

# A Facile Method to Construct of an IoT Based Smart Home

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**Abstract:-** IoT-based smart home devices are becoming popular every day because they make life easier and minimize workload. Given the system's role in promoting everyday life and improving safety and security at home, it is clear that the system needs to be improved and modernized. The automatic and electronic control of appliances, functions, and events in the home is home automation. A smartphone has become an essential part of our everyday lives. This way of managing and monitoring work promotes and relaxes our lives. In the last decades, smart home systems have attained great popularity as they increase comfort and quality of life. Smartphones control most smart home systems. This paper discusses the concept of smart home by integrating IoT services and cloud computing into it, as well as incorporating intelligence into sensors and actuators, networking smart things with appropriate technology, enabling links to smart things using cloud computing for easy access at different locations, increasing computing power, storing space, and enhancing data sharing.

**Keywords:-** *Iot, Automation, Easy Access, User Friendly, Cost-Effective.*

## I. INTRODUCTION

In this age of innovative technology in the 21st Century, It has been said that without energy, modern life is impossible, but that statement has changed. Current technology has advanced to a different level, with automated and intelligent systems. In modern times, there is no need to embed technological innovation. As we know, the transition has gone a long way, nearly reaching its peak in modernization. Nowadays, creativity has become an asynchronous part of the lives of people. It has and continues to influence many aspects of daily life and has enabled better social interaction, the convenience of transportation, the ability to enjoy excitement and news, and advanced pharmaceutical advances. A smartphone is one of the modern-day's most essential phones. In the modern age, the Internet is an essential element too. With the aid of this little gadget, home automation became possible. Remote correspondence's rapid development encouraged us to use cell phones to operate a home computer remotely. Besides

apartments, there are restaurants where food is served in Bangladesh with the help of the robot. Android-controlled home systems are not popular in Bangladesh but are available to some degree in some offices. Remote correspondence's rapid development encouraged us to use cell phones to operate a home computer remotely. No clear description of the embedded systems is given. Embedded systems can be called machines that are controlled by computer. Cell phones have proven to be capable devices by offering better equipment and better software and have become an indispensable piece of everyday life for individuals. First, wireless proxy server software because home computing has been around for three ages. The key to accessing the automated device world is the combination of Smartphone and the Internet. So, home automation became possible with the help of these two and microcontrollers. You might imagine the start of home automation, for example. Can power TV, light, fan cooler etc., with Android phones. This venture is about a home automation device and security system, which is inexpensive and straightforward.

Artificial intelligence controls electrical apparatuses— for example, an Amazon Echo. The latest technology is a robot that is interactive with humans. Example: Robotic Rovio, Roomba, etc. In Bangladesh, we have excellent and cheap wireless networking facilities and are still expanding. The 2nd and 3rd generations above are not eligible in Bangladesh. It doesn't mean that we won't want to. The government and some organizations are trying to develop our country in high-tech conditions. High technology isn't bound in a couple of apps now. The automatic system is the thing that takes high technology to the next level. It is why demand is increasing for automatic electronic devices. Home automation is necessary to accomplish that.

Seven sections have been organized into the rest of the document. Section II describes the Literature Review of a sustainable earth-battery system. Section III, methodology & modelling, and Section IV describe the prototype's working process; section V explains the project implementation. The results analysis, future development & applications, and conclusions are discussed in sections VI, VII, VIII.

**II. LITERATURE REVIEW**

Since the IoT has a vast chamber to discuss earlier, showing its principle was briefly relatively represented in several research papers. There was discussion of home automation advantages, such as reduced installation costs, system stability, easy extension, esthetic benefits, and mobile device integration. Home automation appliances such as lighting and devices, webcam surveillance, magnetic doors and so on need to be in place. Researcher S Bharat et al., published on International Journal at Computer Technology and Research (IJCTR) in 2016, addressed some of the hardware and software-based applications and components such as RFID, Wireless Sensor Network in a journal featuring a comprehensive home automation system with short and straightforward view writing called 'IOT-Home Automation. Smart IoT Based Home is an automation system designed to eliminate human labour: homework, housework, or computerization of nuclear family action using IT and control systems. It is also known as domotics and as a smart home with automation. Home automation can be joined by a lighting control unit, HVAC (warming, ventilation and flowing through and cooling air), machines, and various structures to provide up-to-date settlement, comfort, critical savings, productivity, and protection. Home Automation has been around for quite a while, and products have been available for a crucial number of years; no one's game-plan has yet met the mark in any case. Early home automation systems were used in labour-saving equipment. Its main objective is to provide facilities for the elderly and disabled to carry out their routine activities and remotely control home appliances.

**III. METHODOLOGY & MODELING**

Home automation is a network of electronic hardware interface that connect every device through the Internet. Each system is equipped with sensors and connected via Wi-Fi, allowing you to control them from your smartphone or tablet, whether at home or miles away. It allows you to turn the lights on, lock the front door or even switch off the heat wherever you are. A home automation system has three main elements: sensors, controls, and actuators. Sensors can detect changes in daylight, temperature, or motion. Home automation systems will then (and more) tailor those settings to your tastes. Controllers refer to the tools used to send and receive information about electronic apps' status in your home personal computers, tablets or smartphones. Actuators can be light switches, motors, or motorized valves which control a home automation system's actual mechanism or feature. They are designed to be switched on by a remote controller command. The word Internet of Things or IOT may have been identified. It applies to the wireless appliances that homeowners mount, such as smart thermostats, so they can access data and send commands over the Internet from the remote. IoT tools are also used in home automation setups.

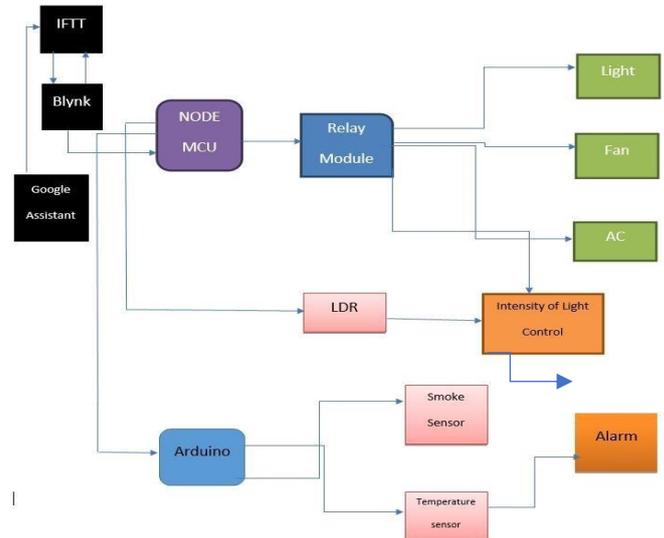


Fig. 1. Block Diagram of an IoT based Smart Home

**IV. WORKING PROCEDURE**

The working procedure, the smart home system has designed for automated and electronic surveillance of home appliances, mode of operation using NodeMCU, Arduino Uno, and numerous sensor devices. i.e., The LDR sensor is used for daylight saving to reduce the use of electricity, whereas the LM35 sensor has been used for temperature monitoring. The MQ2 gas sensor has been used for detecting harmful gases and smokes, and after detection, it will trigger an alarm. Finally, an ultrasonic sensor has used for detecting motion in case of opening or closing doors. Users can use an innovative home prototype remotely, as shown in Fig. 2. And via the voice commands shown in Fig. 3.

*A. Remote Access*

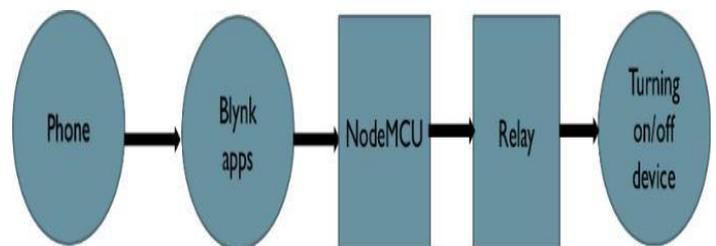


Fig. 2. Remote Control Access Flowchart

To operate the device, you need an internet-connected smartphone and the Blynk application. Switches are available in the Blynk application to enable or disable connected devices. Blynk sent a signal by pressing the switching devices, to NodeMCU which controls the relay to activate or de-activate the desired device.

**B. Voice Command Access**

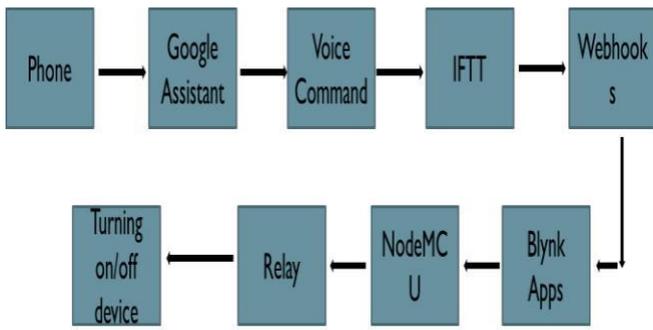


Fig. 3. Voice Command Access Flowchart

The voice command "ok google, turn on the light" has been given using a Google Assistant on a smartphone, for example, and a control signal is sent via webhook to the Blynk application via IFTTT. Blynk then sent a signal to NodeMCU that controls the relay to switch on or off the desired device.

**V. IMPLEMENTATION**

The core stage of the research is the implementation. For implementation, a schematic diagram was drawn at first hence the hardware. NodeMCU and Arduino Uno programming had embedded with Arduino IDE.

**A. Software Implementation**

Arduino IDE for NodeMCU and Arduino UNO did the programming. Proteus 8 was used for designing the schematic Diagram, which has shown in Fig.5.

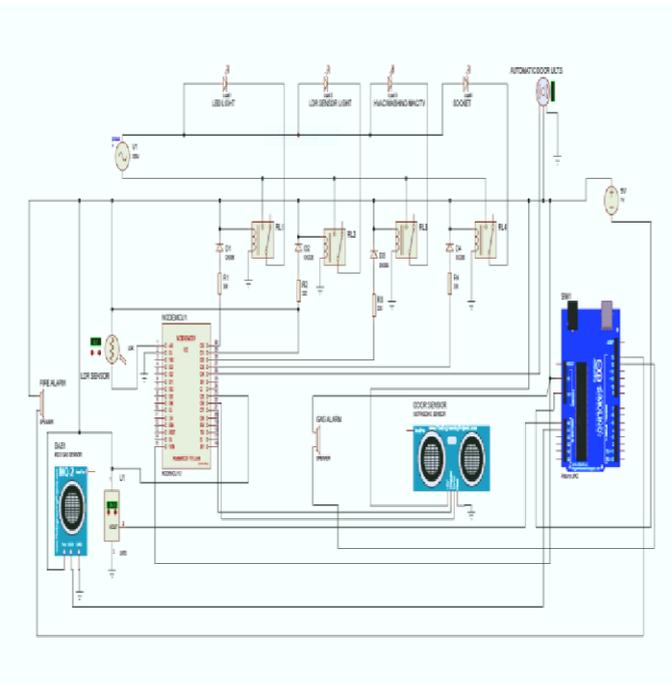


Fig. 4. Schematic Diagram of the prototype

**B. Hardware Implementation**

Implementation of hardware is an essential part of a project. So, each section of the project was first examined and checked; then, it was implemented with care—a Light Dependent Resistor (LDR) has used this project automatic door, a remote control door.

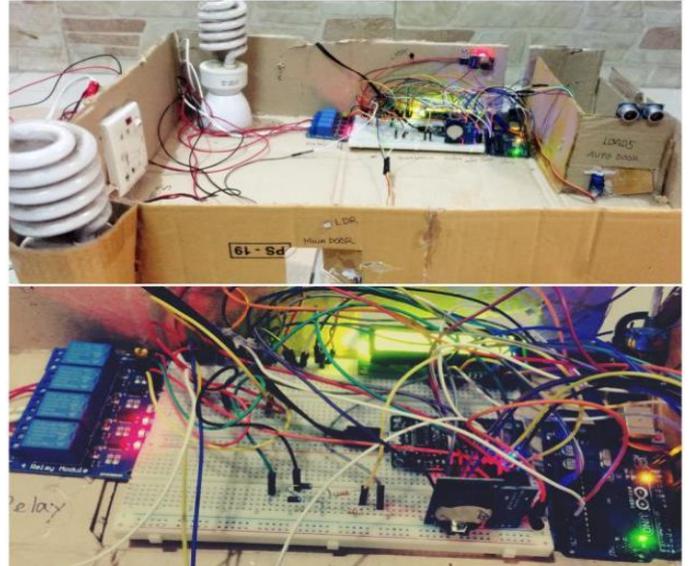


Fig. 5. The implemented Hardware portion of the prototype

Automatic doors open auto when someone approaches, instead of being opened manually with a door handle or bar. Automatic open and closed doors are powered, and a door fitted with a spring is not an automatic door to close. An automatic door is advanced sensor technology, which can be controlled by mobile or computer. We use it in our project via NodeMCU through Blynk apps.

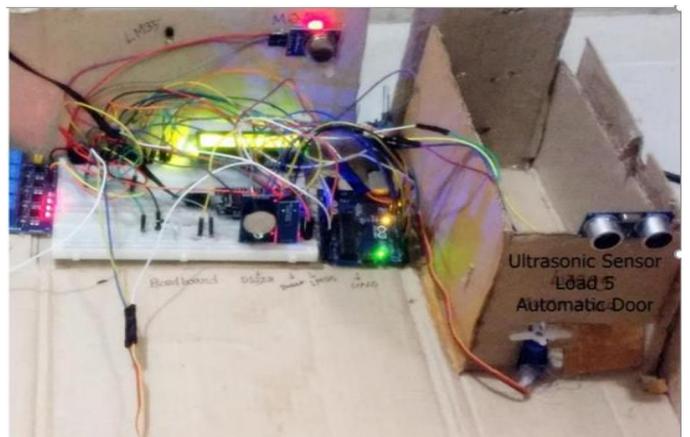


Fig. 6. Automated door implantation

Someone or some devices control remote control doors. It can be controlled by mobile or computer. It is almost like an automatic door, but the difference is someone, or some devices should control it. Servo motor has used for moving the door, and the door is directly connected to NodeMCU. This door is controlled by mobile.

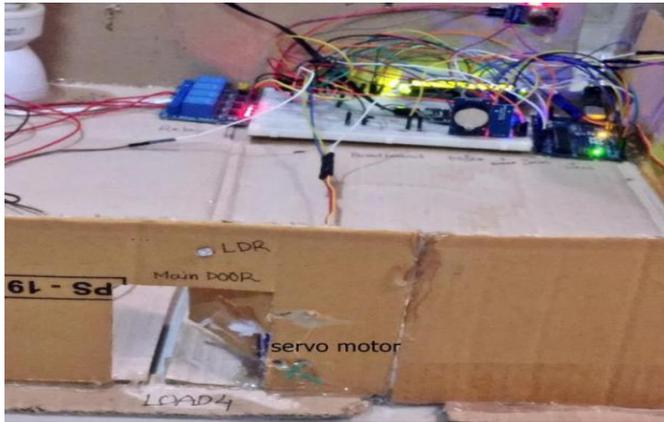


Fig. 7. Implementation of the remote-controlled Door

A Light Dependent Resistor is a luminous sensitive device. Those devices depend on the light. When light falls on the LDR, the resistance decreases and increases in the dark. If an LDR stays in the darkness, its intensity is excellent, and when the LDR is kept in light, its intensity decreases. When CONNECTED TO VCC, the LDR releases an analogue voltage, varying in magnitude in direct proportion to the input light intensity. That is, the greater the luminous intensity, the greater the corresponding LDR voltage. As the LDR releases an analogue voltage, this connects to the input pin of the NodeMCU.

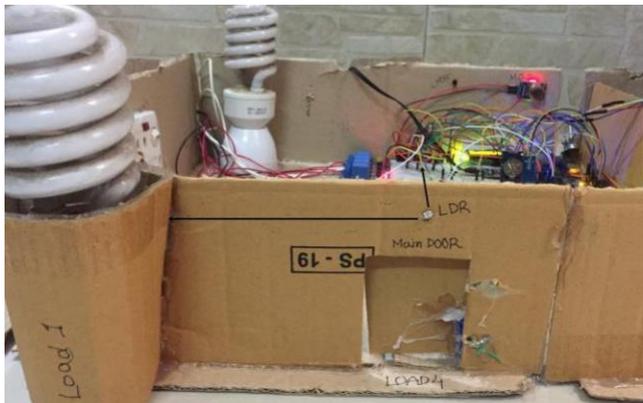


Fig. 8. Implementation of LDR sensor Light

The sensor is used for the detection of unauthorized passing in the home.

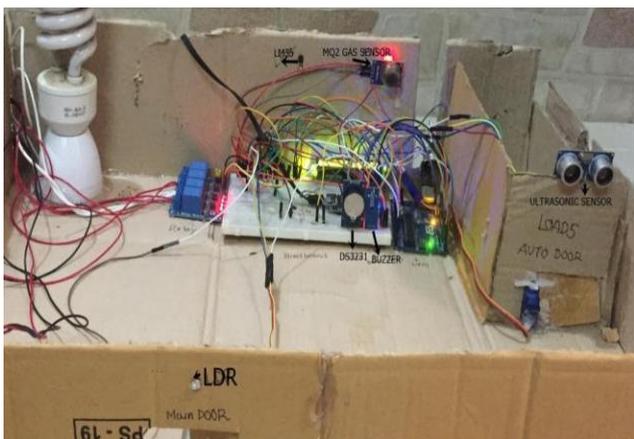


Fig. 9. Other Sensor Implementation

VI. RESULT & ANALYSIS

The Smart Home product analysis had shown with tables and graphs that could improve efficiency as well. This prototype uses Blynk software to remotely control everything and uses Google's assistant to function through IFTTT.

TABLE I. ULTRASONIC DOOR SENSOR DATA

Distance(cm)	Load State
1000-800	Off
800-600	Off
600-400	Off
400-200	On
200-50	On

Table I. shows the distance at which the load status of the device is on or off. Whenever the ultrasonic sensor senses a human or moving object ranges from 50cm-400 cm, the automated door opens.

For 24 hours, a data set had been recorded according to the intensity of light. LDR values are higher during the day and lower during the night. The device goes off when the light intensity is high, and the device gets on when the light intensity is low. A time vs light intensity curve has shown in Fig. 10.

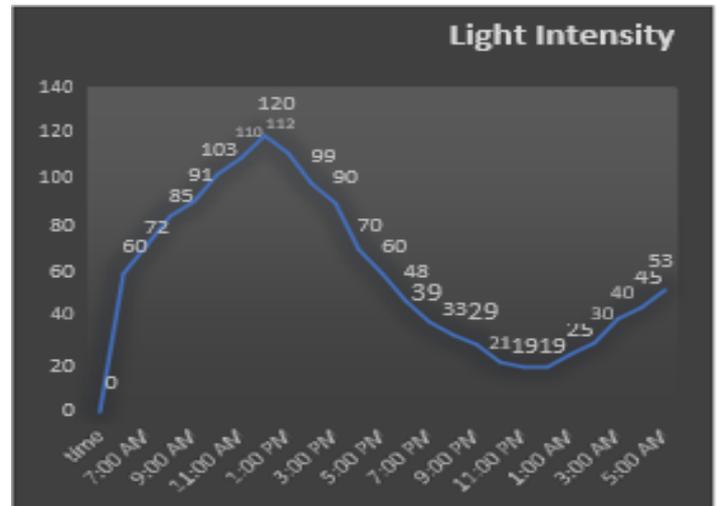


Fig. 10. Time vs Light intensity

TABLE II. TEMPERATURE SENSOR DATA

Temp.	Time	Alarm
50	0.0min	off
60	0.0min	off
70	0.0min	off
80	0.5min	off
90	0.5min	on
100	1.0min	on

In Table II, the temperature sensing time has shown and at what temperature it will provide an alarm to notify the user.

TABLE III. GAS SENSOR DATA

Observation	Smoke (cm <sup>3</sup> )	Time	Alarm
1	0-250	0.0min	off
2	255	0.5min	on
3	275	0.5min	on
4	400	1.0min	on
5	233	0.0min	off

In Table IV. The time to detect the density of the gas has been shown. It provides an alarm to notify the user when the harmful gas density of smoke has been exceeded 250.

TABLE IV. OBSERVATION OF VOICE COMMAND IN GOOGLE ASSISTANT

SL. No.	Google Command	Time taken	Google Command	Time taken
1	Turn on light	5s	Turn off light	4s
2	Turn on light	6s	Turn off light	5s
3	Turn on light	5s	Turn off light	4s
4	Turn on light	6s	Turn off light	4s
5	Turn on light	5s	Turn off light	5s
6	Turn on light	5.5s	Turn off light	4s
7	Turn on light	6s	Turn off light	4.5s
8	Turn on light	5.5s	Turn off light	5s
9	Turn on light	5s	Turn off light	4s
10	Turn on light	6s	Turn off light	4.5s

The observation shown in Table IV shows the average time to turn on the light is 5.5 seconds and the Average time to turn off the light is 4.4 seconds.

TABLE V. OBSERVATION OF GOOGLE ASSISTANT VOICE COMMANDS IN A DIFFERENT PERSON VOICE

No. of voice taken	Response Outcomes
1	Yes
2	Yes
3	Yes
4	No
5	Yes
6	Yes
7	Yes

From the observation, the article refers to Table V. shows seven different voices to see the compatibility of the Google Assistant With different input voices. The table shows that the probability Of working on distinct voices is 85%.

**VII. FUTURE DEVELOPMENTS & APPLICATIONS**

Using AI, a Smart calling bell system, and security surveillance, a smart home had to develop.

There are some impacts of this prototype. IoT technology's advancement reduces energy waste, reduces the cost of basic needs, entertainment, and comfort, and manages home devices.

**VIII. CONCLUSION**

In just a few years, the market for IoT applications has shifted dramatically. The industry has grown to include business people collaborating to build ecosystems customized to mobile technologies, allowing IoT applications to interact. At first glance, home automatons could appear to be a peculiar and unlikely concept. Still, as our devices become more advanced and more capital is invested in IoT consumer goods' growth, we should expect more competition. That's why this project is more understandable and cost-effective for the people and the future.

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