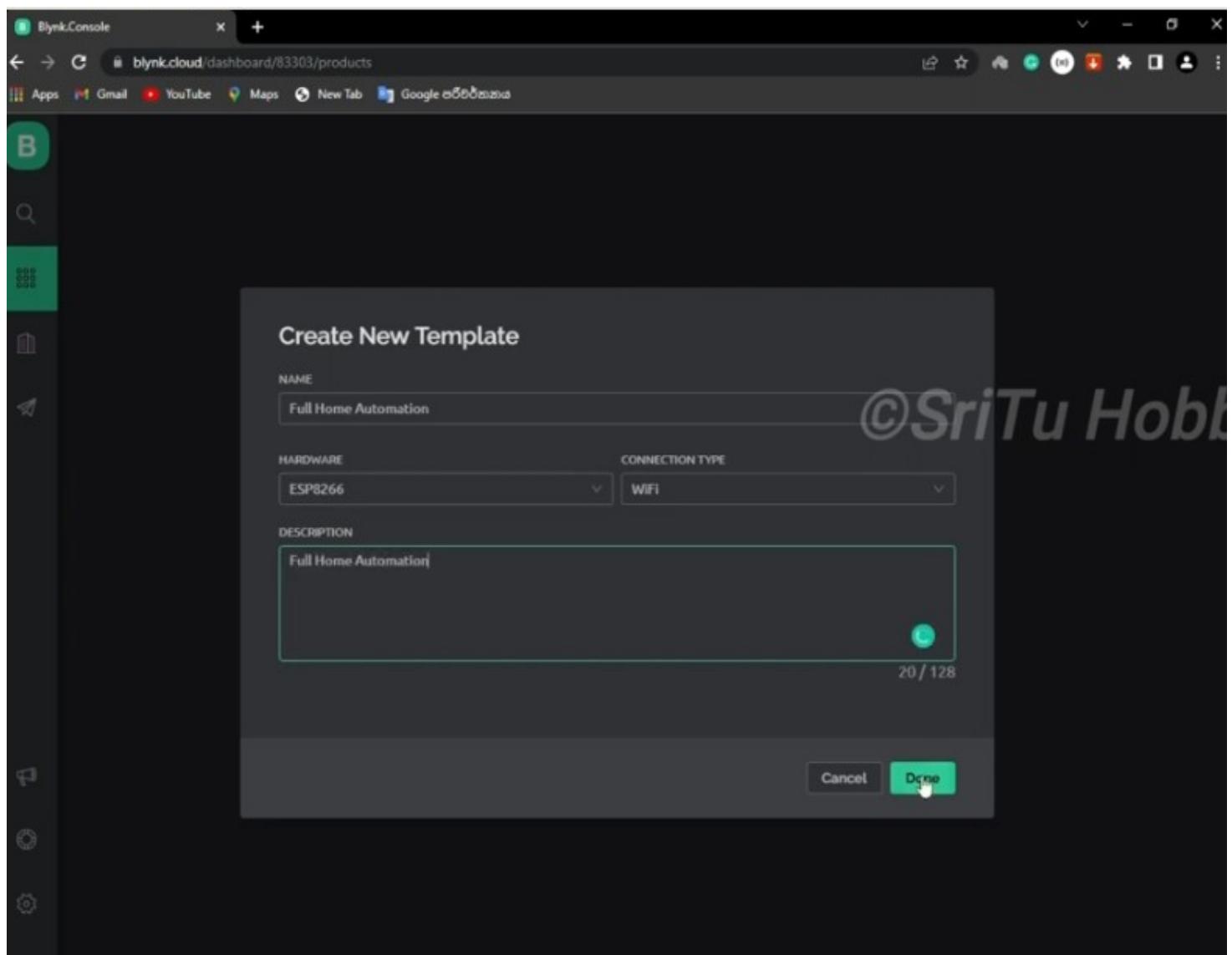


fig13.1

Now we can create the project name give the Full Home Automation .And description is also follows same and next clickthe done button .upto this we can created the template successfully.

Creating of DataStream:

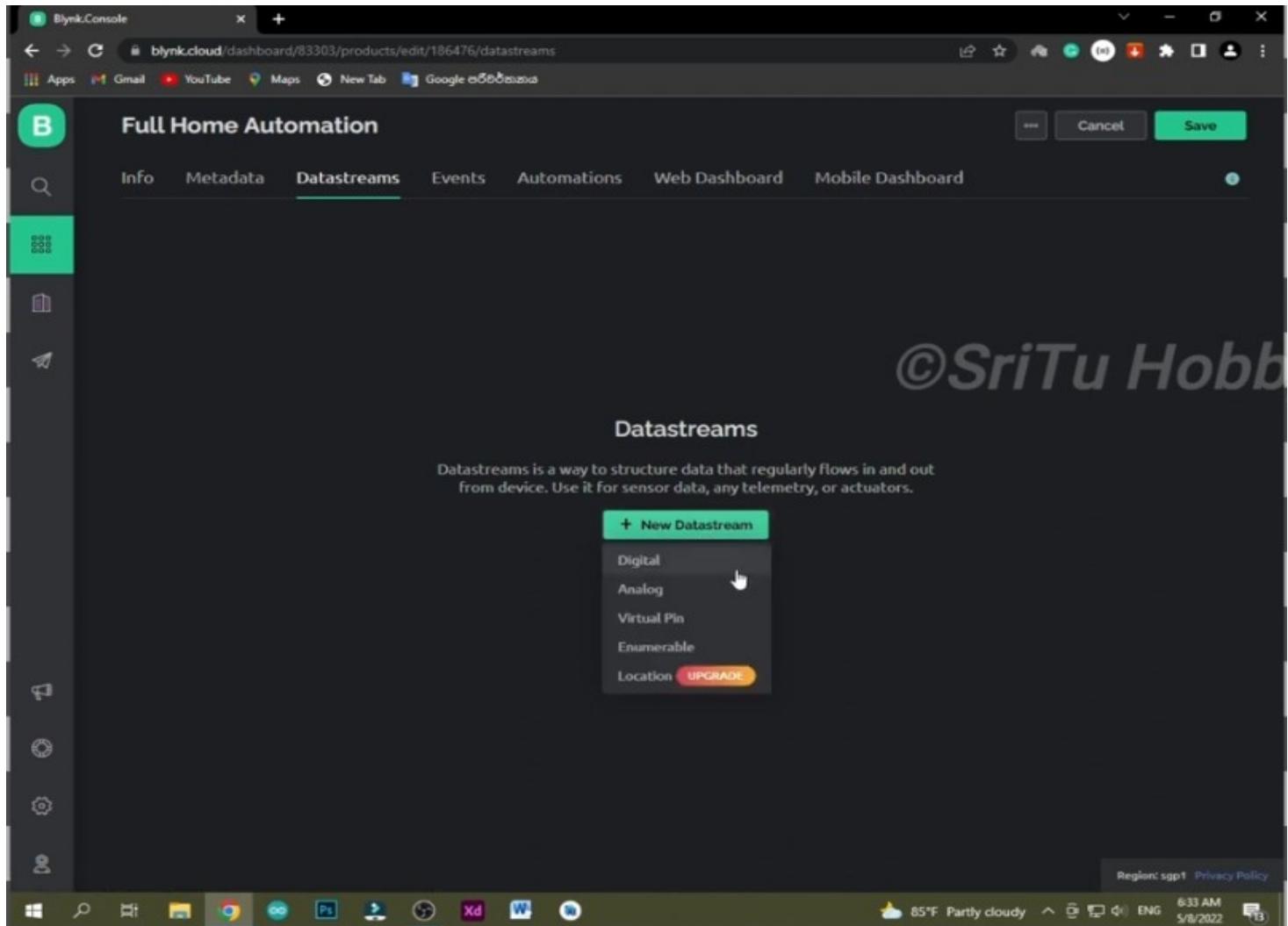


fig14.Creating Datastream

Next, click the “datastreams” tab and create the datastreams one by one.

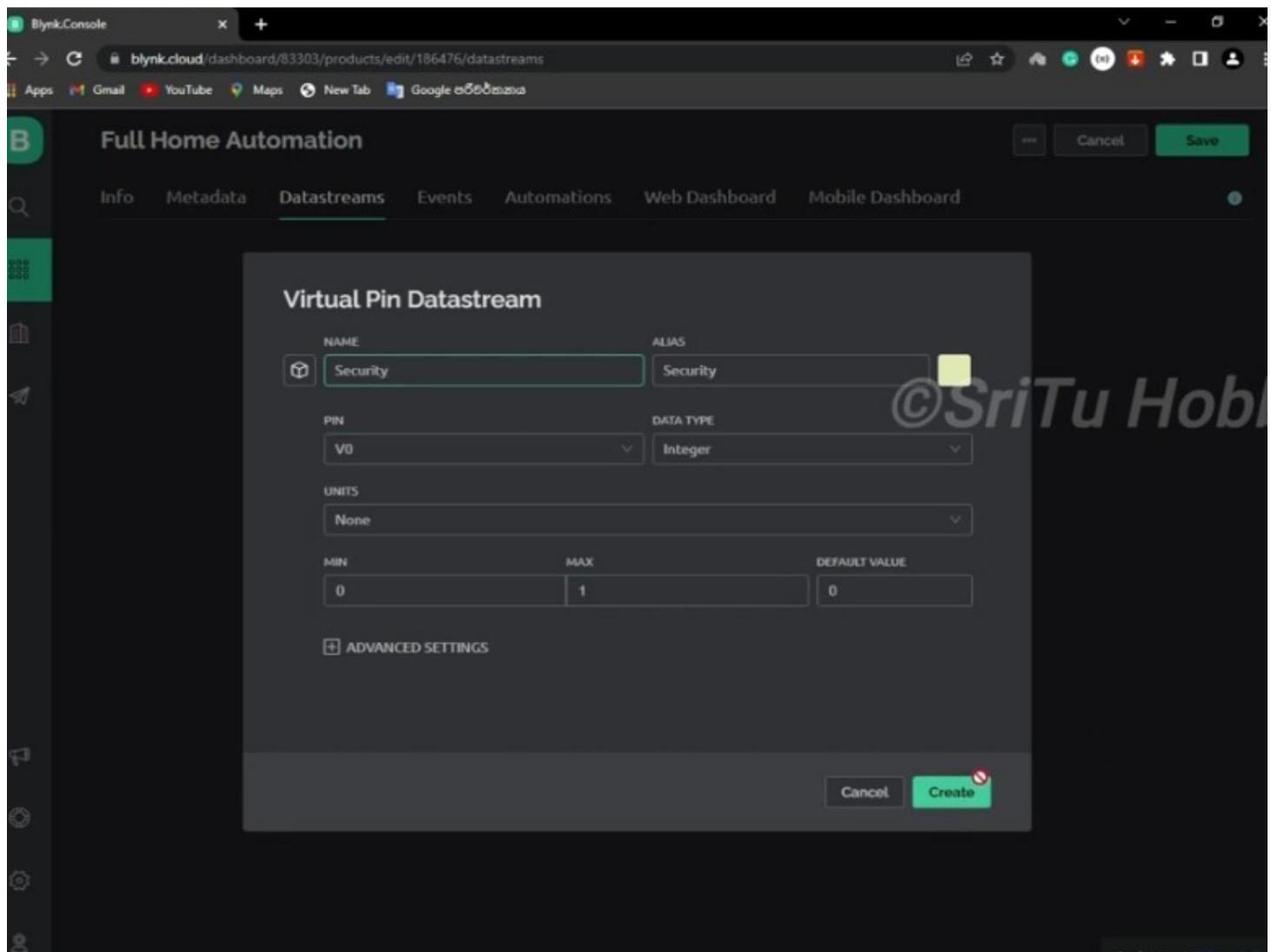


fig14.1

By clicking on the new data stream we can create security pin.

- **Name -> Security / PIN -> V0 / MIN ->0 / MAX -> 1**

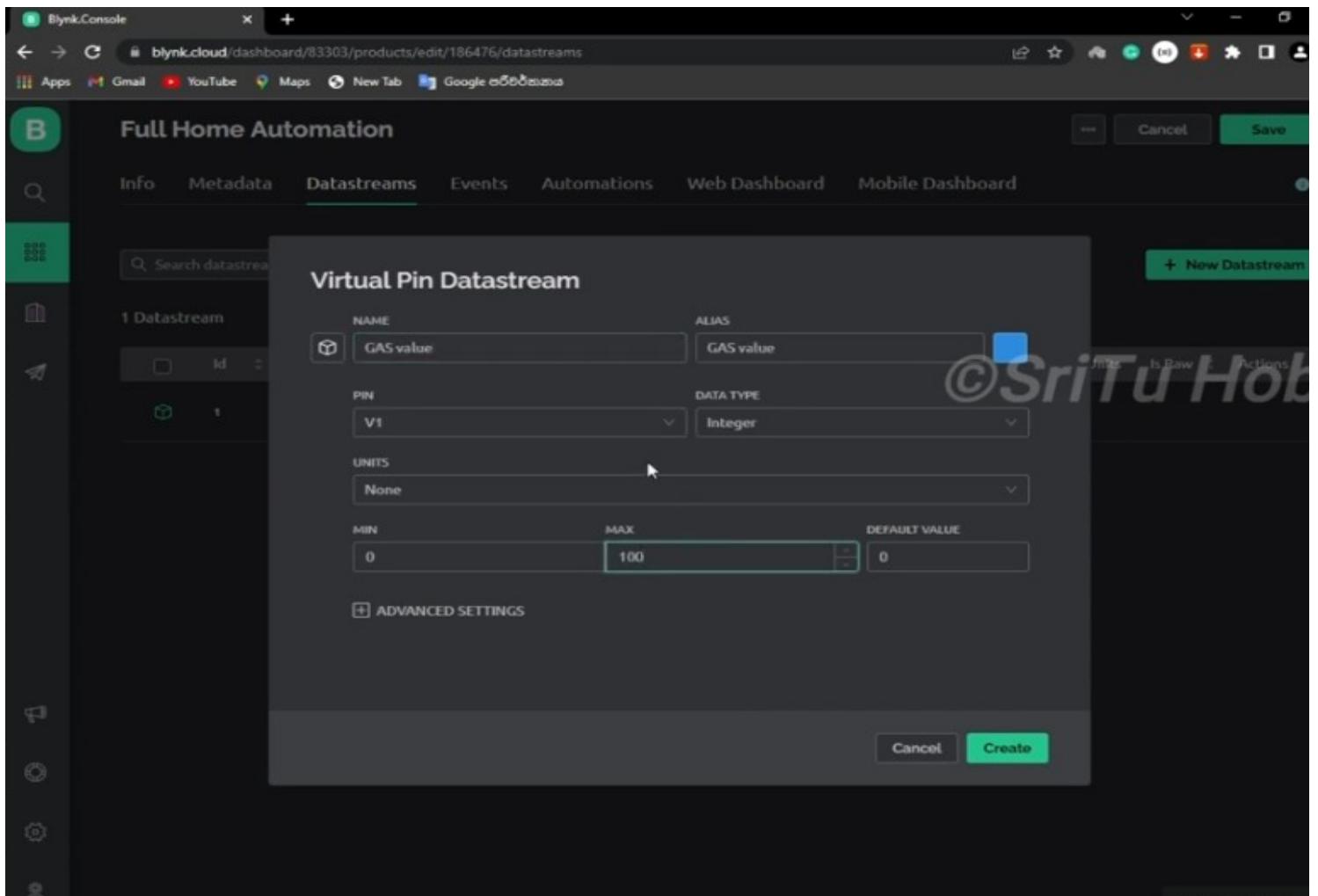


fig14.2

Next we can create the gas value guage .

- **Name -> GAS value / PIN -> V1 / MIN ->0 / MAX -> 100**

Blynk.Console

blynk.cloud/dashboard/83303/products/edit/186476/datastreams

Full Home Automation

Info Metadata Datastreams Events Automations Web Dashboard Mobile Dashboard

Search datastream + New Datastream

7 Datastreams

	ID	Name	Alias	Color	Pin	Data Type	Units	Is Raw	Actions
1	Security	Security		V0	Integer			false	
2	GAS value	GAS value		V1	Integer			false	
3	Temperature	Temperature		V2	Integer			false	
4	Humidity	Humidity		V3	Integer			false	
5	Water level	Water level		V4	Integer			false	
6	Relay One	Relay One		V5	Integer			false	
7	Relay Two	Relay Two		V6	Integer			false	

Region: sgp1 Privacy Policy

fig14.3

- **Name -> Temperature / PIN -> V2 / MIN ->0 / MAX -> 100**
- **Name -> Humidity / PIN -> V3 / MIN ->0 / MAX -> 100**
- **Name -> Water level / PIN -> V4 / MIN ->0 / MAX -> 50 (It depends on the height of your water tank)**
- **Name -> Relay One / PIN -> V5 / MIN ->0 / MAX -1**
- **Name-> Relay Two / PIN -> V6 / MIN ->0 / MAX -> 1**

Creating of WebDashboard:

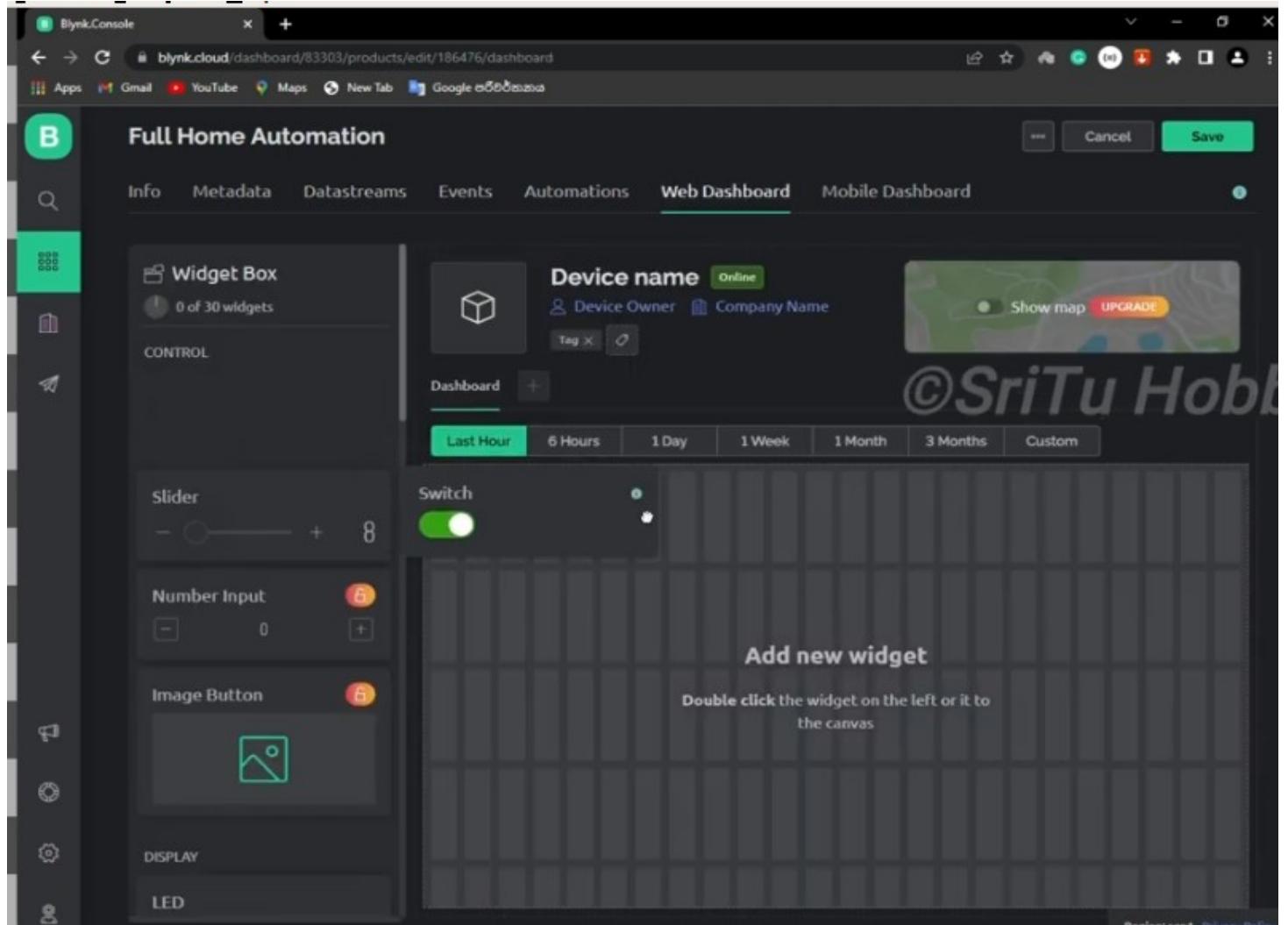


fig15.Creating of Web Dashboard

Now, click on the “Web Dashboard” tab and drag and drop the three Buttons and four Gauges to the interface. Next, click the gear wheel icons one by one in the widgets and select the datastreams. Finally, customize these widgets as we like and save them.

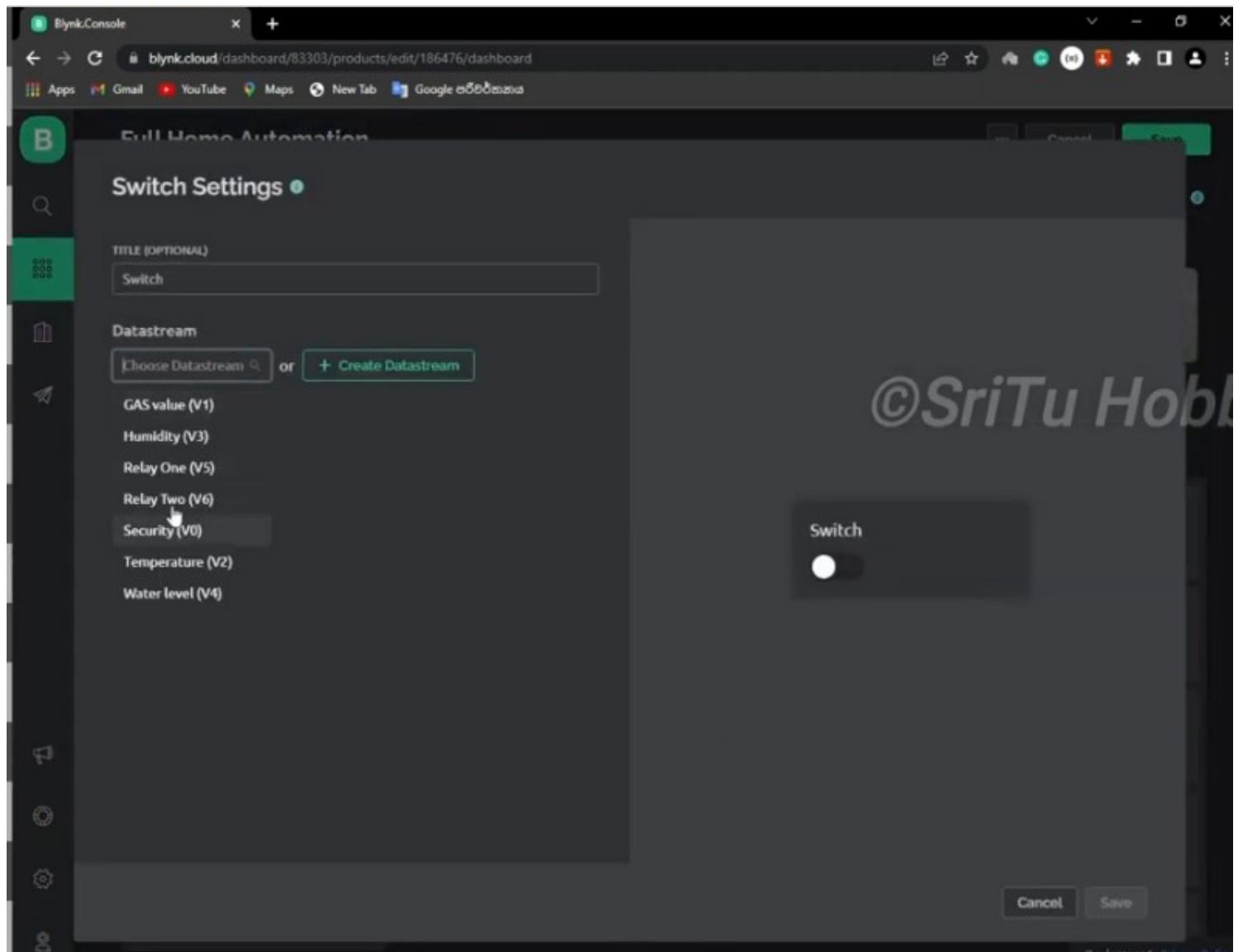


fig15.1

First we can create the switch button on webdashboard. It is used for creation of security switch.

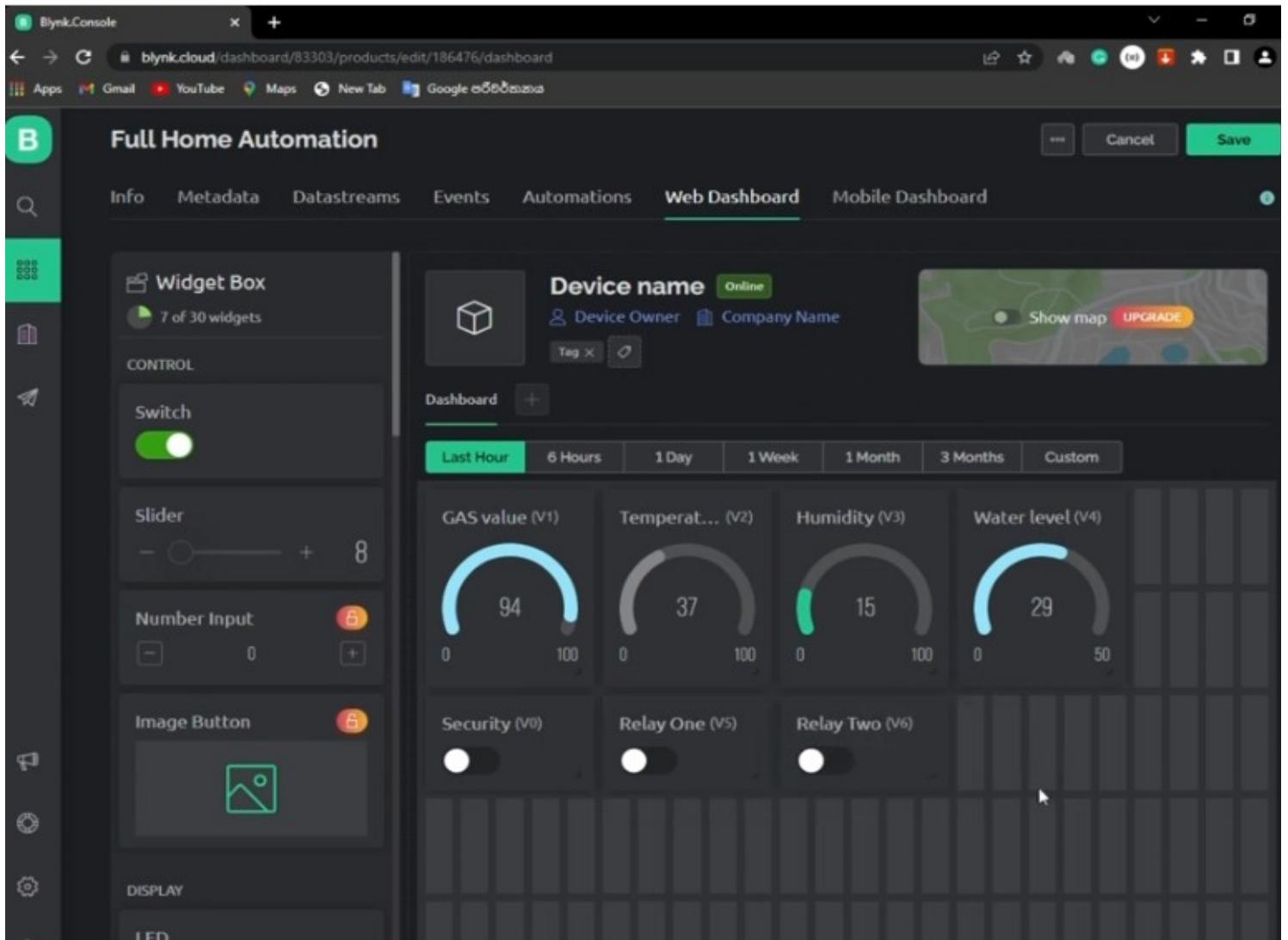


fig15.2

The web Datastreams all are created according to our use of full home automation.and save the all data .

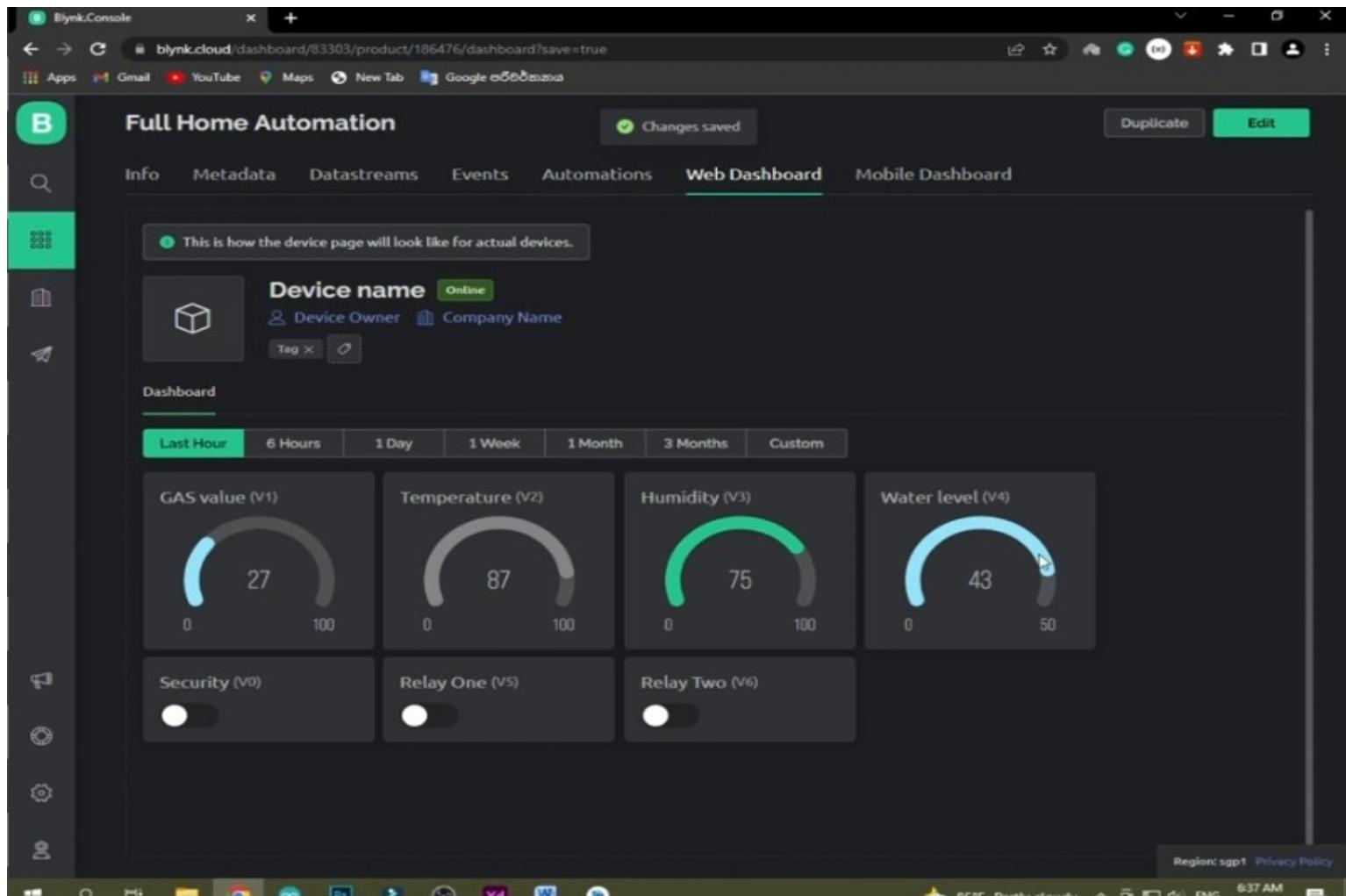


fig15.3

In this step we can complete our web datastream settings for the purpose of mobile applications .by using this we can follows same on our mobile.

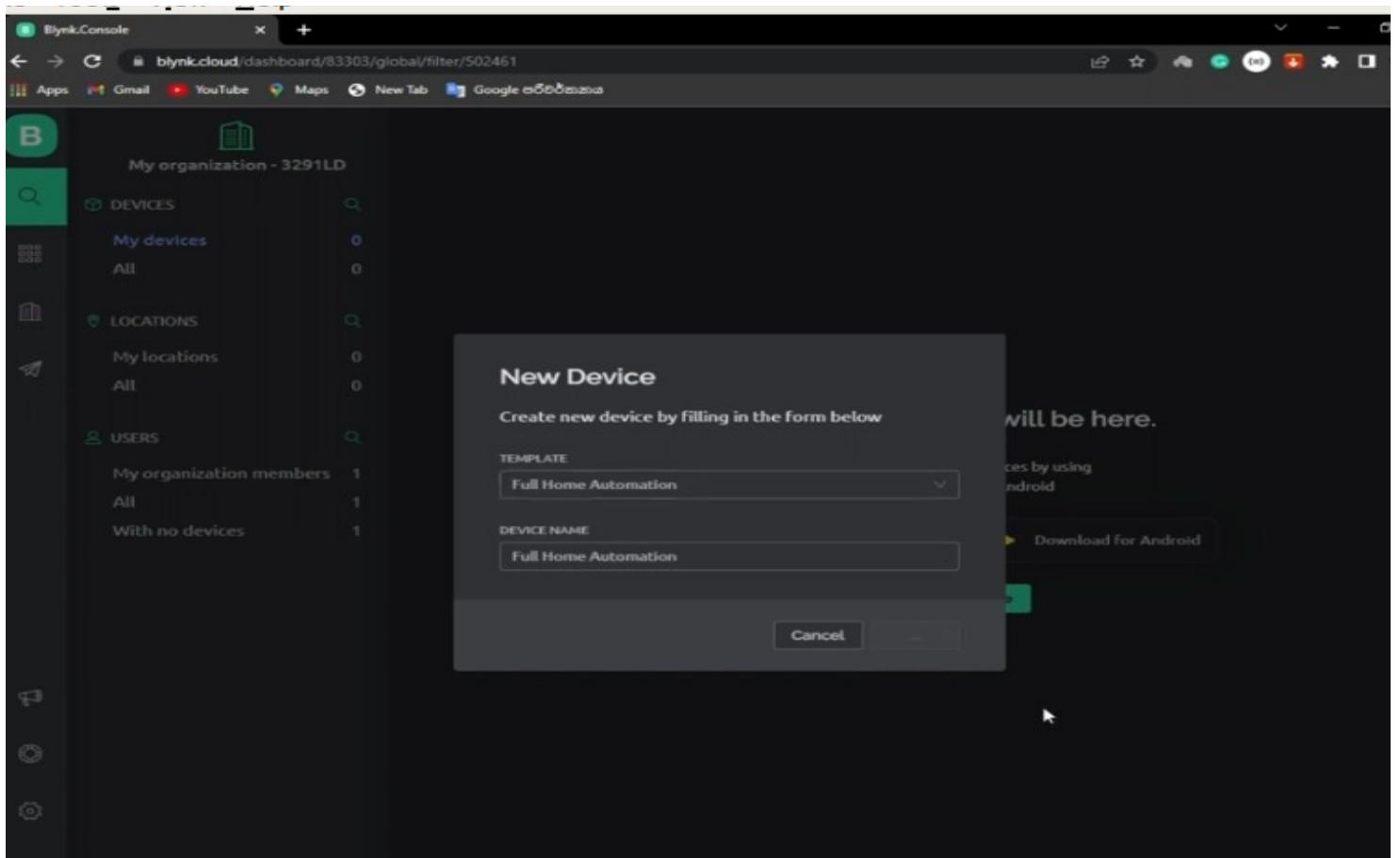


fig15.4

Next, click the search icon and create a new device. For that, select the template created earlier. Our blynk app settings are completed successfully.

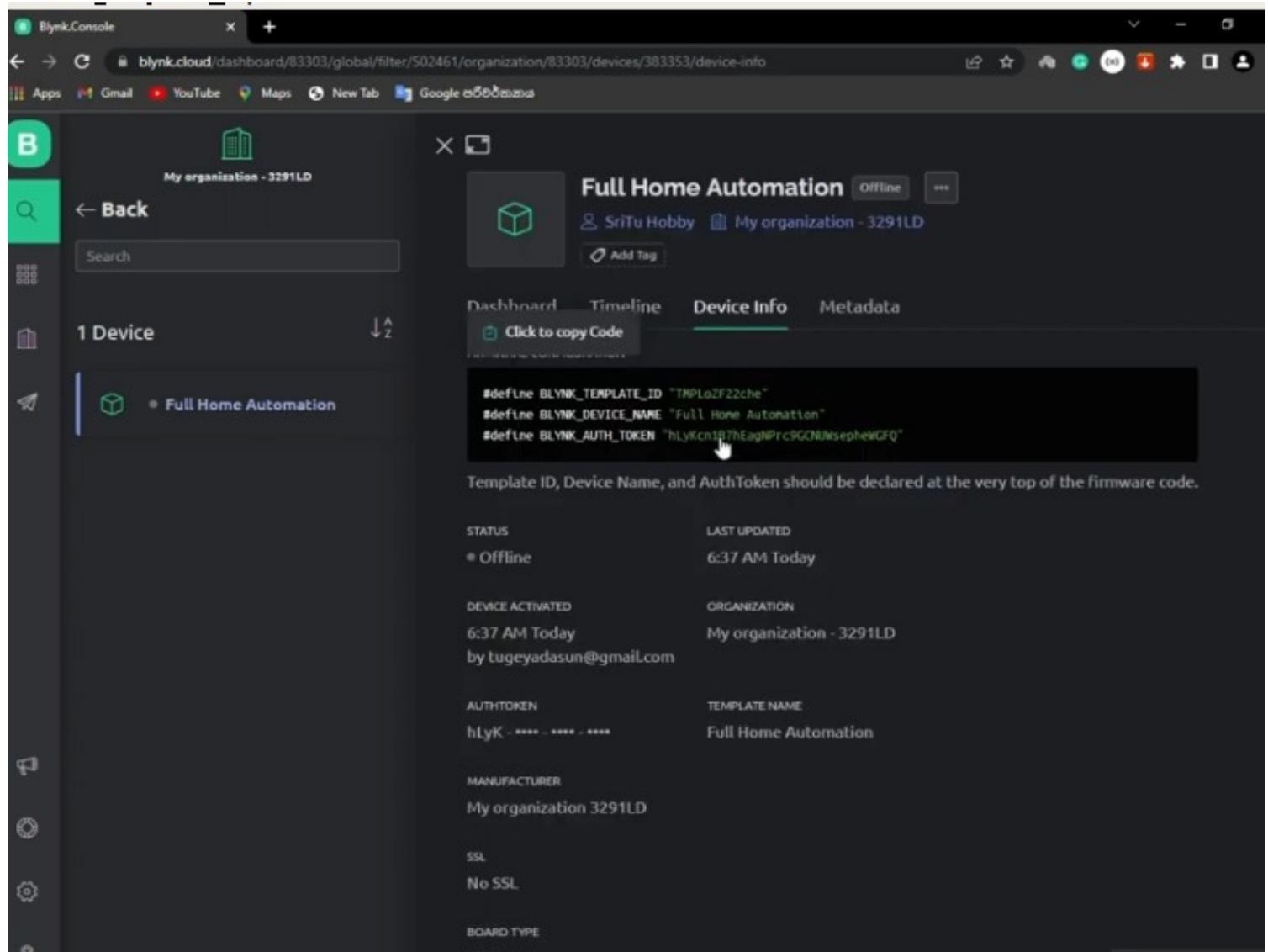


fig15.5

Now by clicking on the Device information we get the link of authentication token copy theat authentication link for the purpose of connecting of cloud.

```
File Edit Sketch Tools Help
Full_Home_Automation_new_Blynk.h
1 /* Full home automation with New Blynk app
2 https://srituhobby.com
3 */
4
5 #include <LiquidCrystal_I2C.h>
6 #define BLYNK_PRINT Serial
7 #include <ESP8266WiFi.h>
8 #include <BlynkSimpleEsp8266.h>
9 #include <DHT.h>
10
11 LiquidCrystal_I2C lcd(0x27, 16, 2);
12
13 char auth[] = "hLyKcn1B7hEagNPrc9GCNUWsepheWGFQ"; //Enter your Auth token
14 char ssid[] = "Sriti"; //Enter your WIFI name
15 char pass[] = ""; //Enter your WIFI password
16
17 DHT dht(D3, DHT11); // (sensor pin, sensor type)
18 BlynkTimer timer;
19 bool pirbutton = 0;
20
21 #define Buzzer D0
22 #define MQ2 A0
23 #define trig D4
24 #define echo D5
25 #define PIR D6
26 #define relay1 D7
27 #define relay2 D8
28
29 BLYNK_SKETCH_ID
```

Enter your WIFI name and password

fig16.Arduino Code

We can paste the already copied authentication and paste the link on auth token and mention ou wifi name and password run the code and upload the code onNodeMCU ESP 8266.

BLYNK APP MOBILE DASHBOARD:

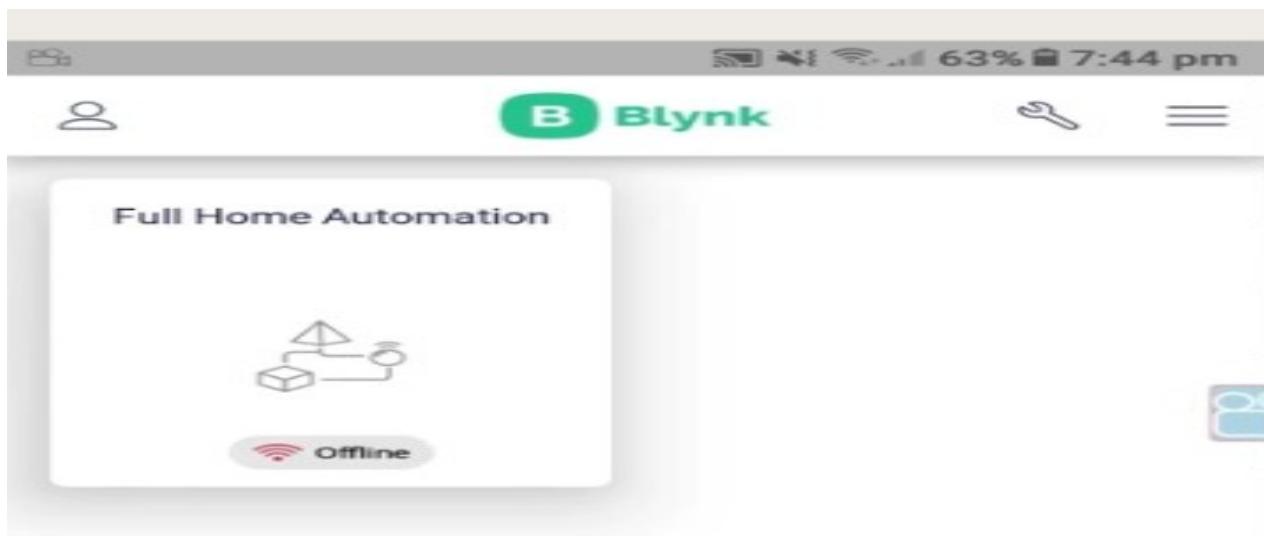


fig17.Blunk App Mobi Dashboard

first we can download the Blynk app and sign in our account same as already signed account in previous settings.

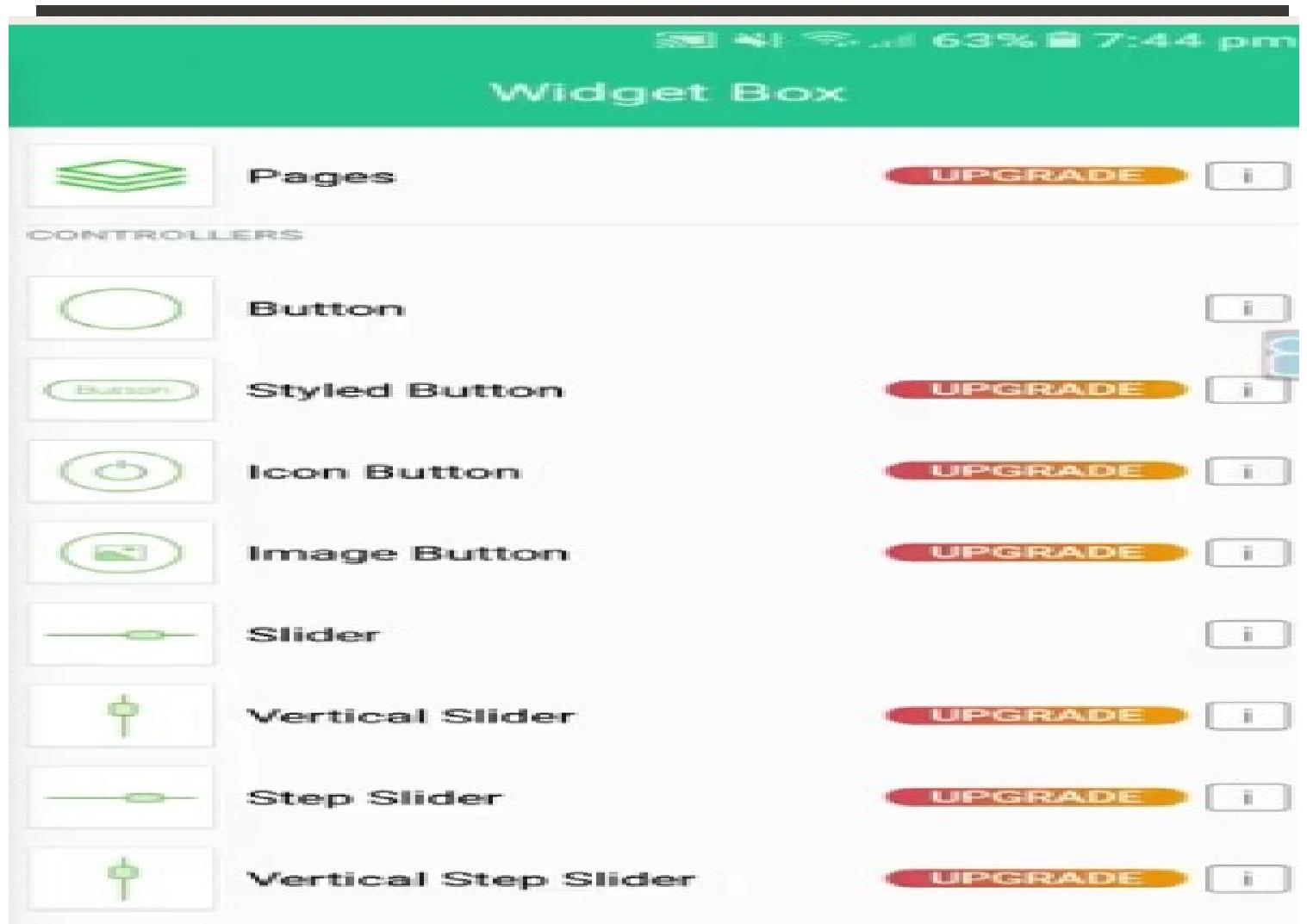


fig:18

Here we can create the web dashboard in that include switches and guages etc...

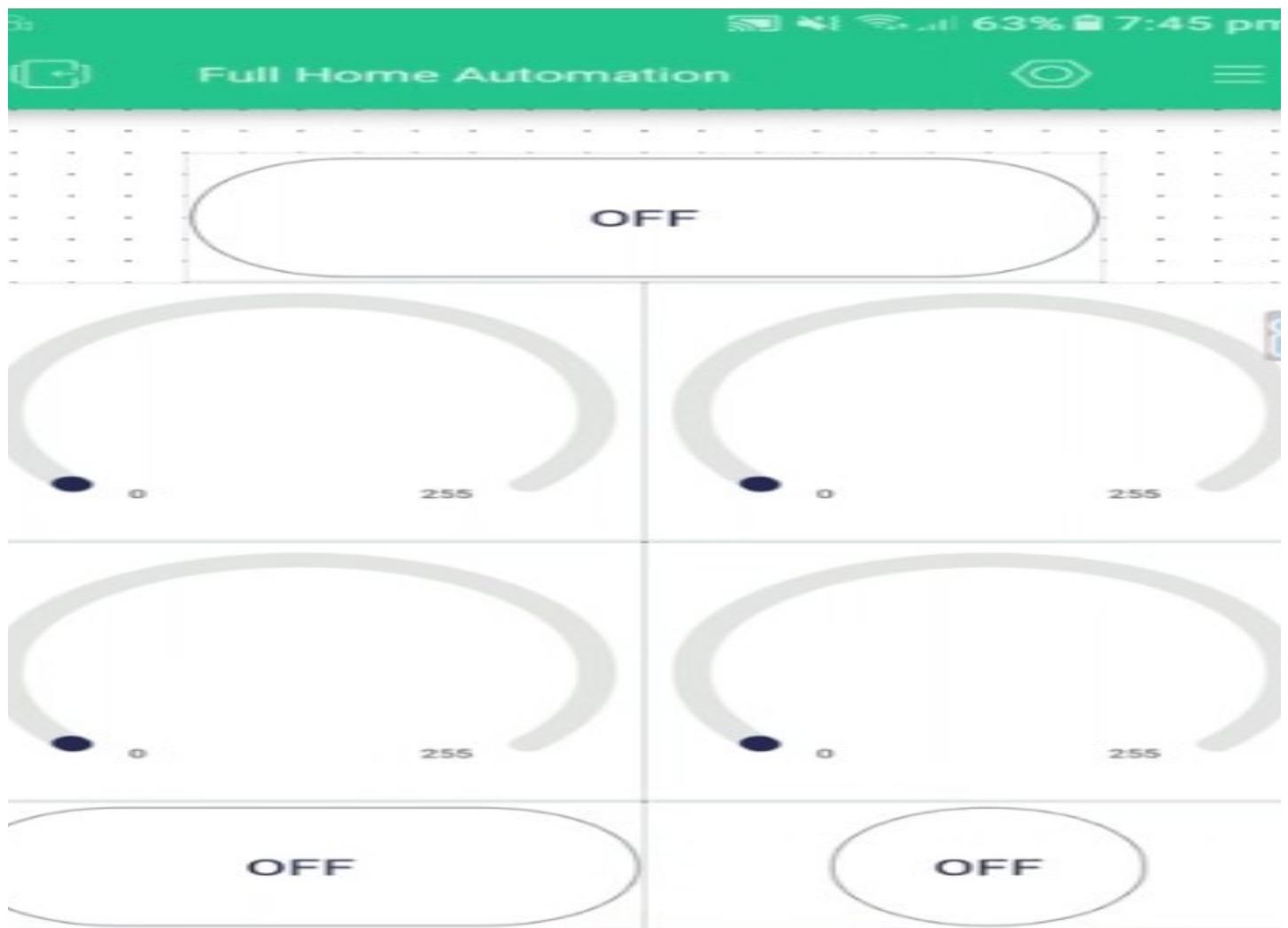


fig:19

here the Dashboard is created on mobile phone.now we use that as web dashboard

OUTPUTS:

Relay control:

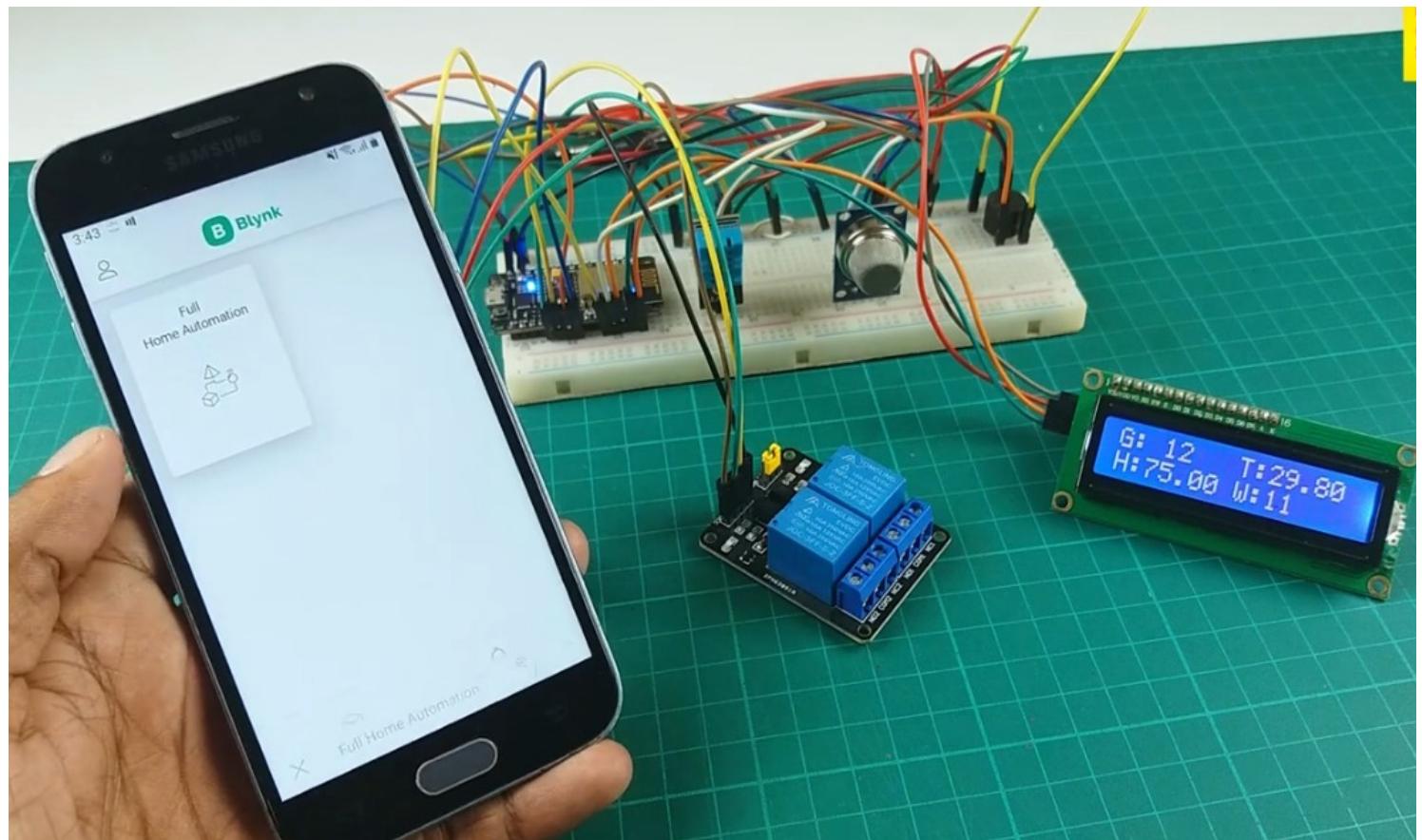


fig:20

Connect the circuit as per the circuit diagram :

To check the output first open blynk app and go to the template full home automation.

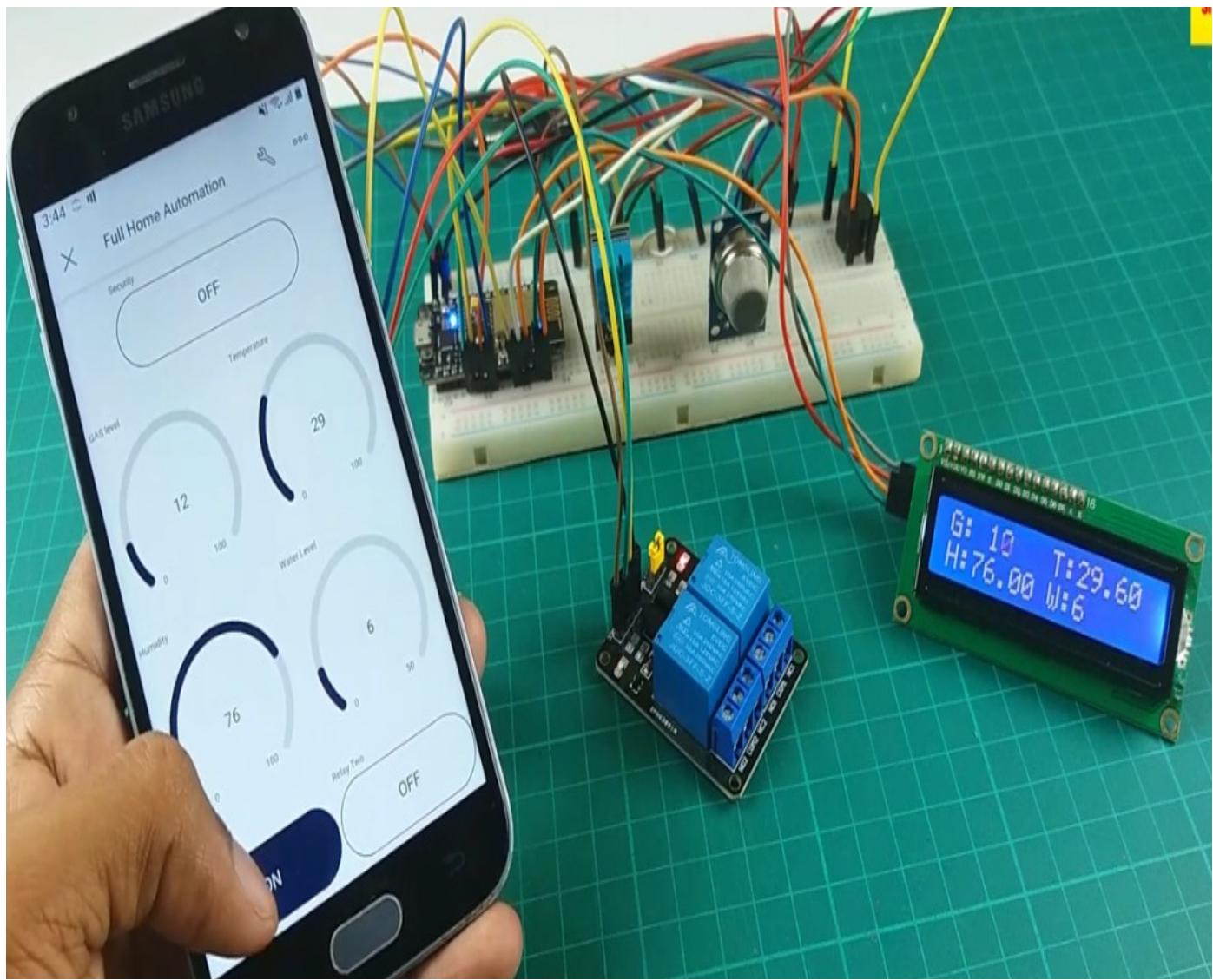


fig:21

To monitor 2 channel relay module click on the button relay1in the blynk app than relay1 will be activated than the led at relay1 will be on.

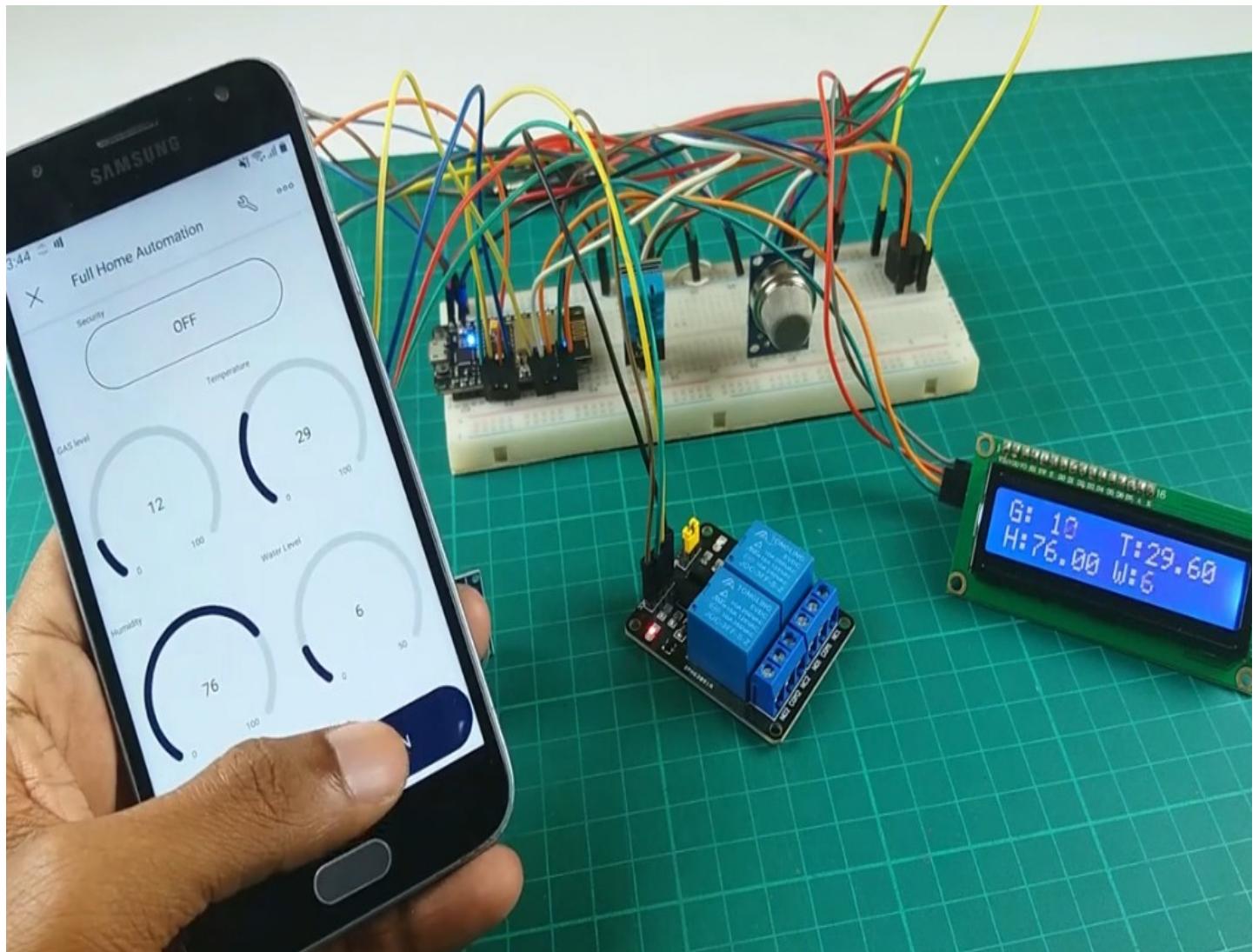


fig:22

To monitor the 2 channel relay2 output click on the button relay2in the blynk app than relay 2 wiil be activated than the led at relay2 will be on.

GAS value

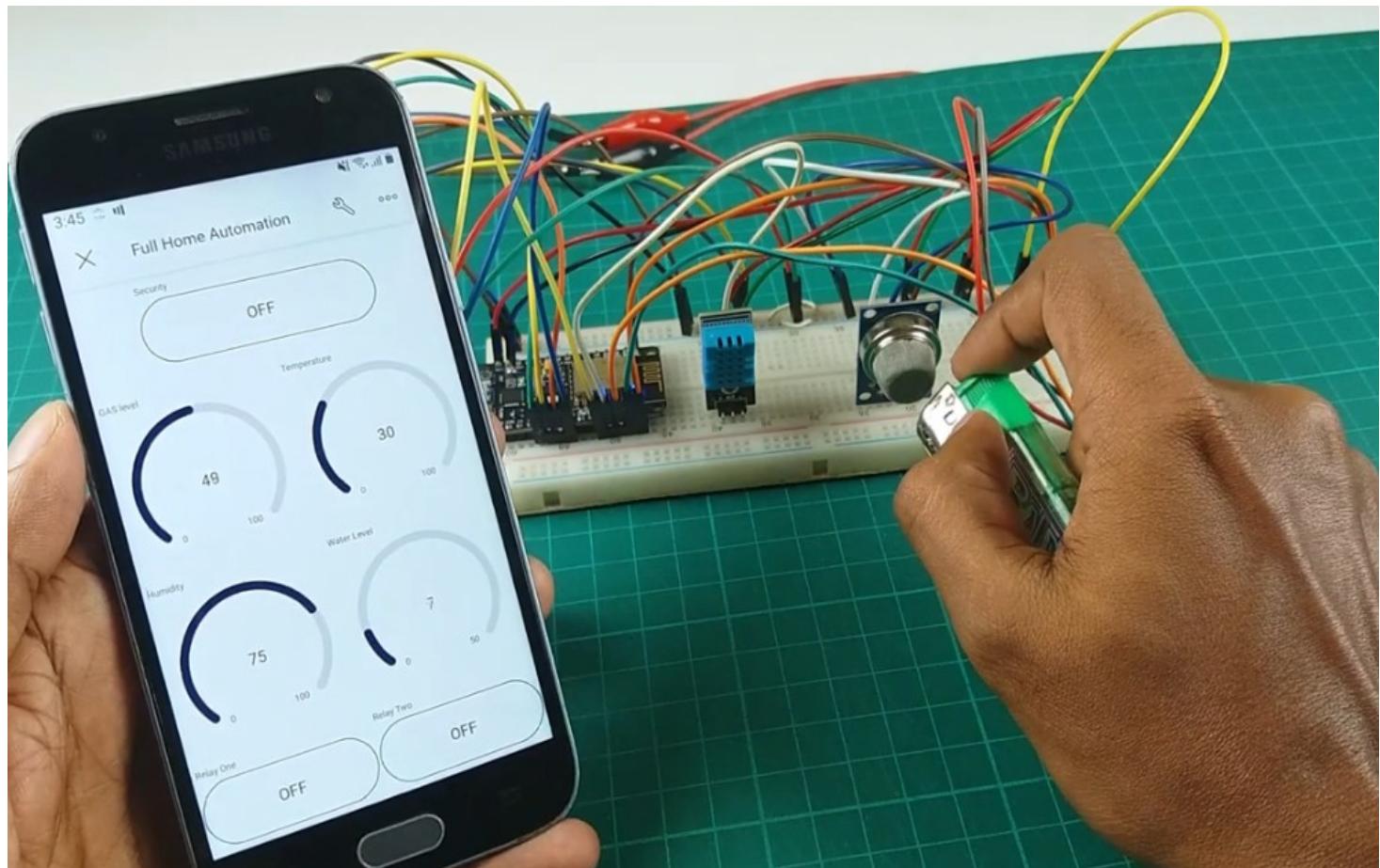


fig:23

To monitor Gas value we have to leak LPG gas near to the MQ2 sensor than the gas value will be displayed on the blynk app.

Security system:

Security System:-

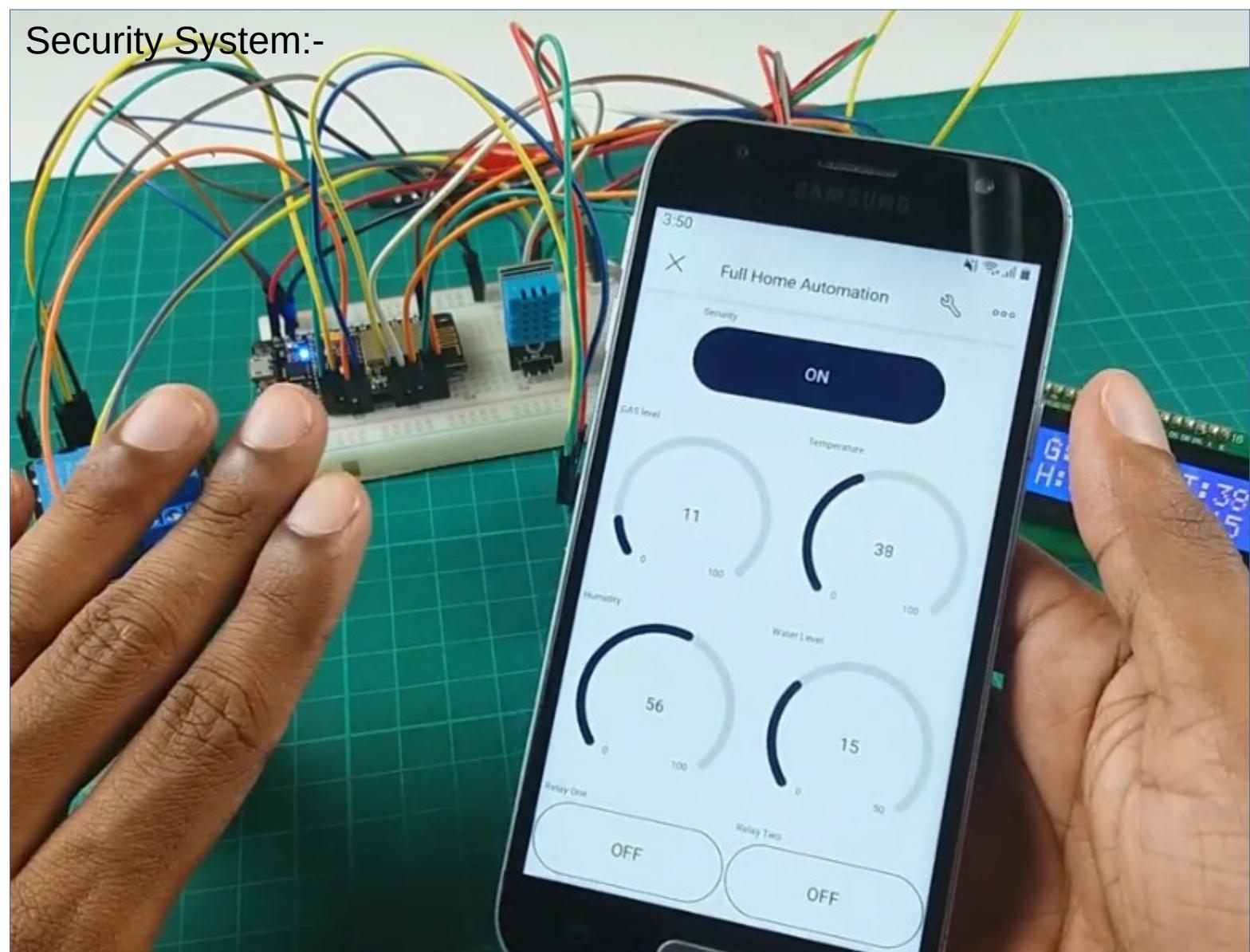


Fig:24

To check the security system first click on the security button then move your hand in front of the pir sensor

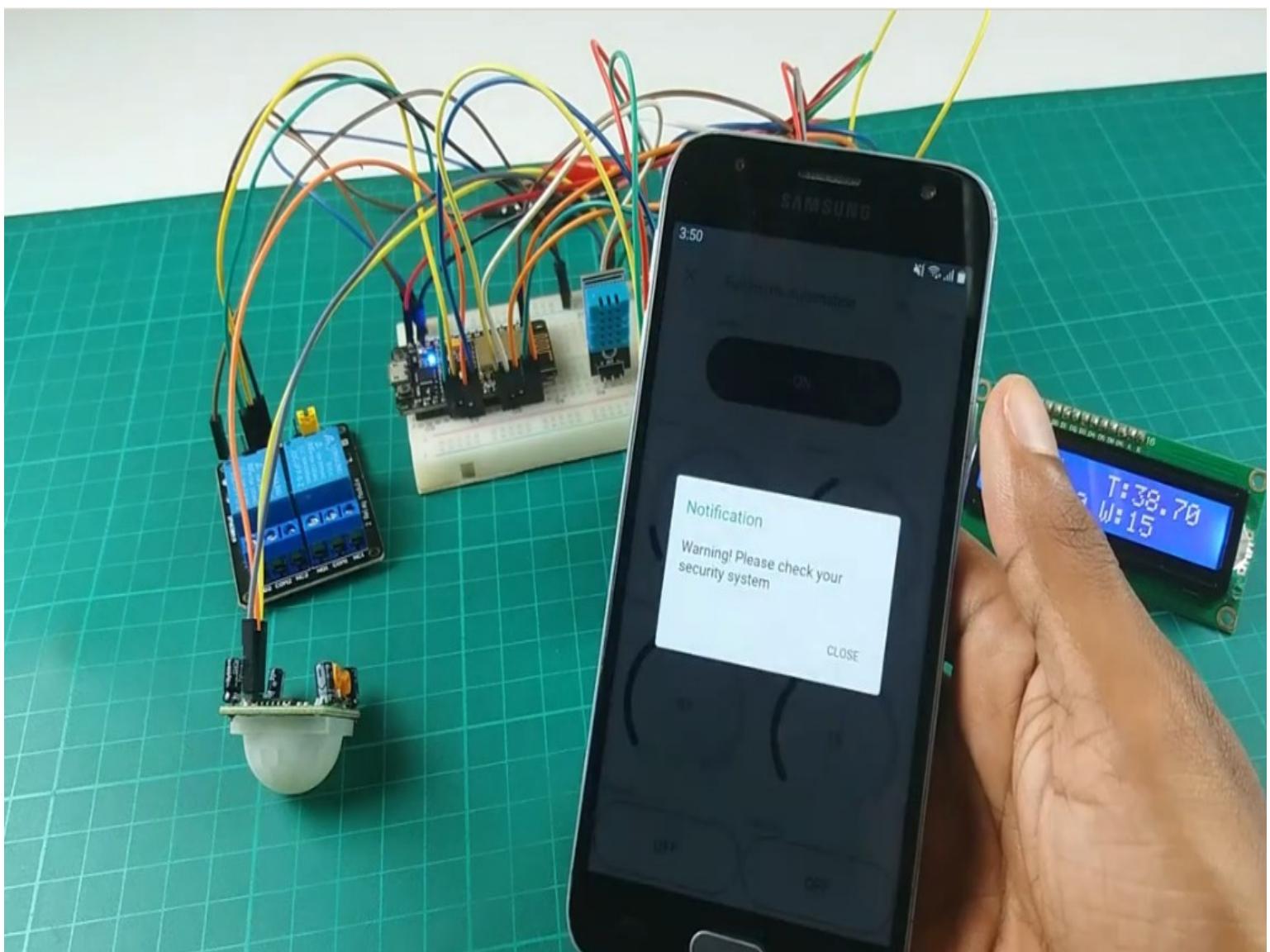


fig:25

By moving your hand a warning will detect on the blynk app to check your security system.

Temperature and humidity:

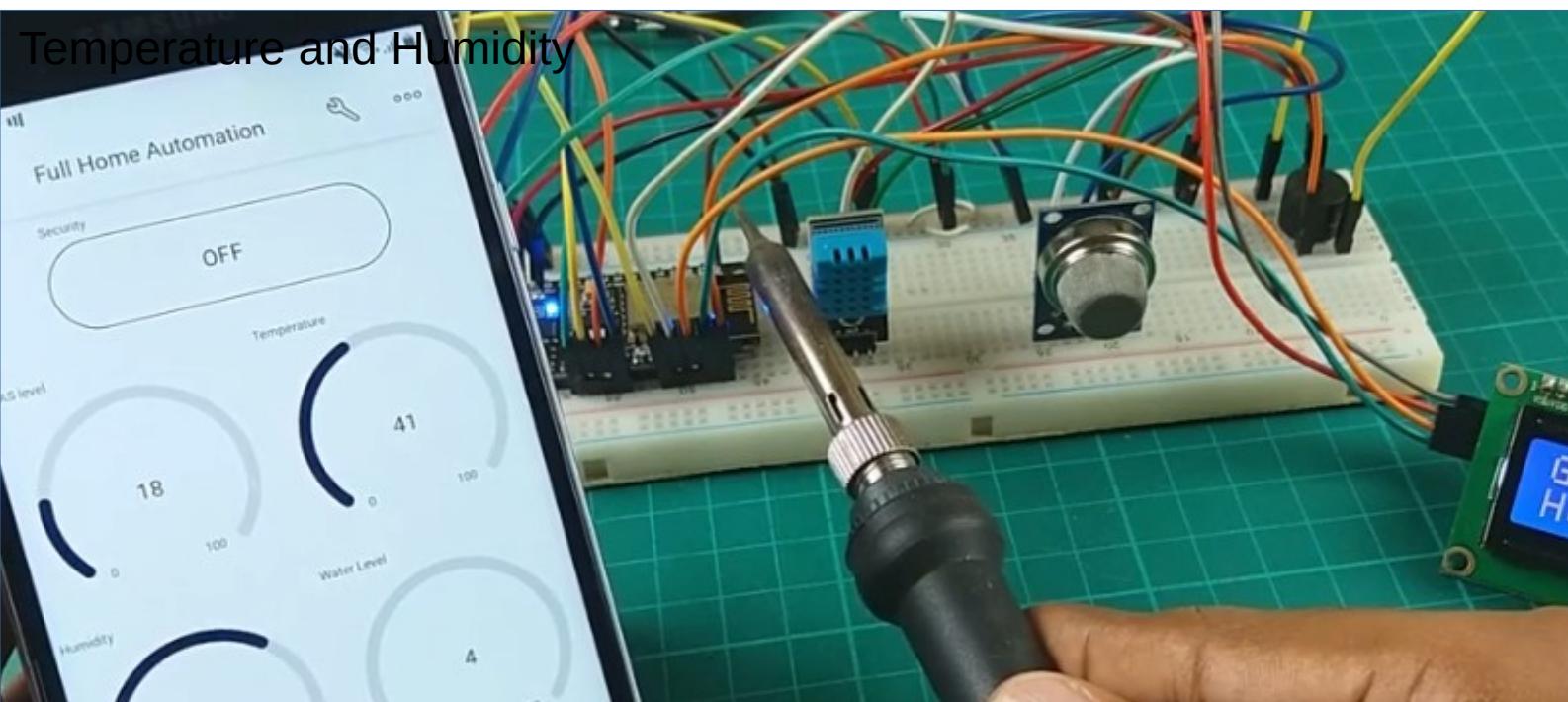


fig.26

To monitor Temperature and humidity value heat one niddle at put it nearer to the DHT11 sensor than temperature value will be displayed on the blynk app and humidity value also displayed on the blynk app.

Water level:



fig:27

To monitor the water level we need to put the ultrasonic sensor at the top of a tub then pour some water after that water level will be displayed on the blynk app(how much the water level).

ADVANTAGES:

1)outfit your Home to suit your Lifestyle:-

we can design our home system according to our lifestyle

2)Reduce maintenance costs:-

Using full home automation we can reduce the maintenance costs,because here we are operating all the sensors with mobile control.

3)Indoor system control:-

Using full home automation we can control our entire indoor system with our mobile.

4) Security:-

Using full home automation we can provide security to our system and we can safeguard our property.

5)Energy savings:-

Using full home automation we can save energy.

DISADVANTAGES:

1)Upfront costs:-

Upfront costs of equipment and installation are the leading disadvantages of home automation systems.Although smart technology can help you to save on your bills,it's initial cost that can leave you surprised.

2)Security concerns:-

Smart Homes are based on the internet technology;it's vulnerable to hacking in addition,most system require password-based authentications.so it may leaked or misuse by some one.

3)Maintenance costs add more to disadvantages of Home automation:-

Maintenance costs add more to disadvantages of Home automation.sometimes maintennace costs will become more.

4)Power supply:-

Devices in an automated home require a constant power supply ,which must be uniform and uninterrupted.

5)APP security:-

App security will be less because of hacking.Hackers can hack the system and misuse them.

FUTURE SCOPE:

More smartness can be added to this proposed project for making this smart home highly automated by using artificial intelligence. A camera can also be connected to microcontroller so that suspect photograph can be taken and can be forwarded to the police if needed. Also voice call feature can be included to this system through which user can control the home appliances

CONCLUSION:

Based on the results of analysis of all data obtained by testing the full home automation with the NODEMCU ESP8266 the following conclusion

Full home automation NODEMCU ESP8266 module can be designed with various components hardware and software support so that it can be arranged into a full home system that is controlled with the Blynk app. By using blynk app we can monitor gas value, temperature value and water level ,humidity value and we can check security of the system.