

Centralized Home Control System using IOT

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Abstract: Smart home systems are rising technology that would bring comfort and security to everyone's daily lives. Many homes in different parts of the world feature older designs that may not be suitable for a smart home concept. Even though, this day the manual system is still being used by most users but the smart home systems can be solving our cost of wasting the electricity and money. Besides, to operate manually using a socket and switch, it will become very difficult for elderly or physically handicapped people to operate them. The purpose of this project is to help users and reduce the power usage consumption by developing an application on a smart phone to control various electrical devices by using the Internet of Things (IoT) platform. Nowadays, technologies are advancing very fast, excessive use of power consumption will result in a very expensive bill. The idea of designing this smart home system is starting from human that waste into electricity like always forgot to switch off the appliances. The lack of application in controlling appliances remotely. Currently, the smart home implementation is complicated for general usage. The objectives of this smart home system is to control multiple operation at home remotely using a smartphone. Besides, it also to design the application mobility and comfortable to use

develop the device compatible with IoT. This project is focusing on normal home to smart home that can be controlled from everywhere in the world. The methodology used to help produce a successful project and the next generation to achieve the objective of this project. The results were obtained for the implementation of the project 'IoT based Smart Home System'

1. INTRODUCTION

This chapter comprises of the study of research of this system. It includes the history of the postal system, web-based application, email as connecting mechanism and comparison to the existing systems. Relevant sources from journals, articles and books are compiled and cited to complete this literature review. The Internet of Things (IoT) has been a trending field in the world of technology. It has changed the way of work. Physical objects and the digital world are connected now more than ever. (Madakam S., 2015) The IoT is a technological revolution that represents the future of computing and communications and its development depends on dynamic technical innovation in number of important fields from wireless sensors to nanotechnology. Regarding the progress of IoT

Smart Home System project, the related research will be discussing briefly in this chapter. Literature review also the main focus in this research project because to make sure the purpose of this project is clearly understanding. It is included the NodeMCU ESP8266, 4 Channel Arduino Relay Module and 2 initialize systems.

Through implementing software programming from the web-based, web applications are dynamic web sites combined server-side programming which provide functionalities such as interacting with user, connecting to back-end databased and generating results to browser. For examples, IFTTT, Blynk Platform and Webhooks. Apart from using this application, promotes much wider range of help regarding to Internet of Things (IoT) knowledge. Blynk Documentation conclude that Blynk application depicted that it serves user for IoT as it could assist data from the Wi-Fi module, store the data or many other interesting things.(Priya 2017) develop Application Based Device Controlling System The application which has been installed on the smartphone helps to remotely access devices and thus implement wireless technology.

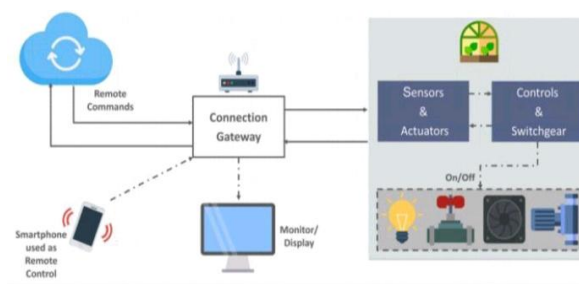
II. LITEATURE REVIEW

Home automation systems suffers four main challenges; these are poor manageability, inflexibility, difficulty in achieving security and high cost of ownership, The main objectives of this research is to design and implement a home automation system using IOT that is capable of controlling and automating most of the house appliances through an easy manageable web interface. The proposed system has a great flexibility by using Wi-Fi technology to interconnect its distributed sensors to home automation server. This will decrease the deployment cost and will increase the ability of upgrading, and system reconfiguration. The physical presence is mandatory in existing home automation whereas this physical presence

obstacle can be completely eliminated by adapting the home automation based on cloud architecture. The existing home automation systems incorporates Technologies like Bluetooth, zigbee, NFC, RFID which has distance limitations and performance limitations. The lack of cloud technology in existing systems make home automation system poor where the disabled and old aged people cannot control and monitor their electrical home appliances remotely over the internet. The result of literature survey of existing IOT systems technologies are as under.

III. ARCHITECTURE

We propose a design of the IOT-based Smart Home system which aims to help people with physical disabilities so they can continue their activities around their home environment. Therefore, this proposed system can help disabled people to control electronic equipment or electrical equipment, such as lights, and fans with voice commands to Android smartphones using Google Assistant or Alexa. This device can be controlled and accessed remotely. It makes it easier for disabled people to utilize it without touching them physically. Disabled people do not need to move anymore to turn on and turn off electrical equipment at home.



In addition to making our life more convenient, home automation can also help you save money. Automated systems can help you conserve energy by managing your lighting and temperature settings, and some security systems can even help you lower your insurance rates. Finally, home automation can improve your safety and security.

IV. PROPOSED SYSTEM

• Bluetooth Technology

Home automation systems using Bluetooth technology are secured and low cost. The Bluetooth system uses a PC or smartphone as receiver device. It has a high communication rate, great security and low cost.

• RFID Technology

RFID Tags mainly constitute of a reader, an access controller, software, an antenna, a tag and a server. It is a technology that transfers the object's (smart object) identity by a serial number using some radio waves. RFID technology is highly important in IOT in order to resolve issues related to object identification.

• Near Field Communication (NFC) Technology

NFC is a wireless technology that operates in short ranges. It works on the frequency of 13.56 MHz, needing a distance. NFC can also operate smoothly in dusty environment, it does not need line of sight communication and hence it is an easy and convenient connection method.

• Wireless Fidelity (Wi-Fi)

Wi-Fi is used to deliver very high speed WLANs (Wireless Local Area Network) in order to connect IOT smart objects. Wi-Fi is a wireless technology used for networking allowing the computers or other devices to establish communication over a signal.

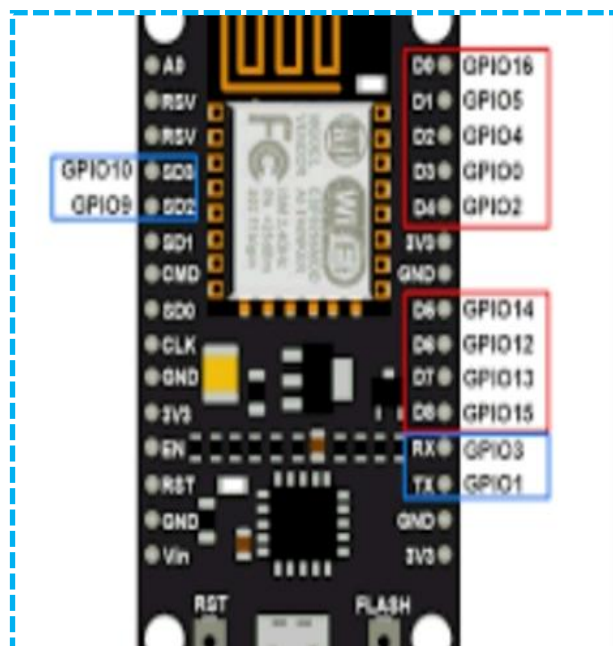
• NODEMCU ESP8266

NodeMCU is an open-source firmware and development kit that help to prototype or build IoT products. It includes firmware that run on the ESP8266 Wi-Fi SoC from Espressif Systems and hardware which is based on the ESP-12 module. It is based on the eLua project and built on the Espressif Non-OS SDK for ESP8266. A capable little device that enable to explore computing. Built-in low power 32-bit MCU @ 80MHz and

512kB Flash Memory. Can be used as Station or Access Point or both combined.

Low cost, compact and powerful Wi-Fi Module
Power Supply: +3.3V only Current Consumption: 100mA I/O Voltage: 3.6V (max) I/O source current: 12mA (max) Built-in low power 32-bit MCU @ 80MHz 512kB Flash Memory Can be used as Station or Access Point or both combined Supports Deep sleep (<10uA)

Fig 1 GPIO PIN CONFIGURATION



• 4 CHANNEL ARDUINO RELAY MODULE

This relay module allows to combine the processing power of the Arduino to device that use higher current and voltage. It does so by providing four relays that are rated for 7A at either 28 VDC or 10A at 125VAC. Each relay has a Normally Open (NO) and a Normally Closed (NC) contact. In the relay module input, the module is supplied with power via the pin VCC and ground via the pin GND. The relays are

energized with low input to the IN1, IN2, IN3 and IN4 inputs.

Fig 2 RELAY MODULE

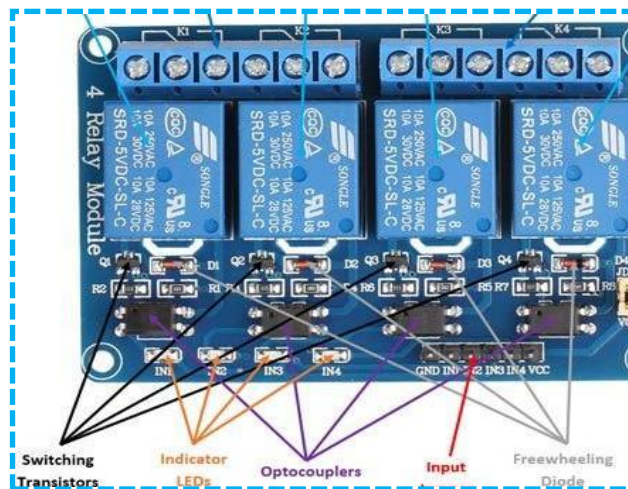
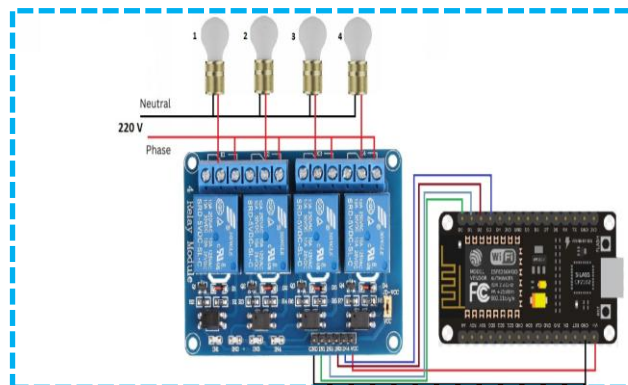


Fig 3 CIRCUIT DESIGN ON PROTEUS SOFTWARE



• BLYNK PLATFORM

Blynk is a platform with smartphone applications to control Arduino over the Internet. It's a digital dashboard where it can build a graphic interface for the project by simply dragging and dropping widget. In this project, Blynk application is the second initialize system that use by pressed the button switch 'ON' or 'OFF'. The steps to create the Blynk platform are firstly installed the Blynk application at the Google Play Store or Apple Store. Then, create the switch button for each

output. Next step, go to setting to change the output pin based on Arduino pin board.

• BLYNK APPLICATION USES

Blynk IoT is a low-code platform used to quickly build, deploy, and manage connected devices, supporting everything from personal prototypes to

large-scale commercial products. It features drag-and-drop mobile app builders (iOS/Android), a web console, secure cloud infrastructure, and device management tools (OTA updates), connecting hardware via Wi-Fi, cellular, LoRaWAN, or satellite.

• PROTOTYPE TESTING

After design the prototype, the prototype tested with two categories which are range distance, command. The prototype tested that the voice range between 0m to 5m while smartphone application is by far larger range because of the implementation of Internet of Things (IoT). Next, the commands show the output will turn 'ON' or 'OFF' by pressed the button on smartphone or assist by google assistant on Google Home API. All the results of test project are shown at table result.

• RESULT AND DISCUSSION

In this section, all the result of testing the prototype are recorded. The table below shows the results of Google Home API and Blynk Smartphone Application. The first part is testing the connection range distance within input and output. Next, second part which based on the objective where testing voice command used on the Google Home API. The third part is testing operation on the smartphone which using Blynk Application to operate the system. The last part is testing the multimedia capability on the screen.

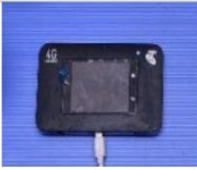
Testing Result on Blynk Application (Smartphone)			
No	Result		
	Command	Condition	Status
1			✓
2			✓
3			✓
4			✓

Fig 4 TESTING RESULT ON BLYNK APPLICATION

DISCUSSION

Each of output are connected to the 4 channel Arduino relay module while Google Home Mini connected to Arduino board using Arduino Wi-Fi module. Since the circuit using Arduino, Google Home API and relay as an output as the prototype design process to build a Home Automation System. Before going to the next stage, make sure there running completely to each component before going to the prototype testing. If the program can run completely, the system is working the correct coding and circuit starting either by choosing Blynk application or Google Home API to run the Arduino board to the output. The result is using push button at Blynk application or Voice at Google Home API to turn on or turn off the output (Lamp, Fan, Television,

USB charger and media capability such as Youtube, Netflix, Spotify etc).

FUTURE SCOPE

The future scope of this IoT-based home automation project extends beyond basic remote control of appliances and lighting, evolving into an intelligent, interconnected ecosystem. By integrating AI and machine learning, the system can predict user behaviors—such as adjusting HVAC based on occupancy patterns—to achieve 20-30% energy savings while enhancing comfort through voice-activated natural language processing. Advanced connectivity via 5G, Matter standards, and edge computing will enable seamless scalability for 100+ devices, low-latency security alerts, and interoperability across brands without proprietary hubs.

Sustainability features like solar energy optimization and real-time air quality monitoring open doors to health-focused applications, aligning with smart city initiatives. Blockchain integration addresses cybersecurity, ensuring secure data sharing amid rising IoT threats. With the global market projected at \$117 billion by 2026 and India's segment growing at 29.8% CAGR, this project holds commercial potential for urban deployments, paving the way for AR/VR interfaces and predictive maintenance by 2030.

CONCLUSION

As mentioned earlier in the introduction, there are four main objectives in this project. After conducting the project, the objectives have been achieved. For first objective is to control multiple operations at home remotely using smartphone. It can help user to easy use the appliances at home anywhere and data is centralized. Control such as television, fan and light can be control by smart phone by configure the Arduino with NodeMCU acts as system. The connected appliances which is built on the key foundation of Internet access

both in the home and on the move typically provided by smartphones other portable devices. Second objective of the project is to control multiple operations at home remotely using voice command. It is to integrate multimedia capability with IoT based smart home system. We came out with advanced idea by combining all the appliances together as we knew the existing technology usually focusing on one system. In order to achieve this, the application let user switch ON/OFF the light, fan, television and many other devices with the voice command. It presents the content with simple phrase to command using Google Home API. For example, 'Hey Google, Turn ON the light' to execute the system. Next, the third objective is to integrate multimedia ecosystem with IoT based smart home system. It is because ecosystem can be saving energy, these appliances can be reduced energy bills.

VI. RECOMMENDATION

As recommendation, looking at various aspect dealt, there are many possibilities that there are positive elements present that are supporting and encouraging the upgrading the IoT based on Smart Home System. The following suggestion are automatic gate, mailbox notification and AC voltage detector. AC voltage detector used to save energy consumption at our home. This can be concluded that this project had achieved all the objective and succeed.

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