SMART OFFICE AUTOMATION SYSTEM USING NODE MCU ESP8266 ON VOICE COMMAND

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ABSTRACT: System automation has become the most popular field due to its efficiency, comfort and ease in operation of many electronic devices from remote locations. This paper focuses on Office Automation system, where user can control electronic devices like lights and fans and also can securely handle very important office data remotely using a smart phone. This paper aims the design and implementation of Internet of Things (IoT) based office automation system using NodeMCU ESP8266 Wi-Fi module and by developing this system we are able to control office appliances through any smart phones in real time. The control commands are instructed by the user's smart phones. IFTTT Google Assistant is used to give the voice control commands. The system's hardware consists of NodeMCU, sensors, Relay driver module and Power supply. The software requirements for this project are Arduino IDE, Blynk App and IFTTT. Internet of Things application is implemented using NodeMCU which is a credit-card sized computer aimed at providing a computer operation from anywhere. It can securely handle some important and confidential office data which is stored on office computer and sometimes required to handle using smartphones. Cloud computing services are used which gives host the data of owner on the server and authorized users can access the data of the servers. The smart mobile is joined to the computer system with the NodeMCU using the IP address via Wi-Fi. Wireless applications using Wi-Fi is user-friendly, improves the efficiency of the system, and it successfully overcomes the drawbacks in the Bluetooth and ZIGBEE technology.

Index Terms – **Office automation, voice control command, IoT, NodeMCU, Cloud Computing.**

I. INTRODUCTION

Internet of Things (IoT), is a network of the automobile, physical appliances, and also the item plant with electronic, detector, package, and network correspondence that grants bound objects to gather and exchange information. In 2013 the world Standards Initiative on IoT-GSI confirmed the IoT as the "base of the data society". The machine to machine and IoT technology is conducting a sort of "super visibility" up to virtually every trade. Imagine utility and Telco's that may forecast and stop services blackout, airlines that remotely monitor and arrange a performance, and tending operation that may base care on real-time genetic information analysis. The business probability is limitless. IoT cloud solutions bring a budget to high-speed information networks and significantly expand the scope and accessibility of your IoT application. They will conjointly supply information storage, processing, analysis, and remote device management. As firms collect information on the far side of ancient IT boundaries, IoT security measures are vital [1].

Workplace automation is nothing, however, interconnection of physical devices embedded with sensors and packages. The network property is employed to gather and exchange the info. Workplace automation refers to the automated and electronic management of activity and appliances. Varied management systems square measure used during this residential extension of building automation. Workplace automation is additionally called domestics or demons. The fashionable system typically carries with it switches and sensors connected to a central "gateway" from that the system is controlled with a computer program that's interacted either with a wall-mounted terminal, portable package, pill pc or internet interface, typically, however, not invariably via web cloud services [4].

These days, the automation system is being used for the wide-ranging management of devices around the home or workplace. A range of electrical devices is controlled with the assistance of an automation system. Every kind of home appliance like doors, lights, fan, electric fire, police work systems, and client physics belong to the house automation system devices. The workplace automation system is adopted by exploiting the technology offered for the aim of dominant the devices additionally because the systems employed in the house mechanically. This project can present intelligent workplace automation to manage the appliances and electrical and equipment by exploiting the smartphone. It'll activate or OFF the appliances and electrical instrumentality by exploiting relay circuits with the idea of IoT. This can be implemented by exploiting NodeMCU [5]. A pair of Cloud computing is that the combination of the many antecedent technologies that have matured at totally different rates and in numerous contexts. The goal of cloud computing is to permit users to require to have the benefit of these technologies. Several organizations are square measure stepping into the cloud as a result of it permitting the users to store their information on clouds and might access it at any time from anyplace. Information breaching is feasible in the cloud setting since the information from varied users and business organizations lies in the cloud. By uploading the info to the cloud, house owners transfer the management of their data to a 3rd person who might raise security issues. Typically, the Cloud Service supplier (CSP) itself can use/corrupt the info illicitly. Security and privacy stand as a major obstacle to cloud computing, i.e., conserving confidentiality, integrity, and handiness of information. A straightforward answer is to cipher the info before uploading it onto the cloud. This approach ensures that the info isn't visible to external users and cloud directors however have the limitation that plain text-based looking rules aren't applicable [7].

II. LITERATURE SURVEY

We have studied many papers to check the progress in the field of Office Automation System because of which we came to know that there is a various issue in every paper. In papers [1, 7] authors have used the Raspberry Pi board to control the home appliances. Author have implemented the theory of using cloud computing for storing the data in a remote storage location, but data security

was the major threat in their idea. In paper [3] authors had used smart phone's in-built Bluetooth facility for automation because of which remote control to the device was not possible. In paper [10] authors used Arduino board and Arduino IDE to control the various electronic appliances and the devices of the home. From the review of some other papers, we can conclude that they are aiming only either on home automation [4, 5, 6] or on office automation [9] but most of the researchers have just controlled the different appliances without any security provisions. In our project we are aiming to control office and handle the office data securely from remote location.

III. MOTIVATION AND IMPORTANCE

The need for automation is for some reasons. These reasons emphasize the importance of automation. The explanations are
(a) Automation facilitates economical and elaborated info through the utilization of mechanical aids like computers.
(b) It ensures speedy recording, processing and presenting of data.
(c) Accumulated volume of labour, deficiency of your time and, therefore, the slow manual processes necessitate the introduction of automation.
(d) It facilitates higher quality work by reducing errors that area unit created during manual work.
(e) Revolution in workplace has been brought by automation as a result of accumulated volume of labour being handled in a higher manner with bigger accuracy and speed thanks to automation. This method ends up in an accumulated output.
(f) Automation will increase the goodwill and name of the firm as a result of it adding to the status and standing image of the enterprise.

IV. EXISTING SYSTEM

The existing office automation systems are based on IoT applications which control various electronic smart appliances remotely. Few of them allows data or file handling. The existing systems will simplify the office automation system as the tool that enables data to move from one system to another on its own without human intervention and inaccuracies. These tools facilitate organizations to collect, manage, and analyze firmly to accomplish everyday tasks and processes. It develops and automatic existing business processes and procedure.
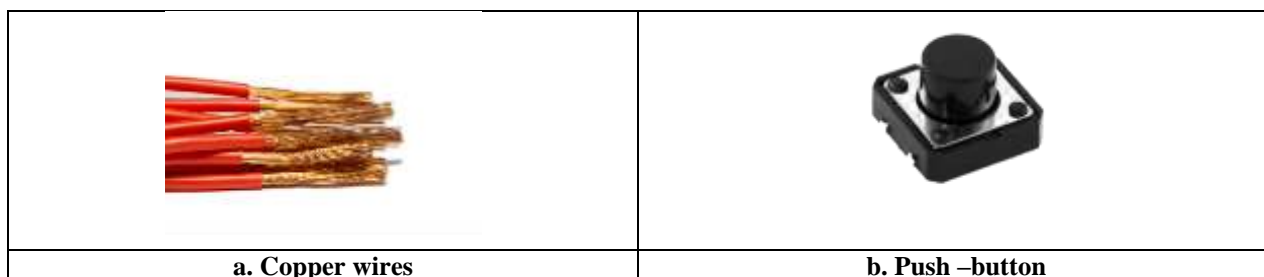
V. PROBLEM DEFINITION

In some situations, it is necessary to monitor and control the office from remote location. Smart Electronics appliances like smart light bulbs and smart fan saves the energy as compared to Normal Electronics Device. Security is the most significant issue for the office because of the important and confidential data. While controlling our office system remotely, sometimes we require to share the important data or files which are stored on a computer through our smartphone. We are going to implement an office automation system with various features which provide security, energy efficiency and ease of use. It also provides a remote interface to office appliances to control and monitor the system data from smartphone which also gives you access to the file or data of the computer in your smartphone.

VI. SYSTEM REQUIREMENTS

Our Project Office Automation System has the following Hardware as shown in Fig. 1 and Software Requirements:

A. HARDWARE REQUIREMENT:
- **Computer System:** An electronic device for storing and processing data, typically in binary form, according to instructions given to it in a variable program.
- **Smart Phone:** A mobile phone that performs many of the functions of a computer, typically having a touchscreen interface, internet access, and an operating system capable of running downloaded apps.
- **Jumper Wires:** Jumper wires are simply wiring that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed.
- **Copper Wires:** Copper has been used in electric wiring since the invention of the electromagnet and the telegraph in the 1820s. The invention of the telephone in 1876 created further demand for copper wire as an electrical conductor.
- **Push-Button:** A pushbutton on front panel can be used to simultaneously control the position of both channels from Offline to Online or vice versa.

a. Copper wires	b. Push –button

c. 5v Relay model	d. Mini breadboard
e. Jumper Wires	f. NodeMCU (ESP8266)

Fig. 1 Hardware requirements

- **Mini Breadboard:** The modern breadboard is a plug-and-play way to make connections between electronic components. It gets its name from the long-dead practice of using a wooden board (an actual bread-board if it was handy) to prototype circuits.
- **NodeMCU (ESP8266):** Node MCU is an open-source firmware and development kit that helps you to prototype or build IoT products. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Espress if Systems, and hardware which is based on the ESP-12 module.

B. SOFTWARE REQUIREMENT:

- **Firebase:** Firebase is a Backend-as-a-Service (Baas). It provides developers with a variety of tools and services to help them develop quality apps, grow their user base, and earn profit. It is built on Google's infrastructure.
- **If This Then That (IFTTT):** IFTTT derives its name from the programming conditional statement "if this, then that." What the company provides is a software platform that connects apps, devices and services from different developers in order to trigger one or more automations involving those apps, devices and services.
- **Android Studio 3.7:** Android Studio is Android's official IDE. It is purpose-built for Android to accelerate your development and help you build the highest-quality apps for every Android device.
- **MQTT Adafruit.io:** MQTT, or message queue telemetry transport, is a protocol for device communication that Adafruit IO supports. Using a MQTT library or client you can publish and subscribe to a feed to send and receive feed data.
- **Arduino IDE:** The Arduino IDE (Integrated Development Environment) is used to write the computer code and upload this code to the physical board. The Arduino IDE is very simple and this simplicity is probably one of the main reason Arduino became so popular.
- **Blynk Application:** Blynk is a Platform with iOS and Android apps to control Arduino, Raspberry Pi, NodeMCU and the likes over the Internet. It's a digital dashboard where you can build a graphic interface for your project by simply dragging and dropping widgets.

VII. IMPLEMENTATION DETAILS

Our system is divided into two modules: - 1) Saving and Retrieving Logs and Files and 2) Controlling Electrical Appliances of Office.
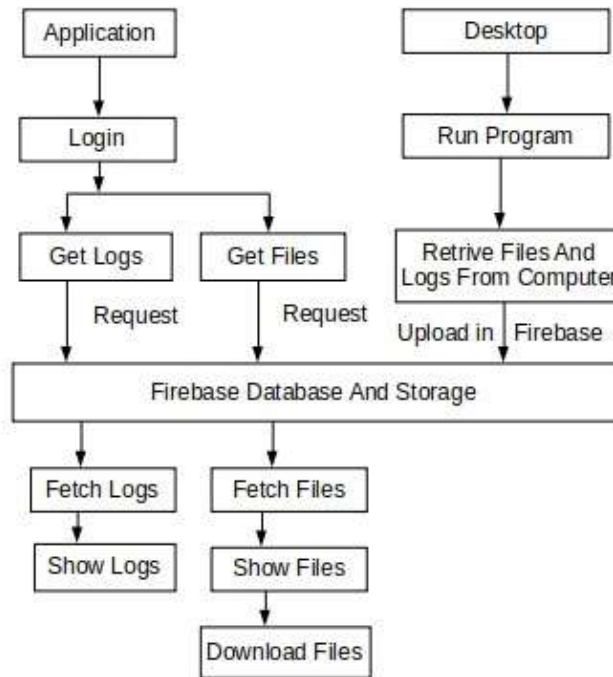
1. **Saving And Retrieving Logs and Files:**

Fig 2. Saving and Retrieving Logs and Files

The user will run this program in the browser for uploading and saving logs and files in firebase. In the Android application, the same firebase connection is established to retrieve the logs and files. When the user will start the application, he or she has to sign in first. After that user will be provided with two options: - "Get Logs" and "Get Files". If the user will select "Get Logs", the list of computers in his/her office will appear to the user. After selecting the particular computer, the application will retrieve the logs of that computer from the firebase database and will show them to the user. If the user will select "Get Files", again the list of computers in his/her office will appear and after selecting the particular computer, the application will retrieve the files of that computer from firebase and will show the list of files to the user. After clicking on files, the user can download them. You can see the System Flow Diagram in Fig.2.

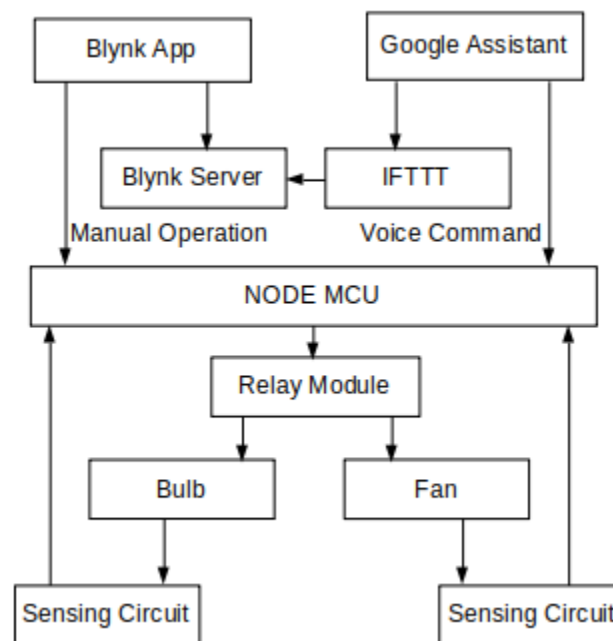2. **Controlling Electrical Appliances of Office:**

Fig. 3 Controlling Electrical Appliances of Office

Users can control office devices including lights, switches, fans, and thermostats manually or through voice command. The process is explained in Fig. 3. If the user wants to control it through voice command, the system is connected to Google Assistant through IFTTT (If This Then That) to Adafruit. Adafruit is directly connected to NodeMCU. After giving a command like "Turn on the light of cabin", IFTTT will verify the command. If the command is valid the command will go to Node MCU and it will perform

the particular function. If the user has to control the device manually. Users have to start the Blynk application in which connection is already established to NodeMCU through the code. By simply switching buttons, the command will go to NodeMCU to perform the task, and NodeMCU will perform that task. You can see the System Flow Diagram in Fig.3. The detailed connections and Circuit Diagram of NodeMCU are shown in Fig.4.
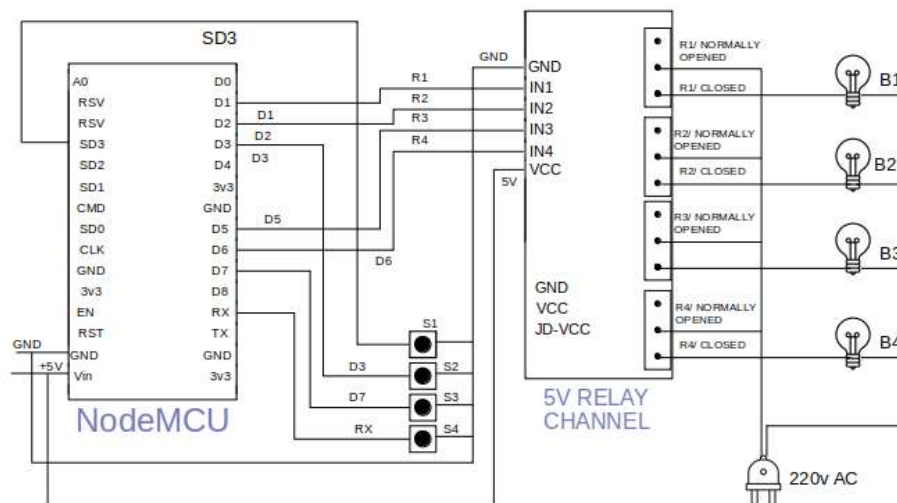

Fig. 4 Circuit Diagram

VIII. ADVANTAGES OF PROPOSED SYSTEM:

Our proposed "Smart Office Automation System Using Node MCU Esp8266 on Voice Command" have many advantages-
1. Flexibility for new appliances and devices.
2. Maximize office security.
3. You can monitor your daily work.
4. Tracking the Logs of office systems
5. Managing all smart devices from one place.

IX. FUTURE MODIFICATION

Despite of many advantages discussed above, the proposed system has following limitations as it is developed in extremely restricted areas-
1. The various future applications may be used for controlling all the office equipment using the internet and smart phones.
2. Industrial management and automation through the internet.
3. Improvement of security problems.

X. CONCLUSION

This Project becomes more efficient and everything can be controlled from one place. It is known that all the Office is equipped with such devices and applications which make the daily activities and work of the users easier, faster and more accurate. A prototype smart office automation is presented here. We made an application which can access any electrical device through voice command or we can also instruct with the manual command. We had also provided the feature like accessing the data or files from computer or laptop using smartphone and developed the android application for the same. This work will be carried forward by integrating relays to the NodeMCU board for controlling smart electrical appliances from a remote location in a real scenario. We had developed the application which help us to get Logs and data of our office system on our mobile phone which make the monitoring work of the office systems efficient and easy.

XI. ACKNOWLEDGEMENT

We sincerely wish to thank the project guide **Dr. Uttara Gogate** for her encouraging and inspiring guidance helped us to make our project a success. Our project guide makes us endure with her expert guidance, kind advice and timely motivation which helped to us determine our project.

We would like to thank our project coordinator **Prof. Reena Deshmukh, HOD Dr. P. R. Rodge** and our college principal **Dr. J. W. BAKAL** for providing lab facilities and permitting to go on with our project. We would also like to thank our colleagues who helped us directly or indirectly during our project.

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