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An Implementation on Home Automation System

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ABSTRACT: This project presents the overall design & working of Home Automation System with low cost and wireless system. It specifically focuses on the development of an IOT based home automation system that is able to control various components via internet or be automatically programmed to operate from ambient conditions. In this project, we design the development of a firmware for smart control which can successfully be automated minimizing human interaction to preserve the integrity within whole electrical devices in the home. We used Node MCU, a popular open source IOT platform, to execute the process of automation. Different components of the system will use different transmission mode that will be implemented to communicate the control of the devices by the user through Node MCU to the actual appliance. The main control system implements wireless technology to provide remote access from smart phone. We are using a cloud server-based communication that would add to the practicality of the project by enabling unrestricted access of the appliances to the user irrespective of the distance factor. We provided a data transmission network to create a stronger automation. The system intended to control electrical appliances and devices in house with relatively low cost design, user-friendly interface and ease of installation. The status of the appliance would be available, along with the control on an android platform. This system is designed to assist and provide support in order to fulfil the needs of elderly and disabled in home. Also, the smart home concept in the system improves the standard living at home.

KEYWORDS: Automation System, Node MCU, IOT, Project, Home, Design, Development, Wireless, Automation, User, Smart, Project, Control.

I.INTRODUCTION

The Internet of Things (IoT) is a concept that has gained widespread attention in recent years, and for good reason. It involves assigning an IP address to each device, allowing it to be identified on the internet, and providing mechanical and digital machines with unique identifiers (UIDs) that can transfer data over a network without human intervention. Originally known as the "Internet of Computers," this idea has expanded to include a variety of devices that are connected to the internet, such as home appliances, wearable technology, and even vehicles. Research studies have shown that the number of connected devices will continue to grow exponentially, leading to the creation of a vast network of interconnected devices, known as the IoT.

This growth has been made possible by recent advancements in technology, which have enabled the use of wireless controlling environments like Bluetooth and Wi-Fi. These wireless connections have allowed different devices to connect with each other seamlessly, making it possible to create complex IoT systems that can be controlled remotely. One of the key technologies that have enabled the development of the IoT is the use of Wi-Fi shields. These shields can act as micro web servers for devices like the Arduino, eliminating the need for wired connections between the Arduino board and the computer. This not only reduces costs but also enables the device to work as a standalone device. To connect the Wi-Fi shield to the internet, a wireless router or hotspot is needed, which acts as a gateway for the Arduino to communicate with the internet. With this in mind, an internet-based home automation system has been designed that allows users to remotely control and monitor the status of their home appliances. This system is based on the use of Wi-Fi technology, which is one of the most widely used wireless connections for IoT devices.

Despite the availability of other wireless connections, such as GSM and BT, Wi-Fi has been chosen for this system due to its superior capabilities. Among the four popular wireless connections that are often implemented in home automation systems, Wi-Fi offers the best combination of speed, range, and reliability. Additionally, most current laptops, notebooks, and smartphones come with built-in Wi-Fi adapters, reducing the cost of implementing this system. In conclusion, the IoT is a revolutionary concept that is changing the way we interact with machines and devices. It has been made possible by recent advancements in technology, including the use of wireless connections like Wi-Fi. With the development of Wi-Fi shields, it is now possible to create complex IoT systems that can be controlled remotely, enabling users to monitor and control their home appliances from anywhere in the world. As the number of connected devices continues to grow, it is clear that the IoT will continue to play a significant role in our daily lives.

II. LITERATURE REVIEW

A. Bluetooth based home automation system using cell phones

In Bluetooth based home automation system the home appliances are connected to the Arduino BT board at input output ports using relay. The program of Arduino BT board is based on high level interactive C language of microcontrollers; the connection is made via Bluetooth. The password protection is provided so only authorized user is allowed to access the appliances. The Bluetooth connection is established between Arduino BT board and phone for wireless communication. In this system the python script is used and it can install on any of the Symbian OS environment, it is portable. One circuit is designed and implemented for receiving the feedback from the phone, which indicate the status of the device.

B. Zigbee based home automation system using cell phones

To monitor and control the home appliances the system is designed and implemented using Zigbee. The device performance is record and store by network coordinators. For this the Wi-Fi network is used, which uses the four switch port standard wireless ADSL modern router. The network SSID and security Wi-Fi parameter are preconfigured. The message for security purpose first process by the virtual home algorithm and when it is declared safe it is re-encrypted and forward to the real network device of the home.

Over Zigbee network, Zigbee controller sent messages to the end. The safety and security of all messages that are received by the virtual home algorithm. To reduce the expense of the system and the intrusiveness of respective installation of the system Zigbee communication is helpful.

C. Wi-Fi based home automation system using cell phones

Wi-Fi based home automation system mainly consist three modules, the server, the hardware interface module, and the software package. The figure shows the system model layout. Wi-Fi technology is used by server, and hardware Interface module to communicate with each other. The same technology uses to login to the server web based application. The server is connected to the internet, so remote users can access server web based application through the internet using compatible web browser. Software of the latest home automation system is split to server application software, and Microcontroller (Arduino) firmware. The Arduino software, built using C language, using IDE comes with the microcontroller itself. Arduino software is culpable for gathering events from connected sensors, then applies action to actuators and preprogramed in the server. Another job is to report the and record the history in the server DB. The server application software package for the proposed home automation system, is a web based application built using asp.net. The server application software can be accessed from internal network or from internet if the server has real IP on the internet using any internet navigator supports asp.net technology. Server application software is culpable of, maintain the whole home automation system, setup, configuration. Server use database to keep log of home automation system components, we choose to use XML files to save system log.

D. Wireless Home Automation system using IoT

This system uses mobiles or computers to control basic home control and function automatically through internet from anywhere around the world globally, an automated home is sometimes called a smart home. It is meant to save the electric power and human energy. The proposed system is a distributed home automation system, consists of server i.e. Wi-Fi module, sensors. Server controls and monitors the various sensors, and can be easily configured to handle more hardware interface module (sensors). The Arduino board, with built in Wi-Fi module acts as web server. Automation System can be accessed from the web browser of any local PC using server IP, or remotely from any PC or mobile handheld device connected to the internet with appropriate web browser through server real IP (internet IP). Wi-Fi technology is selected to be the network infrastructure that connects server and the sensors. Wi-Fi is chosen to improve system security (by using secure Wi-Fi connection), and to increase system mobility and scalability.

III. PROPOSED ALGORITHM

The home automation system being proposed utilizes various components such as Arduino microcontroller, sensors, and electrical devices commonly found in homes. The system is designed to be easily configurable to handle additional hardware interface modules or sensors. To connect to the internet, a Wi-Fi module is used. The system can be accessed locally through a web browser using the server IP or remotely through any device connected to the internet with a compatible web browser via the server's real IP address. By using Wi-Fi as the network infrastructure, the system's security is improved, and it becomes more scalable and mobile. The system has the capability to control several appliances including lights, fans, doors, televisions, refrigerators, and air conditioners. These appliances can be switched on/off or have their brightness adjusted. The system can also open and close doors.

•**Arduino:**The ESP8266 is a pocket-friendly and compact microcontroller that has a built-in Wi-Fi module and the capability to operate as both a TCP/IP stack and a microcontroller. This microcontroller is produced by a Chinese company situated in Shanghai. Its cost-effectiveness, small size, and integrated Wi-Fi module make it a perfect option for linking an Arduino board to the internet, cloud server, and mobile apps.



Fig. 1.1 Arduino

•**Node MCU ESP8266:**The ESP8266 is a budget-friendly and small-sized microcontroller that comes with a built-in Wi-Fi module and the ability to function as both a TCP/IP stack and a microcontroller. This microcontroller is manufactured by a company based in Shanghai, China. Its affordability, compactness, and integrated Wi-Fi module make it an ideal choice for connecting an Arduino board to the internet, cloud server, and mobile applications.



Fig. 1.2 Node MCU ESP8266

•**Fan:** About the power supply: Since your fan uses 100mA at full speed (I assume), it is still possible to power it over the 5V pin of the Arduino. You can source about 500mA over it (including the current for the Arduino itself).



Fig.1.3 Dynamic Mini Fan

•**Relay:** A relay is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, such as make contacts, break contacts, or combinations thereof.



Fig.1.4 Relay

•**LED:** Visible LEDs are used in many electronic devices as indicator lamps, in automobiles as rear-window and brake lights, and on billboards and signs as alphanumeric displays or even full-colour posters



Fig.1.5 LED Blub

IV. IMPLEMENTATION

In this home automation project we have created all types of AC and DC devices that we can control from any place through internet, we can control all these four devices from any place through a mobile application called home automation instead of the AC devices we have any Can control by connecting the devices.All these devices are connected to the Node MCU and the controller Node MCU ESP8266 must be connected to the home Wi-Fi When the home Wi-Fi is connected to the Node MCU, when we give a command through the mobile application, that command goes to the server of our app and that server notes through the home Wi-Fi MCOC connects and after connecting it gives command to controller and relay through which all devices are controlled.

This is a home automation system app that is connected to a server called ThingSpeak. This app sends commands to a server called ThingSpeak. Then that server sends commands to the WiFi module set in the home. The WiFi module in the home sends commands to the controller in your project. Sends a command to a relay in the project and that relay turns on and off all the devices in the project.

V. RESULTS

1)Home Page of HOME_AUTOMATION Application

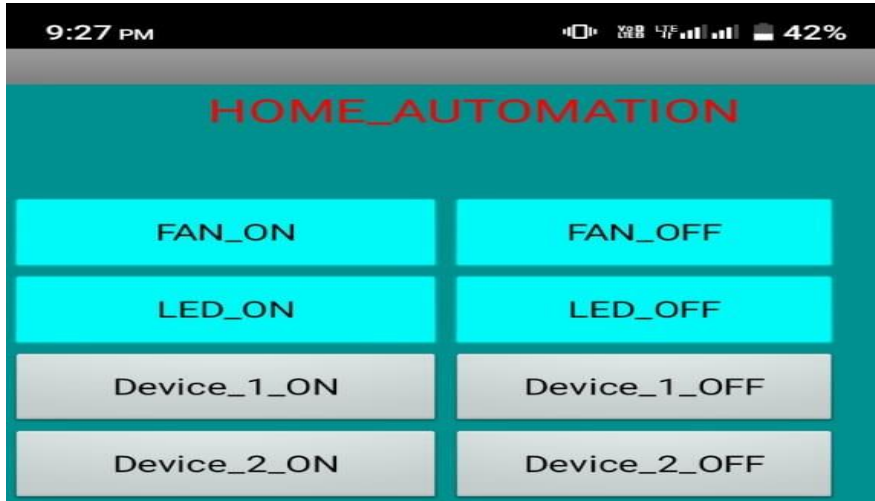


Fig.1.6 Home Page Of Home Automation App

2)Final Hardware Outputs of Our Projectwhich are controlled by app

Picture 1



Fig.1.7 Device 1 Started (AC Bulb)

Picture 2



Fig.1.8 Device 2 Started(AC Bulb)

Picture 3

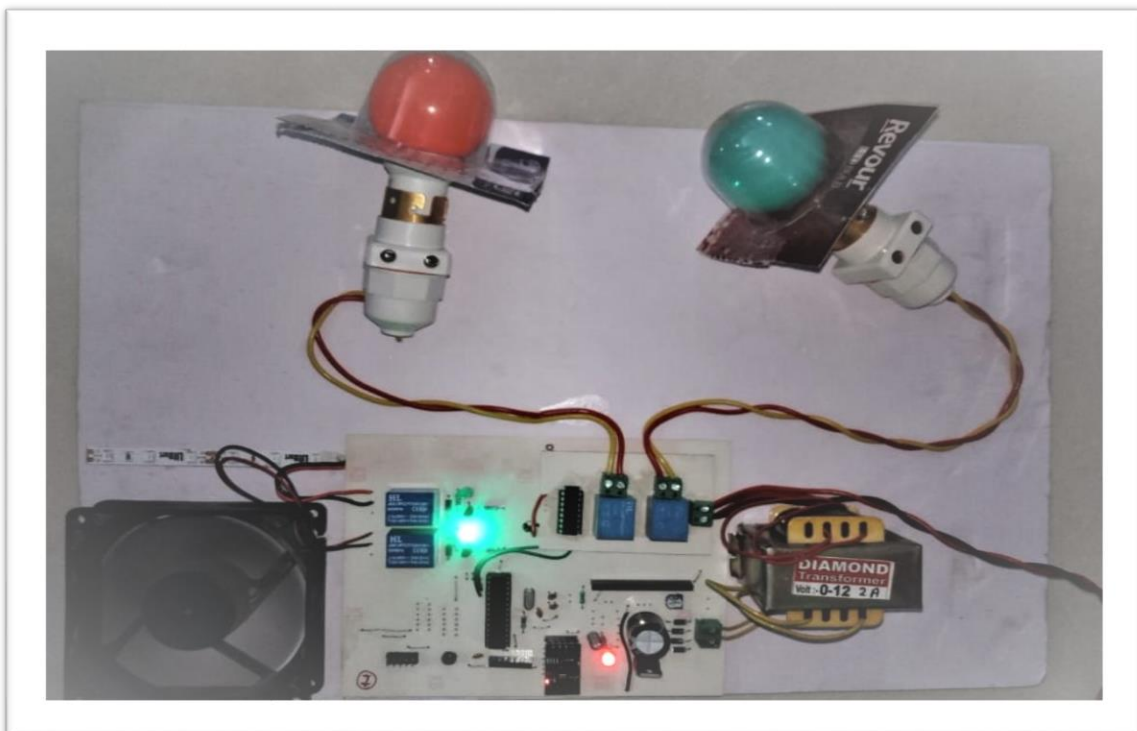


Fig.1.9 Device 3 Started(DC Fan)

Picture 4

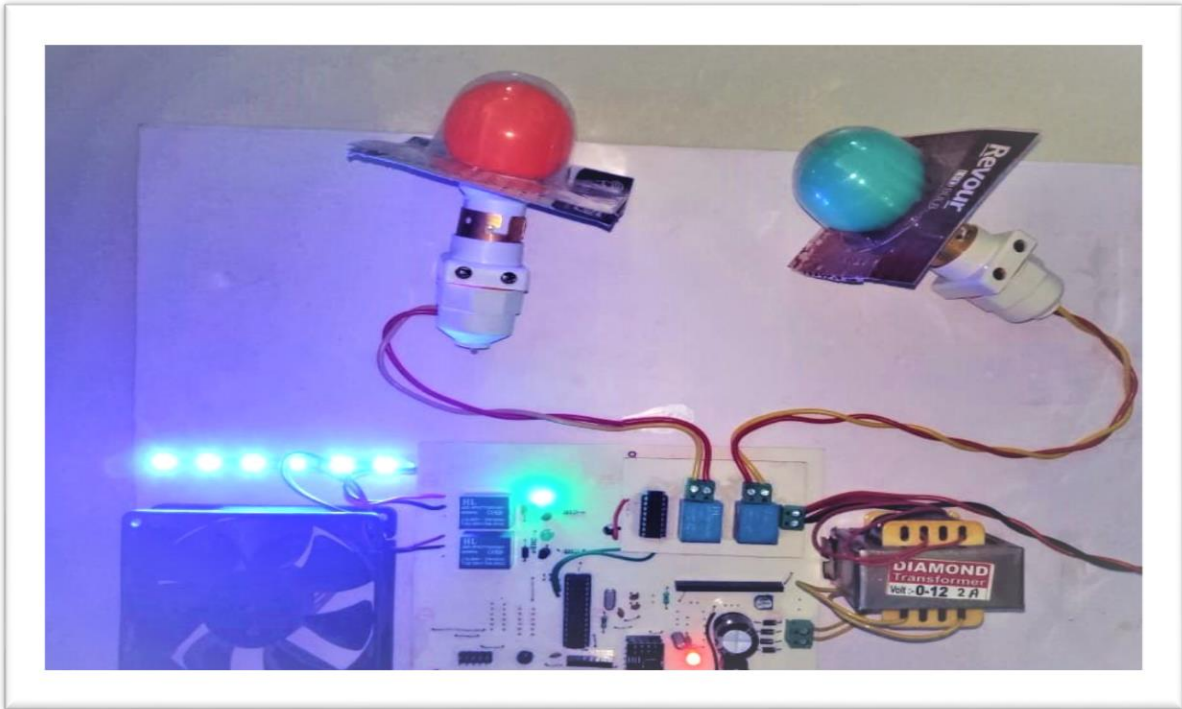


Fig.2.1 Device 4 Started (DC LED Light)

Picture 5



Fig.2.1 All Devices Started

VI. CONCLUSION

The paper explores the use of Arduino, Node MCU, and Android-based techniques to create a user-friendly platform that allows individuals to control their home appliances via their mobile phone applications. The study concludes that wireless technology is a fundamental component of all home automation systems. The research paper provides detailed designs, implementations, and flowcharts of various techniques that are utilized to identify the strengths and weaknesses of each approach. The main objective of home automation systems is to simplify the management of household appliances and conserve resources such as time, money, and electricity. Additionally, these systems are utilized to secure homes from break-ins by triggering alarms and sending alerts to the owner's mobile phone when unauthorized individuals attempt to enter the house. In the future scope the system can also display the number of people entering the house on an LCD screen, which adds an extra layer of security.

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