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Smart Home Control

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Abstract: ***This project presents the final design of Home Automation System (HAS) with low cost and wireless system. It specifically focuses on the event of an IOT based home automation system which can control various components via internet or be automatically programmed to figure from ambient conditions. during this project, we design the event of a firmware for smart home control which could successfully be automated minimizing human interaction to preserve the integrity within whole electrical devices within the house. We used NodeMCU, a popular open source IOT platform, to execute the tactic of automation. Different components of the system are visiting be conversant in control the appliance supported the user's input through NodeMCU. the foremost system implements wireless technology to provide remote access from smart phone. We are employing a cloud server-based communication which may increase the practicality of the project by enabling unrestricted access of the appliances to the user irrespective of the space factor. We provided a knowledge transmission network to create a stronger automation. The system intended to manage electrical appliances and devices in house with relatively low-cost design, user-friendly interface, and straightforward installation. The control of appliances is obtainable on an android platform. this method is supposed to assist and provide support to fulfil the requirements of elderly and disabled in home. Also, the smart home concept within the system improves the standard living reception.***

Keywords: Internet of Things; Adafruit; Node MCU; Home Automation; Automation using IOT; Adafruit and Node MCU; IOT Cloud

I. INTRODUCTION

Home automation is become more beneficial due to its safety and security. Nowadays, home automation become more advance and precise to appear in the slightest degree the house appliances. Home automation system become energy efficient and highly approachable smart home technique. It involves basic feature to want care of the user satisfaction and luxury. Home automation could also be a singular system which is ready to manage and communication between nearly all aspects of your house. Home automation could even be a term want to clarify the working together of all household amenities and appliances. as an example, a centrally microcontroller panel can have the aptitude to manage everything from heating and overall electrical appliances. Home automation can include controlling aspects of our home remotely through a computer or any mobile equipment, programming electronics devices to conditions or scenario or centralizing the control of a diffusion of appliances to a minimum of one centre. It's essential that the various controllable appliances be interconnected and communication with one another. the foremost purpose of home automation is to manage or monitor signals from different appliances or basic services. A wise phone is employed to regulate or monitor the house automation system. The concept of "Home Automation" has been breathing for several years. "Smart Home", "Intelligent Home" are terms that followed and has been accustomed introduce the concept of networking appliance within the house. Home Automation Systems (HASs) includes centralized control and distance status monitoring of lighting, security system, and other appliances and systems within a house. HASs enables energy efficiency, improves the security systems, and therefore the comfort and easy users. within the present emerging market, HASs is gaining popularity and has attracted the interests of the various users. HASs comes with its own challenges. Mainly being, within the present day, end users especially elderly and disabled, although hugely benefited, aren't seen to simply accept the system due to the complexity and price factors.

II. LITERATURE SURVEY

A. "Smart Energy Efficient Home Automation System using IOT", by Satyendra K. Vishwakarma, Prashant Upadhyaya, Babita Kumari, Arun Kumar Mishra.

This paper presents a step-by-step procedure of a sensible residential automation controller. It uses IOT to convert home appliances to smart and intelligent devices, with the assistance of design control. An energy efficient system is intended to access the smart home remotely using IOT connectivity. The proposed system mainly requires, Node MCU because it's the microcontroller unit, IFTTT to interpret voice commands, Adafruit a library that supports MQTT acts as an MQTT broker and Arduino IDE to code the microcontroller. This multimodal system uses Google Assistant together with a web-based application to regulate the smart home.

The smart house is implemented with main controller unit that relates to the 24-hour available Wi-Fi network. To ensure, that the Wi-Fi connection don't close up, the most controller is programmed to determine automatic reference to the available network and connected to the auto power backup.

B. "IOT Based Smart Security and Home Automation", by Shardha Somani, Parikshit Solunke, Shaunak Oke, Parth Medhi, Prof. P. P. Laturkar.

This paper focuses on a system that gives features of Home Automation looking forward to IOT to control easily, additionally thereto it includes a camera module and provides home security. The android application basically converts Smartphone into a distant for all home appliances. Security is achieved with motion sensors if movement is sensed at the doorway of the house; a notification is shipped that contains a photograph of house entrance in real time. This notification is going to be received by the owner of the house via internet such that an app can trigger a notification. So, owner can raise an alarm just in case of any intrusion, or he/she can toggle the appliances like opening the door if the person could be a guest. The system uses Raspberry Pi, a little pocket-sized computer which acts as server for the system. The smart home consists of two modules. Home automation that consists of; fan light and door controller, and security module that consists of; smoke sensor motion sensor and camera module.

C. "A Low-Cost Home Automation System Using Wi-Fi based Wireless Sensor Network Incorporating internet of Things", by Vikram.N, Harish.K. S, Nihaal.M. S, Raksha Umesh, Shetty Aashik Ashok Kumar.

This paper illustrates a strategy to supply a low-cost Home Automation System (HAS) using local area network (Wi-Fi). This summarizes the concept of internetworking of smart devices. A Wi-Fi based Wireless Sensor Network (WSN) is meant for the aim of monitoring and controlling environmental, safety and electrical parameters of a sensible interconnected home. The various sections of the HAS are temperature and humidity sensor, gas leakage warning system, fire device, burglar warning device, rain sensing, switching and regulation of load & voltage and current sensing. the first requirement of needs to monitor and control of devices is accomplished employing a Smartphone application. the applying is developed using Android Studio supported JAVA platform and interface of these are exemplified. the first focus of the paper is to develop an answer cost effective flexible up to the mark of devices and implementing a large range of sensors to capture various parameters.

III.OUR PROPOSED METHOD

There aren't any users who don't want to feature more features over the prevailing system which provides more elasticity and runs with some general applications sort of a smart phone. Our system is intended in such the way that abstains from the drawbacks of the present system. The developed method gives more security, comfort, and adaptability. The aim of our proposed method is to style and to implement an occasional cost and open-source home automation that's able to lead most of the house and sustain the house automation system. To use wireless reliable technology to interconnect many modules to the server of the house automation system, as a result, the proposed system gives more flexibility. this technique will reduce the expansion cost; will augment the elasticity of advancement. Through DHT22 sensor we are able to measure temperature and humidity. The temperature value is employed to tour on the fan if the worth of temperature is beyond the given threshold. The user can either activate or off this automation using the android/ IOS application.

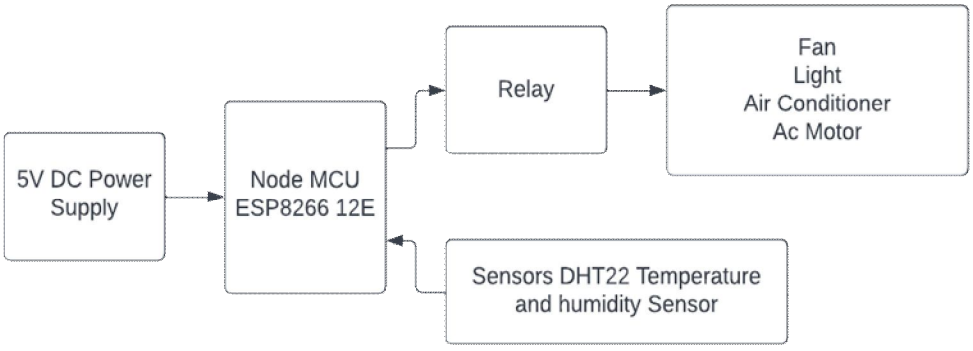


Figure 1: Home Automation for electrical devices

IV. SYSTEM DESIGN

A. NodeMCU

NodeMCU is an open-source firmware that open source prototyping board designs are available. It's sort of a brain. Its primary advantage is low cost and Wi-Fi capabilities. the most a part of home automation system is NodeMCU. Its very useful for learning IoT. We are going to use Micro Python to program our NodeMCU which is a variation of python built for small low power and low processing requirements.

B. Sensors and NodeMCU

The DHT22 Temperature and humidity sensor module is employed for reading temperature and humidity values. The DHT sensors are manufactured from two parts, a capacitive humidity sensor and a thermistor. there's also a awfully basic chip inside that does some analog to digital conversion and spits out a digital signal with the temperature and humidity. The digital signal is fairly easy to read using any microcontroller.

We upload the temperature value to Adafruit Server through MQTT communication therefore the user can see these values from android/IOS application. We use the temperature value to show on fan when the temperature reaches a specific degree. We even have TTP223 capacitive touch sensor that the user can use to show off or on the values of individual electrical components. TTP223 touch sensor is that the quite common sensor that's want to control the system with human interface with the system. TTP capacitive touch sensor, widely used sensor in automation and project. Touch Sensor are used for controlling the system or device physically with the touch response of body to sensor.

C. Architecture of Our Proposed IoT System

The proposed IoT architecture system consists of Network and Transport Layer, electrical circuit Layer, Application and Presentation layer, Physical Layer.

IoT gateway router, device manager and lots of contact protocols are a part of the information link layer. All the controlling devices are included within the physical layer section. For controlling many devices, an online portal is meant an internet page at the appliance and presentation layer.

The de-vices may also be controlled by making an app on a transportable. the online portal and mobile app do similar works. The proposed system IoT layer is shown in figure 2.

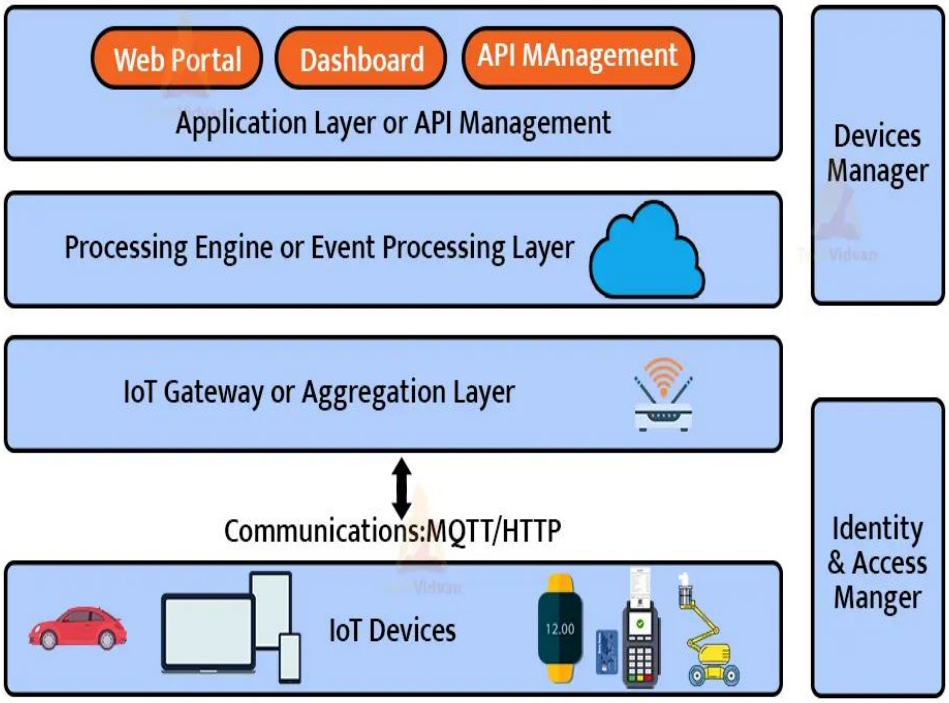


Figure 2: IoT Layer

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V. IMPLEMENTATION

A. Hardware implementation

The most important components of hardware parts are NodeMCU, DHT22, 4 Channel Relay, TTP223 Capacitive Touch Sensor. Many sensors are interfaced with NodeMCU through Micro python artificial language and also the output is seen in Web and android/IOS application. The circuit diagram is given below.

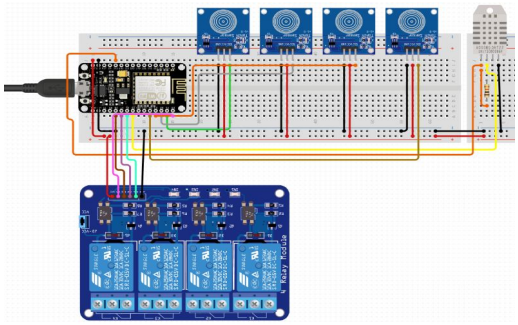


Figure 3: Circuit diagram of interfaces with sensors and actuators

B. Software Implementation

Install micro-python on NodeMCU using Thonny Software. Then we write a code using micro python artificial language to remotely control lights, fan, switches and other appliances.

We use the third-party server as Adafruit for this prototype except for the business purpose we use our server. We connect the code between NodeMCU and therefore the third-party live server. The NodeMCU is interfaced with many sensors like DHT22 Temperature and humidity sensor and TTP223 Capacitive touch sensor. These sensors are continuously updated data to the server every 10 sec. this will easily change by the user. We develop an Android/IOS app using Flutter to manage and monitoring home appliances. First, the app connects to the server and sends data to the server from the user itinerant via the net when the user presses the visual button during this android app. NodeMCU reads the information from the server and executes this instruction. Also, the Android app gets updated JSON data from the live server and displayed on the mobile screen.

C. Mobile Application

Smart phone may be accessed on the house automation system through IP addresses. io.adafruit.com could be a hosted server of the smart phone and therefore the remote user sends and receives data through this server. Through a sensible phone and IP address, the user can check the status and instruct the devices. we've developed an internet portal which will also control and monitor the devices. The device first receives the state of all topics and updates the information on the app. Then we are able to view the status of the sunshine, fan, and switches within the rooms where they're turned ON/OFF. we are able to see all the devices and that we can select any devices which we wish to regulate. Figure 4 shows the controlling app, control devices and their status (on/off/temperatures and humidity).

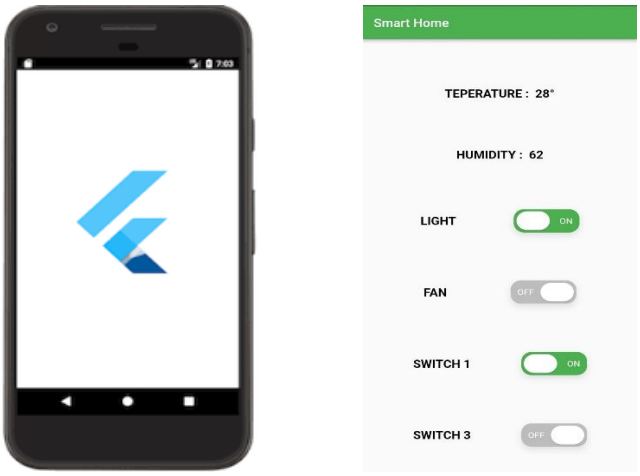


Figure 4: Mobile Application.

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VI. RESULTS

The Figure 5 shows the experimental testing of temperature and humidity sensor working prototype. When temperature value is increased beyond threshold level then fan is automatically switched ON without human interruption. The web application controls the light, fan, switches relays through network from remote location. The smart phone, laptop and personal computers are used for accessing web application over the network. This proposed model controls the relays over the network from remote location.

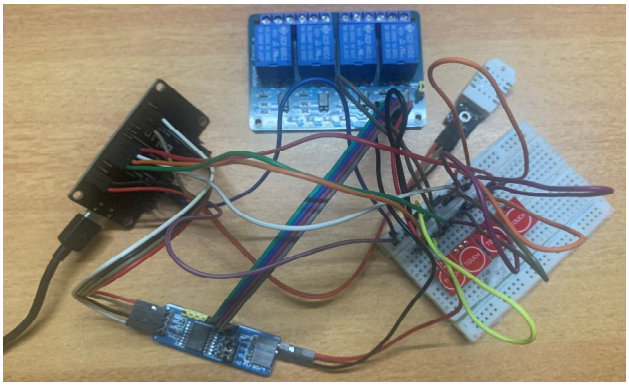


Figure 5: Experimental Testing of Prototype

Figure 6 shows the online dashboard that the user can utilize to manage the relays remotely and think about temperature and humidity.

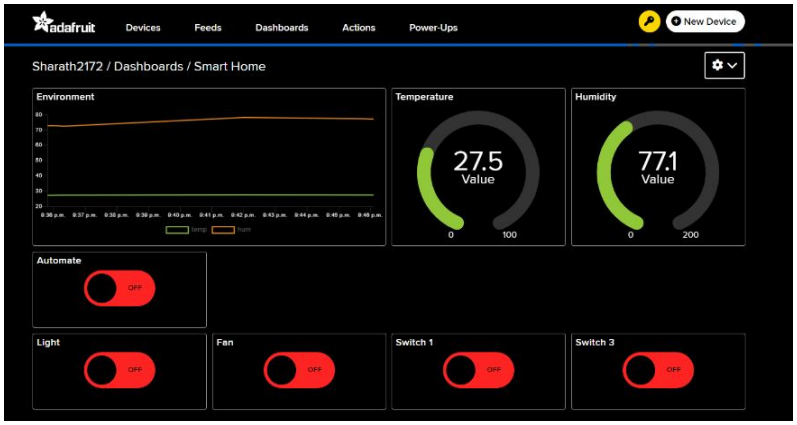


Figure 6: Adafruit Dashboard

Figure 4 shows the mobile application designed for the user. The app first loads the previous values from Adafruit server so load the info on app. Then the user can control the devices remotely using network through Adafruit server.

The latent period for our commands is well within the allowable range and might be controlled easily. We designed an easy system for the user to manage the electrical appliances in his home with a coffee cost model which might be expanded to the users' requirements

VII. CONCLUSION

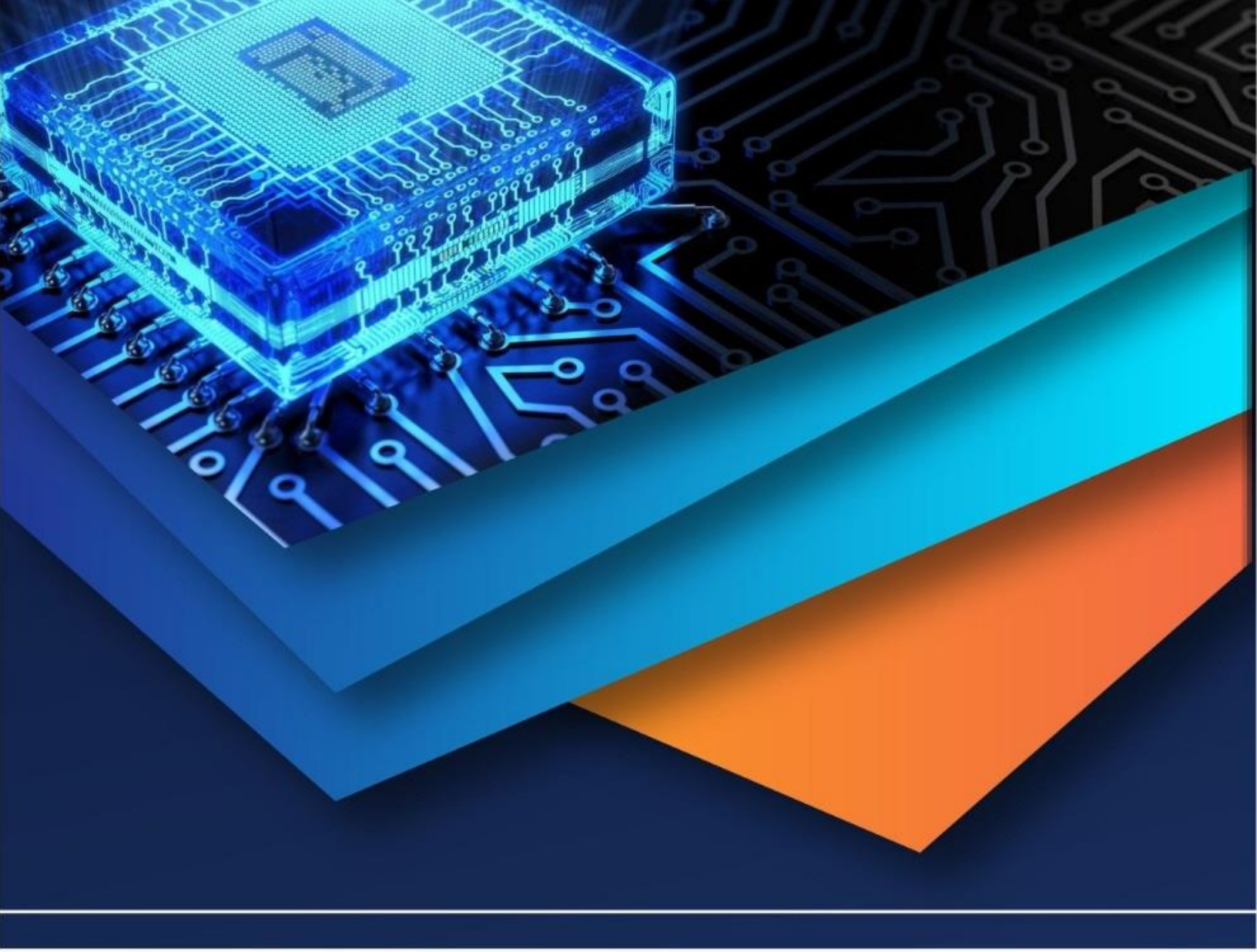
It is evident from this project work that a personal control home automation system will be cheaply made up of low-cost locally available components and may be wont to control multifarious home appliances starting from the protection lamps, the tv to the air-con system and even the whole house lighting system. And better still, the components required are so small and few that they will be packaged into a tiny low inconspicuous container. The designed home automation system was tested several times and authorized to regulate different home appliances employed in the lighting system, air-con system, home entertainment system and plenty of more. Hence, this technique is scalable and versatile

VIII. ACKNOWLEDGMENT

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