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Iot based smart home automation

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ABSTRACT:

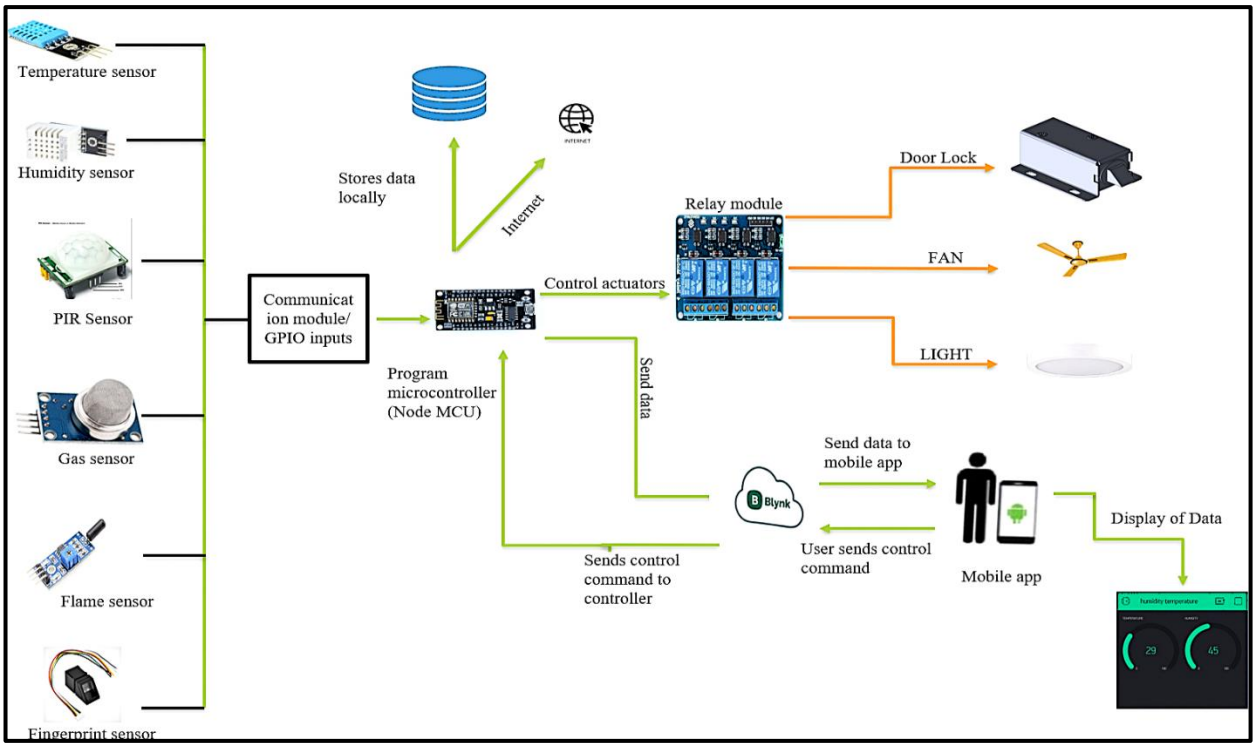
Nowadays, people are looking for methods to improve their lifestyles by utilizing the latest technologies accessible. Various home automation system have grown in popularity over the last decade, and it improves comfort and quality of life. This system can be used to describe how all home appliances function together and control them using the laptop, Android smart phone, or tablet with internet access. This implementation of an individual control home automation device uses the Wi-Fi module, microcontrollers, relay module, PIR motion sensor, temperature sensor, flame sensor, fingerprint sensor, gas sensor, and also a mobile applications like Blynk App. However, the availability of microcontroller; like Node MCU makes it possible for implementation of low cost IOT based smart home system. Additionally, the system can incorporate smart scheduling and automation features to further enhance user convenience. By learning user habits and preferences, the home automation system can automatically adjust lighting, temperature, and other appliances to create a comfortable living environment. Integration with voice assistants such as Google Assistant or Amazon Alexa can further streamline control, allowing users to operate devices through simple voice commands. This level of automation not only improves energy efficiency but also enhances security, ensuring a seamless and intelligent home experience tailored to individual needs.

I. INTRODUCTION:

The main objective of a smart home is to reduce energy consumption, increase efficiency of home appliances, improved comfort and security features enhanced the trend of smart home automation. Therefore, it is becoming more common in India due to the low cost and accessibility of devices. Smart automation of lights or electrical devices supports to prevent incidents such as short circuits, fires, and wastage of power consumption. The code is written in the Arduino IDE platform provides the ability to write code using the C++ programming language to be loaded into the ESP8266. This ESP8266 module can be powered by a micro-USB cable connected from the module to a computer. There is a blue LED on the module that confirms that the module is receiving power. The Arduino IDE is an open-source, available for Windows, Linux, and macOS, and it has a built-in text editor which is used to edit and compile code. Then code is uploaded onto the Node MCU (ESP8266) module and executed. The advantages of a home automation system is safety concern, improved comfort, power optimization. In an automation free environment, people occasionally forget to turn them off and have to come home to do so. This is a waste of time that causes a lot of confusion and tension. To prevent such a situation, the most recent technology has already been widely available: smart home technology. A smart home is one in which all of the electrical equipment in and around the house is advanced, intelligent and automated, technologically with a highly advanced automatic security system in place. All would be benefited from a smart home, and it can be used in daily life.

II.PROPOSED SYSTEM:

In today's fast-paced world, homeowners face the challenge of managing power consumption and they want to optimize it using smart technology. In addition to that, traditional home systems require manual control of appliances, leading to difficulty for old people, energy waste, and safety concerns. There is a growing need for an affordable, reliable, and user-friendly smart home automation solution that allows homeowners to remotely control and monitor their appliances and security systems, optimizing energy usage while providing enhanced comfort and security. So, this smart home automation will addresses these challenges by integrating IoT technologies to enable remote control and automation of household devices through a mobile application.



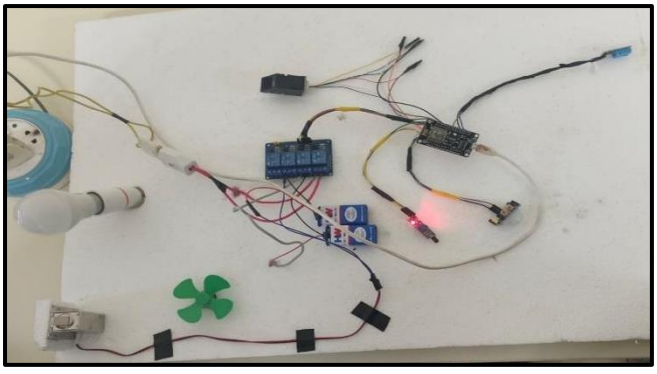
III. IDENTIFICATION OF TOOLS:

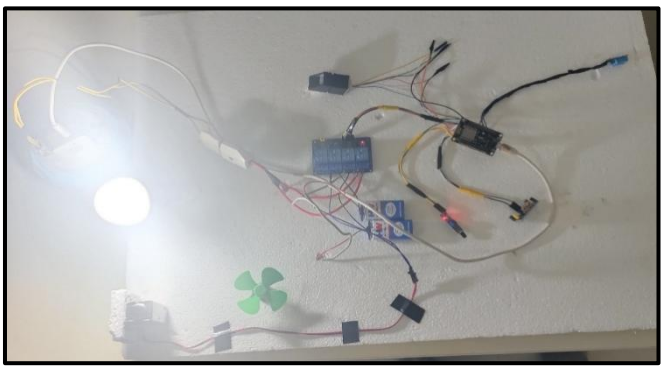
Tools we have used:

- **NodeMCU (ESP8266)**: A low-cost, Wi-Fi-enabled microcontroller that acts as the central control unit for managing sensors, relays, and communication with the cloud.
- **Arduino IDE**: Used to write, compile, and upload code to the NodeMCU. It supports the necessary libraries for communication, sensor data collection, and integration with the Blynk platform.
- **Blynk App**: A user-friendly mobile application that provides real-time control and monitoring of home appliances and sensor data. The app allows you to add widgets (buttons, sliders, displays) for remote control and viewing of sensor data.
- **Blynk Cloud**: A cloud platform that facilitates communication between the NodeMCU and the Blynk app, enabling remote monitoring and control without requiring a custom server setup.
- **Sensors:** Data from these sensors can be used to control appliances like fans or air conditioning systems based on threshold algorithms.

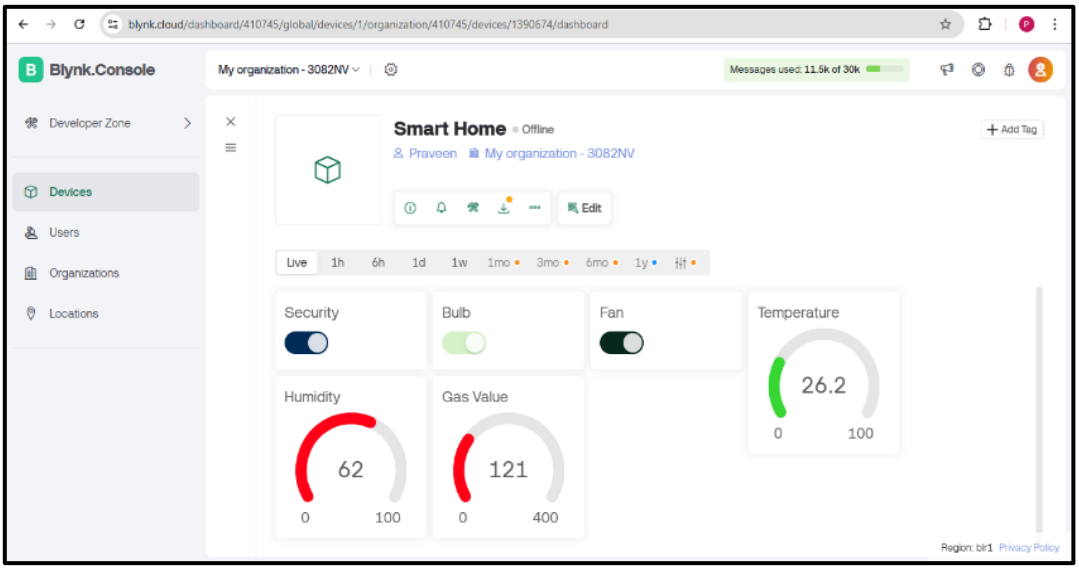
IV.RESULTS AND DISCUSSION:

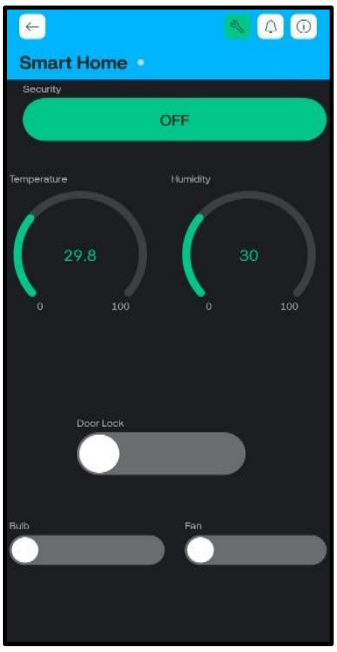
Here, we can see the final setup for the project, which is the sensors (DHT11, PIR Motion, Fingerprint R307, Flame) are connected to the central microcontroller (Node MCU) for sensor data transmission. To power the Node MCU we have used a 5V USB adapter. Also, the 4-channel relay module is connected to the Node MCU to receive the trigger commands for controlling the home applications which are Bulb, Fan, and Solenoid Lock. For example, if the user presses the bulb button in the Blynk app to turn it on, then that command will be sent to the Blynk cloud, and that Blynk cloud will forward the same command to Node MCU such that the relay module will get triggered and execute the command(like turning on the bulb or turning off the bulb). Similarly, for the fan and solenoid lock also based on the commands the relay will get triggered and execute the commands accordingly. Here, the bulb we have used a 100V capacity and to power this bulb we have used direct current only, for the solenoid lock and fan we have used a 9V battery (HW).





Finally, this is the interface (Blynk app) through which we can control our home applications by using any smart phone. Here, we can see the different buttons for different home applications and different sensors in the below Figure. The Bulb button is to turn on/off, similarly for fan and Door Lock button, user can control their home applications using this Blynk interface through mobile. And also we can see the temperature and humidity readings in the same dashboard which we are using for controlling the home applications. Moreover, we can see a security button as well and the working of this security button is like, whenever the user turns it on then only the motion sensor will get activated and detect the motion in the home and if finds any detection, then system sends a notification alert to the user through Gmail as well as Blynk app. And same for flame sensor also when flame is detected then system will send the notification alert to us. Additionally, we can control these home applications from the laptop as well which shown in the below to the





V.FUTURE ENHANCEMENT:

- **Automated Light Intensity Control:** Automation of light intensity in homes is positioned to become increasingly important as we move closer to a future with greater connectivity and intelligence. Traditional lighting systems are being replaced with smart lighting solutions that dynamically alter intensity based on ambient circumstances, user preferences, and time of day. To deliver a smooth and energy-efficient lighting experience, we will also look at integrating sensors, artificial intelligence, and machine learning.
- **Voice Command:** In future we will implement voice command in the system by using AI and Google API voice to text. By doing this one can control the system by just giving voice command to turn on or off something.

VI.CONCLUSION:

The main goal of this work is to represent a home automation system that can be operated remotely with synchronization of appliances like Blynk app to reduce power optimization. And also traditional wall switches are much more challenging to the old people to get close enough to control them. With smart phones, remote controlled home automation system offer the most advanced solution. Furthermore, by integrating IoT technology and cloud-based applications, the system enhances efficiency, security, and user convenience. The ability to automate and control home appliances remotely reduces unnecessary power consumption, contributing to energy savings and a more sustainable lifestyle. Additionally, the inclusion of voice commands and AI-based automation can further improve accessibility, especially for elderly individuals and those with mobility challenges. This work not only modernizes home management but also provides a cost-effective, user-friendly solution adaptable to various household needs. By addressing real-life challenges, this home automation system aims to improve the overall quality of life while leveraging advanced technology for a smarter and more connected home environment.Moreover, this system can be further enhanced by integrating machine learning algorithms to analyze user behavior and optimize appliance usage based on patterns and preferences. Predictive automation can help in scheduling appliances efficiently, reducing manual intervention, and improving overall energy efficiency. Additionally, the real-time monitoring and alert systems is enhancing security by notifying users of unusual activities or malfunctions. With continuous advancements in IoT and smart home technologies, this system has the potential to evolve into a more intelligent, adaptive, and seamless automation solution, making modern living more convenient, secure, and sustainable.

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