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IOT-ENABLED HOME APPLIANCES CONTROL SYSTEM

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ABSTRACT

This paper presents a design and prototype implementation of new industrial or home automation system that uses GPRS\Wi-Fi technology as a network infrastructure connecting its parts. The proposed system is better from the scalability and flexibility point of view than the commercially available home automation systems. In Industry, we have different types of loads at different locations. We can control all loads at a time from one place (control room) without connecting any physical wire between loads and the control room, In this project, we are using a GPRS\WI-FI module, Microcontroller, and Relay. Here, In this project, GPRS\wifi is connected to the phone, and the loads are operated with it, once the GPRS\wifi is connected.

In this project we should note one thing that is AC loads should not directly connected to the microcontroller however AC may be entirely into the controller due to this your controller may be destroyed, To avoid such type of drawback we need some drivers, In this project we are using RELAY as load controller (as a switch) so we need RELAY drivers. We have so many RELAY drivers one of them is BC547, which is used as a RELAY driver in between Microcontroller to AC loads. This system can control various ac high-voltage AC and DC appliances, alarm systems, and many more appliances using Internet communication from long distances with the help of mobile or desktop applications.

INTRODUCTION

In-home automation is one of the most important things to automatically ON and OFF the home appliances without the inclusion of humans. In present days most of automation system utilize a combination of hardware and wireless systems for controlling appliances. In this project, we design and develop of controlling of the home automation system via the Wi-Fi module or Webpage server using Arduino. This project is concerned with the programmed control of light or other home appliances.

The user will communicate with Arduino through the internet via a Wi-Fi network. This system is less costly, allowing additional home appliances. It's more secure for us. IOT or the Internet of Things is an upcoming technology that allows us to control hardware devices through the Internet. Here we proposed to use IOT to control Home Appliances, thus automating modern homes through the Internet. Three Loads are used in this system to demonstrate home lighting and fan. A smart home is equipped with lighting, heating, and electronic devices that can be controlled by a smartphone or via the Internet.

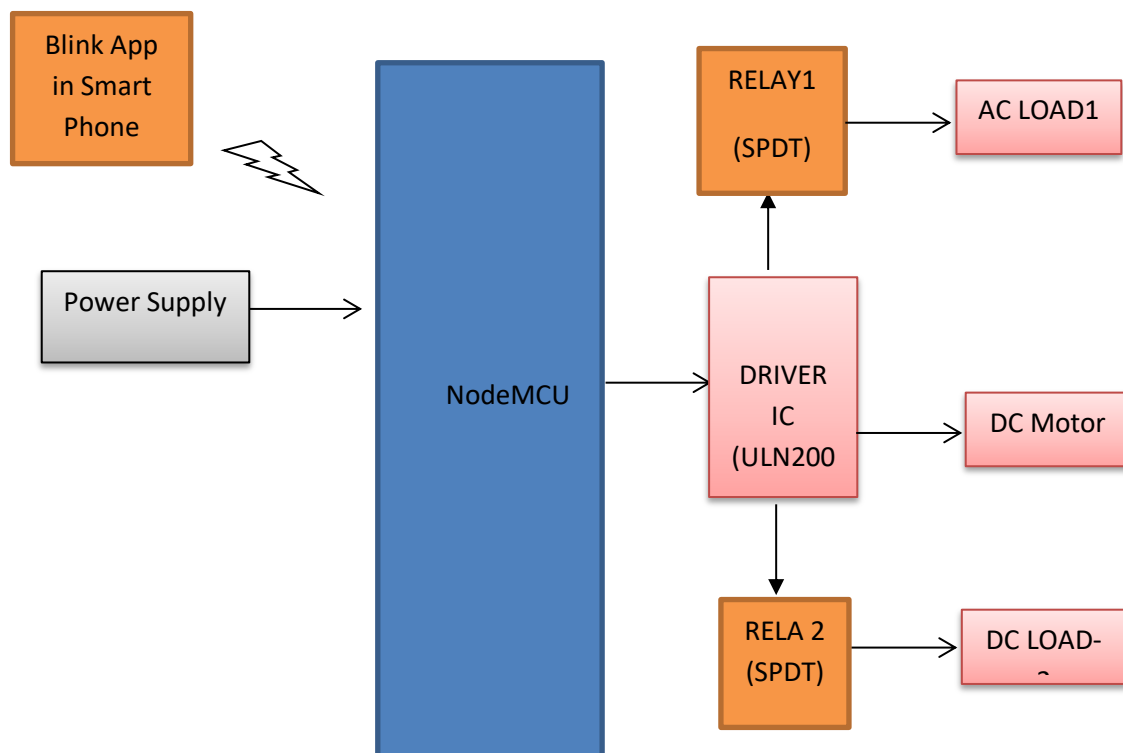


Figure.1 Block Diagram

OBJECTIVE OF THE PROJECT

The core objective is to provide remote and automated control of various home appliances such as lights, thermostats, doors, locks, and more, typically through a mobile app or voice commands. This can be achieved by integrating sensors, actuators, and communication modules with the appliances, enabling them to collect data, respond to user commands, and interact with each other.

LITERATURE SURVEY

1. A study by Smith et al. (2019) highlighted the growing demand for smart home solutions, citing factors such as energy efficiency, convenience, and security as key drivers.
2. Research by Johnson and Brown (2020) emphasized the role of IoT in enhancing accessibility for individuals with disabilities, showcasing the potential for inclusive design in home automation.
3. Furthermore, advancements in machine learning and artificial intelligence algorithms, as demonstrated in Chen et al. (2021), and Kim et al. (2022) demonstrated the effectiveness of AI-driven home automation systems in understanding user preferences and adapting appliance settings accordingly. These innovations not only enhance user experience but also pave the way for more personalized and intuitive smart home environments.
4. Research by Zhang et al. (2023) explored the benefits of edge-based processing for real-time data analytics and decision-making in smart home environments, highlighting its potential to minimize reliance on cloud infrastructure and improve system responsiveness.

PROPOSED SYSTEM

This paper introduces a novel IoT-enabled Home Appliances Control System with a design and prototype implementation that utilizes GPRS/Wi-Fi technology as the network infrastructure, connecting its components. Unlike traditional systems, this proposed system offers enhanced scalability and flexibility. It addresses the challenge of controlling different loads in various locations simultaneously without the need for physical wiring between the loads and the control room.

The integration of GPRS/Wi-Fi modules, Microcontrollers, and Relays allows for remote operation of loads through a connected phone. Notably, the proposed system includes Relay drivers, such as BC547, to ensure the safe operation of AC loads without directly connecting them to the microcontroller.

This setup not only mitigates the risk of controller damage but also enables the control of high-voltage AC and DC appliances, alarm systems, and other devices over long distances via Internet communication using mobile or desktop applications. Overall, the proposed system represents a significant advancement in terms of efficiency, safety, and the integration of modern communication technologies for home and industrial automation

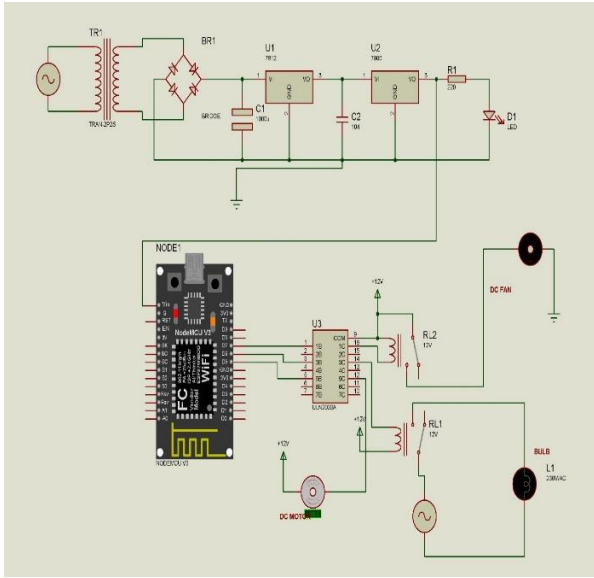


Figure.2 Schematic Diagram



Figure.3 Working Kit

RESULTS

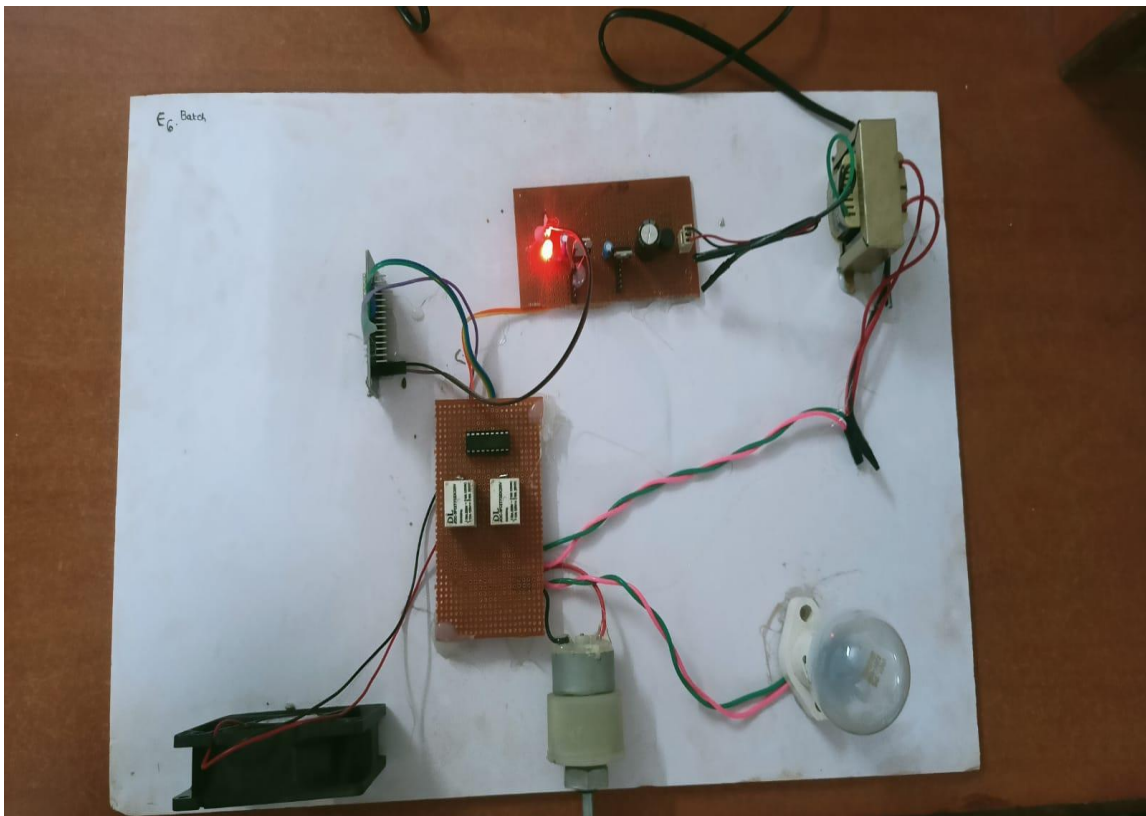


Figure.4 Top View of Project

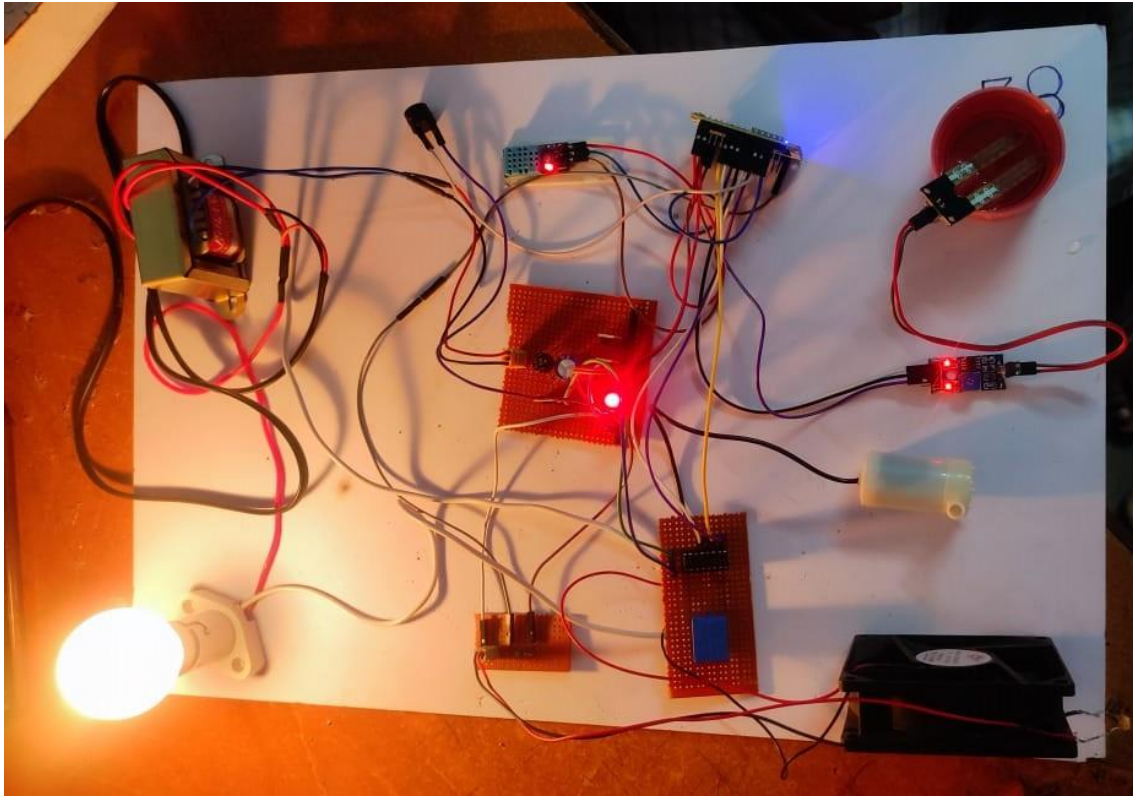


Figure.5 Status Blub ON

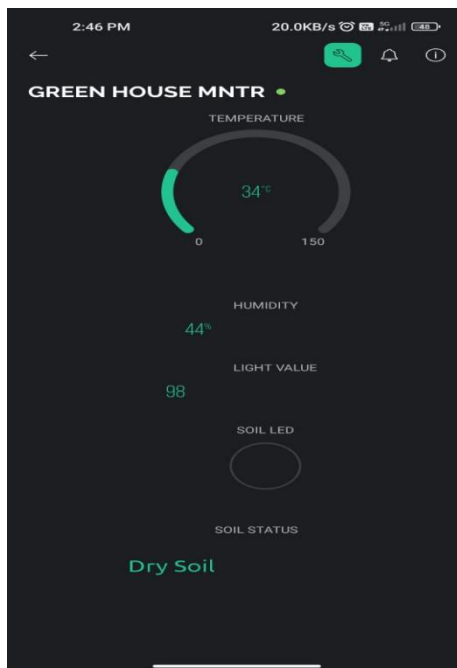


Figure.6 Status Dry soil

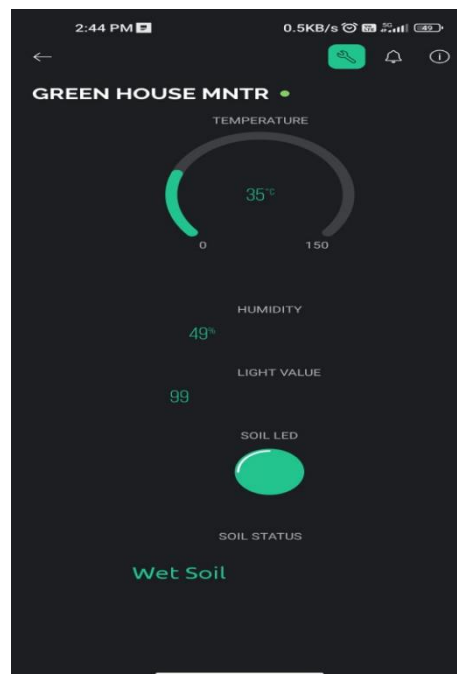


Figure.7 Status Wet soil

CONCLUSION

In conclusion, the development of an IoT-enabled home appliances control system utilizing NodeMCU as the microcontroller, ULN2003 as the driver IC, and 5V SPDT relays for switching devices has been a significant advancement in home automation technology. By integrating both AC and DC loads such as a 230V bulb and a DC motor, along with a regulated power supply and a DC fan, the system offers versatile control over various household devices.

The choice of Arduino IDE for compiling and uploading code, along with the utilization of Embedded 'C' language for programming, ensured a robust and efficient software framework. This allowed for seamless integration with the hardware components, facilitating smooth communication and operation of the system. The schematic capture using Proteus enabled thorough simulation and testing of the system, ensuring its reliability and functionality before implementation. This simulation-based approach not only saved time and resources but also helped in identifying and resolving potential issues early in the development process.

Additionally, the incorporation of the Blynk app provided a user-friendly interface for remote monitoring and control of the connected appliances. This mobile application empowers users to conveniently manage their home appliances from anywhere with an internet connection, enhancing convenience and efficiency in daily household tasks.

FUTURE SCOPE

As technology advances, the future scope of your IoT-enabled home appliances control system project is promising. One avenue is integrating machine learning algorithms to predict and optimize energy usage based on household patterns and preferences. By analyzing historical data collected from sensors within the system, such as motion sensors and usage logs, the system can learn user behavior and adjust appliance settings accordingly, leading to energy savings and improved efficiency. Additionally, incorporating voice control and natural language processing capabilities can enhance user experience, allowing homeowners to interact with their appliances seamlessly through voice commands, making home automation even more intuitive and accessible.

Expanding the project to include interoperability with other smart home devices and platforms would enhance its versatility and appeal. Integrating with popular smart home ecosystems like

Google Home or Amazon Alexa enables users to control their appliances not only through a dedicated app but also through voice commands or routines set up within their existing smart home ecosystem. This interoperability opens up possibilities for automation scenarios involving multiple devices, such as triggering actions across different appliances based on predefined conditions or events, thereby providing users with a more comprehensive and interconnected smart home experience.

REFERENCES

- [1]. Nest Thermostat (2011) - Created by Tony Fadell, Matt Rogers, and engineers at Nest Labs, the Nest Thermostat revolutionized home heating and cooling control by utilizing IoT technology to learn user preferences and adjust temperatures accordingly.
- [2]. Samsung SmartThings (2012) - Samsung launched its SmartThings platform in 2012, allowing users to connect and control various smart home devices, including appliances, lights, and security systems, through a central hub and smartphone app.
- [3]. Amazon Echo (2014) - Amazon introduced its Echo smart speaker, powered by the virtual assistant Alexa, in 2014. With IoT capabilities, users could control compatible smart home devices using voice commands, including lights, thermostats, and appliances.
- [4]. Google Home (2016) - Google entered the smart home market with its Google Home smart speaker in 2016, offering similar IoT functionality as the Amazon Echo. Users could control connected devices and access information using voice commands via the Google Assistant.
- [5]. Apple HomeKit (2014) - Apple announced its HomeKit platform in 2014, providing a framework for developers to integrate smart home devices with iOS devices. HomeKit enables users to control compatible appliances, lights, and more, through the Home app or Siri voice commands.