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Research Paper

TRANSFORMING OFFICE ENVIRONMENTS WITH IOT-BASED AUTOMATION TECHNOLOGIES

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ABSTRACT:

In this article, we will investigate a system that is both cost-effective and adaptable for the purpose of monitoring and managing office spaces. It allows for remote device access and control through an IP-connected micro-web server that is integrated into the NODE MCU microprocessor. The system's innovative communication protocol eliminates the necessity for a specialized server PC for environmental regulation and monitoring, making it a distinctive feature. The configuration simplifies device management by enabling Bluetooth-enabled mobile apps and internet access. The practical application of motion, temperature, and gas sensors, as well as power outlets, demonstrates the system's real-time adaptability and functionality for home and office automation.

Keywords: Node MCU, Blink Android app, WiFi, Relay.

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1. Introduction

Automated loads are far better than manually controlled systems because they can improve efficiency and optimize processes [7]. We'll examine a smart home project in this post that makes use of the Internet of Things to enhance energy efficiency and load monitoring [1], [2]. To facilitate communication between devices, the system makes use of an ESP8266 WiFi receiver and a WiFi-capable Node MCU microcontroller [3], [6]. The control panel is the Blynk app, which is used on smartphones [8]. Through the internet, you can access and manage your home systems in real time from any location [4].

The Node MCU package, intended for Internet of Things projects, comes with a microcontroller and WiFi receiver. Devices can connect to the internet more easily and access more features by controlling WiFi signals [5]. In this instance, firmware is implemented using an ESP8266. It can be programmed with a USB port and the Arduino IDE [6]. The system includes sensors that display data in real-time, like the LM35 temperature sensor, in addition to a four-channel relay that enables the control of connected appliances [9].

This smart home solution simplifies the process of managing a home's energy usage by leveraging

clever tactics and Python scripts [2]. The Blynk app's easy-to-use interface makes managing and monitoring devices a breeze [8]. This approach demonstrates daily how Internet of Things (IoT) technologies can improve the efficiency, ease, and intelligence of home automation [1], [3], [7].

2. Literature Review

We are becoming increasingly reliant on contemporary technologies to automate our daily lives [5]. Our fast-paced world has been significantly impacted by automated systems and the internet [7]. The growing popularity of "smart homes" and "smart offices" is fueled by their amazing ability to securely and effectively connect a variety of devices to the internet [10], [14]. Numerous studies have been conducted on the latest advancements in office and home automation, demonstrating numerous improvements and methods to increase productivity and provide you greater control [2], [3], [12], [13].

Kumar Mandula's two options for automating your home: Bluetooth and Ethernet [8]. Devices can communicate with one another within a ten to twenty meter radius thanks to Bluetooth's good short-range communication capabilities. On the other hand, Ethernet can work over a long distance. The research focused on how to effectively use mobile apps to control household appliances rather than security concerns [6].

Mitul Sheth's On the other hand, the proposal featured both automated and manual systems, as well as numerous device connectivity options via an Android app. This paper discusses the Smart Santander Project. Twenty thousand sensors were used to monitor temperature, humidity, and CO and NO2 gas levels in parks and gardens [7], [11].

Tan, Lee, and Soh (2002) Proposed a distributed control system (DCS) that could be accessed online and used to remotely monitor critical process variables. Their research looked closely at the hardware and software design to make process data easily accessible and manageable for users [12], [15]. Georgila Potamitis, Fakotakis, and G are the people in question.

Kokkinakis (2003) Speech recognition software has made it possible for people with disabilities to control their home appliances by using voice commands. They used their new voice separation technique to ensure that spoken instructions were correctly understood [4].

In 2006, S. M. Anamul Haque, S. M. Kamruzzaman, and Md. Ashraful Islam developed a smart home system that uses voice commands and time to exchange data [1], [3]. The system, developed with Visual Basic 6.0 and Microsoft Voice Engine, allowed users to control appliances with voice commands or timers. A control framework based on SMS was also developed in 2006 by Ciubotaru-Petrescu, Chiciudean, Cioarga, and Stanescu for complex applications. A microcontroller and sensors were used by the system's communication module. The communication module could connect to the RS-232 serial interfaces found on GPRS modems and mobile phones. We demonstrated the feasibility of effective and useful remote monitoring solutions by sending out power outage status updates via SMS [6].

Proposed System

The growing automation of these technologies is having a significant impact on people.

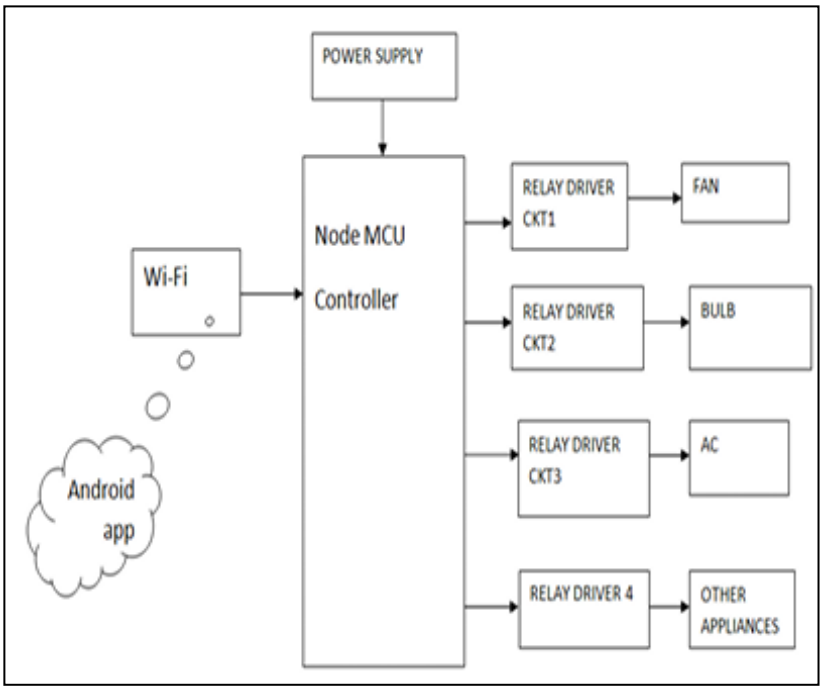

Fig 1: Block Diagram of System

The goal of the project is to automate homes and businesses using WiFi and an Easy IOT Webserver. In the future, it might expand significantly. Due to the need to install a web server, controlling household appliances is currently limited to a single Windows PC. One solution is to set up a web server on the cloud.

We'll install a state-of-the-art program that automates the workflow using a real-time schedule to ensure the machines operate efficiently and on time. The gadget is controllable remotely thanks to wireless technology. All of the operating parameters of the appliance or device can be stored in an RTC with an EEPROM. The initiative's primary objective is to automate homes or businesses. Every household appliance will be controlled by a smartphone app. To ensure reliable operation, the NODE MCU, a centralized microcontroller, will be connected to the office or home equipment. The process will activate the controller's integrated EEPROM and RTC. In order to receive control instructions from the Wi-Fi shield, which is a Wi-Fi hotspot, it also established a WiFi connection. With Wi-Fi, you can download a network provider-specific app to your phone. The operator must toggle the control icon in the app before they can turn the light on or off. All data is sent to the microcontroller's WiFi when it is powered on. When the microcontroller receives a request, it initiates the RTC and EEPROM before performing the requested action. Any other appliance will produce the same outcome.

A. s

We chose this controller because of its small size, compatibility with other controller types, such as PLCs and PICs, and user-friendly interface. The ESP8266 is an open-source firmware that was developed using the private software development kit (SDK) for this chip. The firmware includes an easy-to-understand scripting language for basic programming tasks. The ESP8266 controller is found on single integrated circuit boards. The board has a hardware reset button, GPIO (General Purpose Input Output) pins that can be mounted on a breadboard, LED lights, a Wi-Fi antenna, and an already-connected USB connector. Figure 3 shows the NODEMCU (ESP8266) schematic. Operating at 80MHz, the L106 32-bit microprocessor core is an embedded 32-bit RISC CPU. Its memory consists of 80 KB of user data RAM, 32 KB of instruction cache RAM, 32 KB of instruction RAM, and 16 KB of ETS system data RAM. The Wi-Fi module requires IEEE 802.11b/g/n in order to function.

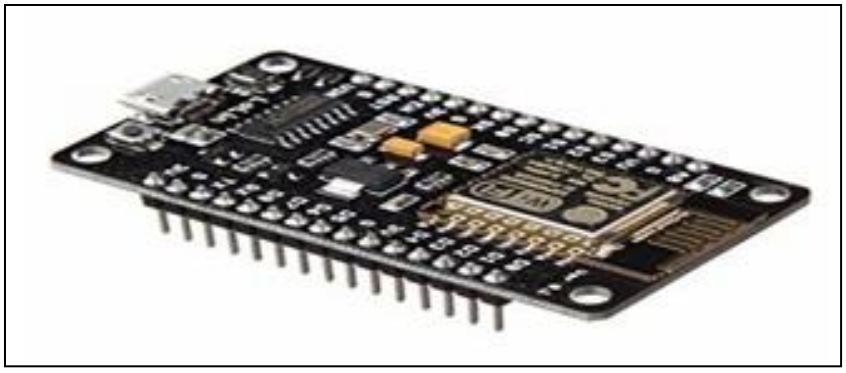

Fig -2: Node MCU (esp8266)

3. B. Relay:

An electromagnetic switch performs the same basic function as a relay. Relays are used to physically separate two circuits to facilitate switching between them. High voltage devices are enabled and disabled by the use of low voltage circuitry. For instance, a 230V AC mains light could be powered by a 5V supply connected to the relay. Relays can be configured to function within the voltage range of 6V to 24V. A relay is composed of two components: the input and the output. On the input side, there is only one coil. A magnetic field is created when the input voltage is low. NC, NO, and COM, which stand for normally closed, normally open, and normally open, respectively, are the three contactors on a relay. With the correct set of contactors, an electrical device's parameters can be changed.

Fig -3: Relay

A. Wifi MODULE:

Flexible wireless module-based system architecture The Smart Connectivity Platform (ESCP) of high-performance wireless SOCs allows mobile platform designers to incorporate Wi-Fi into other systems while preserving all of their features and reducing costs.

A. Software Development:

All of the hardware and software components of the project are connected by the Arduino platform. Programming is necessary to enable the microcontroller to perform the tasks required by the design. After the code is written, compilation and verification come naturally. A flow diagram depicting the general operation of the system is shown in Figure 6. Enhancing the automation of residential and commercial properties is the main objective of this project. Before connecting to the current network, the Wi-Fi hotspot or shield installs the open-source and free Blynk server. The user or operator can determine whether the system is online by using an app that receives signals from the Wi-Fi module. Next, we examine the switches or input-

output terminals with the numbers 1, 2, 3, 4, 5, 6, 7, and 8. Every time a user (client) modifies a control's value and sees it displayed on the application's LCD, the data is transmitted to the Blynk server. The system will return to its initial state at the conclusion of the procedure.

3. Conclusion

This project has led to the development of a single-control, low-cost, locally manufactured office automation system. It could operate the fan, air conditioner, security light, and entire lighting system. Furthermore, because there aren't many parts, they can be conveniently stored in a small container. The office automation system's design, testing, and approval allowed it to control a wide range of office appliances, such as those used for lighting, entertainment, and cooling. This ensures that the system can be expanded and modified as necessary.

References:

1. S. M. Kusuma, Home Automation Using Internet of Things, Assistant Professor, Department of Telecommunication, MSRIT, Bangalore, India.
2. N. Shrotriya, A. Kulkarni, and P. Gadhave, “Smart Home Using Wi-Fi,” International Journal of Science, Engineering and Technology Research (IJSETR).
3. A. Aware, S. Vaidya, P. Ashture, and V. Gaiwal, “Home Automation Using Cloud Network,” International Journal of Engineering Research and General Science, vol. 3, PES’s Modern College of Engineering, Pune, 2015.
4. V. H. Bhide and S. Wagh, “i-Learning IoT: An Intelligent Self Learning System for Home Automation Using IoT,” Proc. Int. Conf. Communication and Signal Processing, pp. 1763–1767, 2015.
5. I. G. Smith, The Internet of Things, New Horizons, IERC Internet of Things European Research Cluster, 2012.
6. N. Vikram, H. K., M. Nihaal, R. Umesh, and A. S. Shetty, “A Low Cost Home Automation System Using Wi-Fi Based Wireless Sensor Network Incorporating Internet of Things (IoT),” Proc. IEEE 7th Int. Advance Computing Conf., pp. 174–178, 2017.
7. Z. K. A. Mohammed and E. S. A. Ahmed, “Internet of Things Applications, Challenges and Related Future Technologies,” pp. 126–148, 2017.
8. K. Mandula, R. Parupalli, C. H. A. S. Murty, E. Magesh, and R. Lunagariya, “Mobile Based Home Automation Using Internet of Things (IoT),” Proc. Int. Conf. Control, Instrumentation, Communication and Computational Technologies (ICCICCT), pp. 340–343, 2016.
9. H. Singh, V. Pallagani, V. Khandelwal, and U. Venkanna, “IoT Based Smart Home Automation System Using Sensor Node,” 2018.
10. R. Bhuyar and S. Ansari, “Design and Implementation of Smart Office Automation System,” International Journal of Computer Applications, vol. 151, no. 3, 2016.
11. K. Akkaya, I. Guvenc, R. Aygun, and A. Kadri, “IoT-Based Occupancy Monitoring Techniques for Energy-Efficient Smart Buildings,” Proc. IEEE, 2015.
12. D. Hasiwar, A. Gruber, C. Dragschitz, and I. Ivkić, “Towards a Cloud-Based Smart Office Solution for Shared Workplace Individualization,” Proc. CLOSER – Int. Conf. Cloud Computing and Services Science, 2024.
13. P. Obioma, O. Agbodike, J. Chen, and L. Wang, “ISLS: An IoT-Based Smart Lighting System for Improving Energy Conservation in Office Buildings,” 2025.
14. S. N. Tasnim and M. T. Ahad, “Toward IoT-Enabled Smart Offices: Achieving Sustainable Development Goals,” 2022.
15. M. Milenkovic, “IoT System Case Study: Personal Office Energy Monitor (POEM),” 2022.
16. Building Automation, 2025.