D Y Patil University Pune, Ambi

--School of Engineering & Technology's Department of Computer Engineering--

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"Ultimate AI Companion For Smarter Homes"

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Abstract:

This project presents the overall design of Home Automation System (HAS) 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 1fulfil the needs of elderly and disabled in home. Also, the smart home concept in the system improves the standard living at home.

Introduction:

Internet of Things (IOT) is a concept where each device is assigned to an IP address and through that IP address anyone makes that device identifiable on internet. The mechanical and digital machines are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. Basically, it started as the "Internet of Computers." Research studies have forecast an explosive growth in the number of "things" or devices that will be connected to the Internet. The resulting network is called the "Internet of Things" (IoT). The recent developments in technology which permit the use of wireless controlling environments like, Bluetooth and Wi-Fi that have enabled different devices to have capabilities of connecting with each other. Using a WIFI shield to act as a Micro web server for the Arduino which eliminates the need for wired connections between the Arduino board and computer which reduces cost and enables it to work as a standalone device. The Wi-Fi shield needs connection to the internet from a wireless router or wireless hotspot and this would act as the gateway for the Arduino to communicate with the internet. With this in mind, an internet-based home automation system for remote control and observing the status of home appliances is designed. Due to the advancement of wireless technology, there are several different types of connections are introduced such as GSM, WIFI, and BT. Each of the connection has their own unique specifications and applications. Among the four popular wireless connections that often implemented in HAS project, WIFI is being chosen with its suitable capability. The capabilities of WIFI are more than enough to be implemented in the design. Also, most of the current laptop/notebook or Smartphone come with built-in WIFI adapter. It will indirectly reduce the cost of this system.

Objectives:

Develop a wireless home automation application with switch and voice control modes. The system allows monitoring of appliance statuses and ensures secure connections using SSL over TCP and SSH between devices and the Node MCU. It supports control from any Wi-Fi-enabled device (Android, iOS, PC) and is designed for easy scalability to integrate additional features and appliances.

Scope:

The aim is to design a prototype that establishes wireless remote control over a network of home appliances. The application is designed to run on android device providing features like, switch mode control, voice command control and a provision to view the status of the devices on the application itself. Considering its wide range of application, following are the scope of this prototype.

The system can be implemented in homes, small offices and malls as well, being in-charge of control of the electrical appliances.

For remote access of appliances in internet or intranet. The appliances in the above-mentioned environment can be controlled in intra-network or can be accessed via internet.

The development of technology friendly environment. The system incorporates the use of technology and making HAS. By the use of day-to-day gadgets we can utilize them for a different perspective
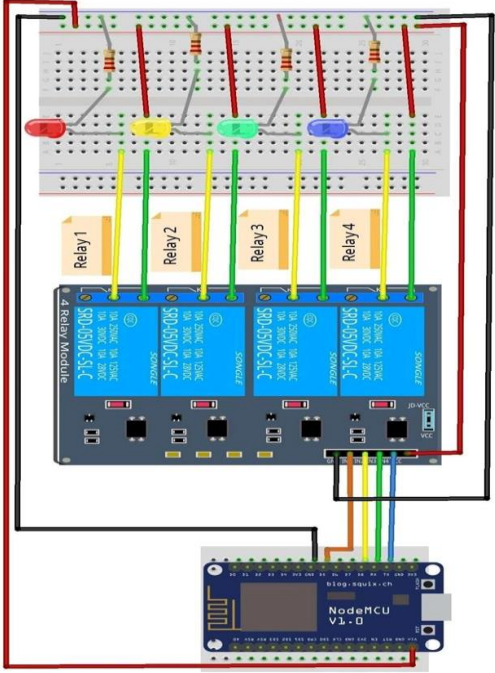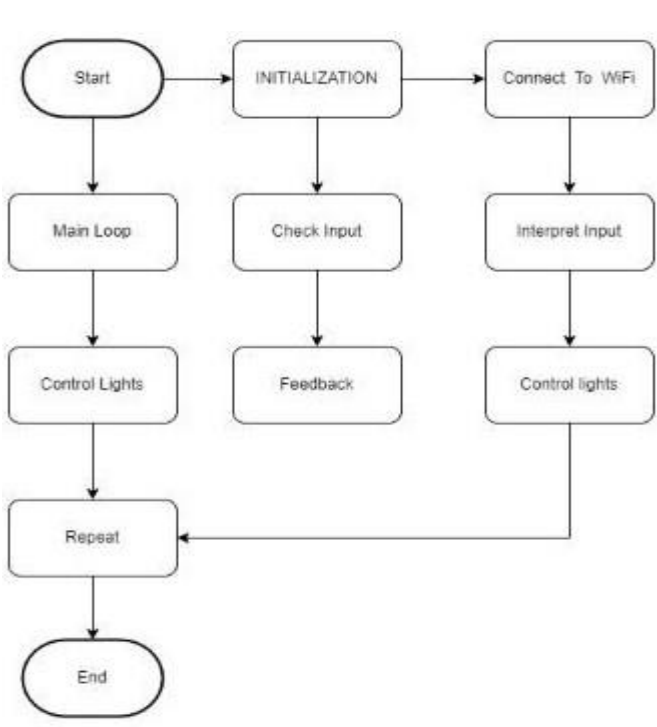
Literature Review:

- The realm of home automation has seen significant advancements, as evident from the reviewed literature. Vishwakarma et al. (Year) emphasize an IoT-driven approach that harnesses the capabilities of the Node MCU and IFTTT for intelligent home control, integrating voice commands via Google Assistant. Somani et al. (Year) expand the horizon by integrating security measures, utilizing motion sensors and real-time camera feeds for enhanced home surveillance. Yang et al. (Year) present a unique perspective on energy management, advocating for PLC-based solutions to optimize power consumption and harness renewable energy sources effectively.

- Churasia and Jain (Year) delve into the intricacies of computational efficiency, introducing a model that minimizes encryption overhead and focuses on the autonomous configuration of smart home devices. Suraj et al. (Year) introduce a groundbreaking vision-based approach, using machine learning to detect appliance states, thereby offering a novel dimension to home automation via visual intelligence.

- Vikram et al. (Year) advocate for a cost-effective approach to home automation, emphasizing the integration of a diverse range of sensors to capture various environmental parameters, all accessible via a smartphone application. Lastly, Rani et al. (Year) revolutionize user interaction with home appliances by leveraging Natural Language Processing, enabling users to communicate with their homes seamlessly using voice commands, thereby obviating the need for complex computer instructions.

Collectively, these studies underscore the multifaceted evolution of home automation systems, from energy-efficient designs and enhanced security protocols to innovative user interfaces and intelligent machine learning algorithms.

Circuit Diagram:

Flow Chart:

Conclusion:

It is evident from this project work that an individual control home automation system can be cheaply made from low-cost locally available components and can be used to control multifarious home appliances ranging from the security lamps, the television to the air conditioning system and even the entire house lighting system. And better still, the components required are so small and few that they can be packaged into a small inconspicuous container. The designed home automation system was tested a number of times and certified to control different home appliances used in the lighting system, air conditioning system, home entertainment system and many more. Hence, this system is scalable and flexible.

References:

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