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SMART HOME AUTOMATION SYSTEM BASED ON IoT

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Abstract

The smart home automation system based on IoT (Internet of Things) is designed to provide an intelligent and connected environment within a residential setting. The system utilizes sensors, actuators, and internet connectivity to enable automation, control, and monitoring of various home devices and systems. Through the integration of IoT technologies, the smart home automation system enhances convenience, energy efficiency, security, and overall comfort for the residents.

KEY WORDS: Home Automation System, Remote Control via mobile, Wi-Fi Control, Smart lighting, Mobile app, Internet of Things (IoT).

1. INTRODUCTION

A Smart home automation system based on the internet of things (IoT) can be an efficient way to manage your home. The system can include smart devices, such as a thermostat, that are connected to the internet. These devices can be controlled through an automation system, which can make it easier to manage your home's temperature and energy use. Additionally, a smart home automation system can enhance your home's security and energy efficiency.

The home automation system is a mobile web-based application. This paper can be customized a lot as it has multiple GPIO port that can be programmed and they can give the user control over various things from his smart phone like security, surveillance, lighting, energy management, access control, entertainment [1]. Home automation system should also provide a user-friendly interface on the host side, so that devices can be easily

setup, monitored and controlled [2]. The main reason to develop this system is to save time and manpower along with maintaining security and convenience. This is how an automated system proves useful to people in providing them security, comfort and easily accessible [3].

2. LITERATURE SURVEY

Yekhande, et. al. [4], proposed the architecture for smart home control and monitoring systems using Arduino is proposed and implemented. It gives a basic idea of how to control different home appliances and provide security by using Arduino Uno controlled from a desktop application. In our project, we tried to implement an embedded system that meets the main functions of home automation for the management of lighting, habitat security, and temperature & humidity control. For these reasons, a desktop application was created to interact with an Arduino via the serial port.

K Eeswari et. al. [5], the light sensor was properly configured to detect when the laser was broken, while not accidentally tripping due to different ambient light environments. In addition, the temperature and light control subsystem outputs are confirmed to be working. Specifically, the firmware has been tested and is confirmed to be outputting the appropriate signals to the subsystem BJT switches which control lighting and furnace operations. Overall, the project has been working to design specifications and has maintained a high-quality standard which can be integrated into modern homes.

Kausalya et. al. [6] suggest, we found out that in this era of computers, smart home technology has become imminent. It's a smart technology that gives us a different level of living standard. We are fully dependent on a system where everything is fully automatic. We are using sun tracking technology so we can get maximum efficiency of solar power. It has two different user functions; one is controlled manually and other automatically. Security is password and/or biometrically protected and sensing ability gives this home strength to protect itself.

Sahoo et. al. [7], in this paper present a Home Automation system (HAS) using Intel Galileo that employs the integration of cloud networking, wireless communication to provide the user with remote control of various lights, fans, and appliances within their home and storing the data in the cloud. With this internet of things project, 6 you can control 4 relays from Arduino IoT Cloud dashboard, Alexa, IR remote, and manual switches. You can also monitor the real-time room temperature in the Arduino cloud dashboard and Amazon Alexa app. If there is no internet available still, you can control the appliances from the IR remote and switches. I have

used all the FREE tools and you do not need any Alexa devices or Amazon Echo Dot for this voice control smart home IoT project.

El-Hajj M. et. al. [8], proposed the system focuses on the a near complete and up-to-date view of the IoT authentication field. It provides a summary of a large range of authentication protocols proposed in the literature. Using a multi-criteria classification previously introduced in our work, it compares and evaluates the proposed authentication protocols, showing their strengths and weaknesses, which constitutes a fundamental first step for researchers and developers addressing this domain.

Ahmed et. al. [9], introduce the system that will automatically change on the basis of sensors' data. This system is designed to be low cost and expandable allowing a variety of devices to be controlled Such as, E-commerce, Coal Mine, Wearable device, Smart Grid, Laboratory Monitoring, Agriculture, and many other domains. The process of controlling or operating various equipment, machinery, industrial processes, and other applications using various control systems and with less or no human intervention is termed as automation.

Kasbekar et. al. [10], define as the Arduino UNO, ESP wi-fi module, Thing speak, relay module monitors and schedule any old electronic device through a mobile application. The process of controlling or operating various equipment, machinery, industrial processes, and other applications using various control systems and also with less or no human intervention is termed as automation. There are various types of automation based on the application they can be categorized as home automation, industrial automation, autonomous automation, building automation, etc.

3. TECHNOLOGY

A smart home automation system based on IoT can be designed, developed, and deployed, offering residents enhanced control, automation, energy efficiency, and convenience within their homes.

3.1 Automation: Automation refers to the use of technology and machinery to perform tasks or processes with minimal or no human intervention. It involves the creation and implementation of systems or tools that can operate automatically, reducing the need for manual labor and increasing efficiency.

Automation can be applied to various industries and sectors, including manufacturing, logistics, finance, healthcare, and information technology. It often involves the use of robotics, artificial intelligence (AI), and computer software to streamline operations and improve productivity [11].

3.2 Smart: Smart is a term commonly used to describe objects, systems, or technologies that have enhanced or advanced capabilities enabled by the integration of sensors, connectivity, and artificial intelligence (AI).

3.3 IoT: The Internet of Things (IoT) refers to a network of interconnected physical devices, vehicles, appliances, and other objects embedded with sensors, software, and network connectivity that enables them to collect and exchange data. In simple terms, it is the concept of connecting everyday objects to the internet to enable communication and data sharing between devices.

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3.4 Wireless Communication Protocols: Smart home devices often communicate wirelessly to connect with each other and with a central hub or gateway. Popular wireless protocols used in IoT-based smart home systems include Wi-Fi, Zigbee, Z-Wave, Bluetooth, and Thread.

3.5 Smart Hubs/Gateways: Smart hubs or gateways act as a central control point for smart home devices. They enable communication between various devices and provide a unified interface for users to manage and control their smart home system. These hubs may use technologies such as Wi-Fi, Ethernet, or cellular connectivity to connect to the internet and enable remote access.

3.6 Mobile Applications:

Mobile apps serve as a user interface for controlling and monitoring smart home devices. These apps can be installed on smartphones or tablets, enabling users to remotely manage their smart home system, receive notifications, and customize settings [13].

3.7 Security Protocols: As smart home devices are connected to the internet, ensuring data privacy and security is crucial. Encryption protocols such as Transport Layer Security (TLS) and authentication mechanisms like OAuth are employed to secure communications and prevent unauthorized access to smart home systems [14].

4. PROPOSED WORK

A smart home automation system based on IoT can be designed, developed, and deployed, offering residents enhanced control, automation, energy efficiency, and convenience within their homes.

4.1 System Architecture and Infrastructure:

- Design a scalable and robust architecture for the smart home automation system based on IoT.
- Identify the necessary hardware components, including sensors, actuators, and a central control hub.
- Determine the appropriate communication protocols and connectivity options (Wi-Fi, Bluetooth, etc.) for seamless device integration.

- Select a cloud platform or server infrastructure for data storage, processing, and remote access.

4.2 Remote Access and Mobile Application:

- Develop a mobile application or web interface for remote access and control of the smart home automation system.
- Enable real-time monitoring of home systems, remote device control, and customization of settings.
- Implement secure authentication and encryption protocols to ensure data privacy and protection [14].

4.3 Actuator Control and Device Integration:

- Integrate actuators and devices, such as lighting systems, HVAC systems, Fan, into the smart home automation system.
- Enable bidirectional communication between the central control hub and actuators for remote control and automation.
- Develop protocols or APIs to facilitate device integration and control.

4.4 Automation and Rule-Based System:

- Design a rule-based system to enable automation based on predefined scenarios or user-defined rules.
- Define rules for automatic device control based on sensor data inputs, such as turning off lights when no motion is detected or adjusting temperature based on occupancy.
- Implement a user-friendly interface to allow users to customize and manage automation rules.

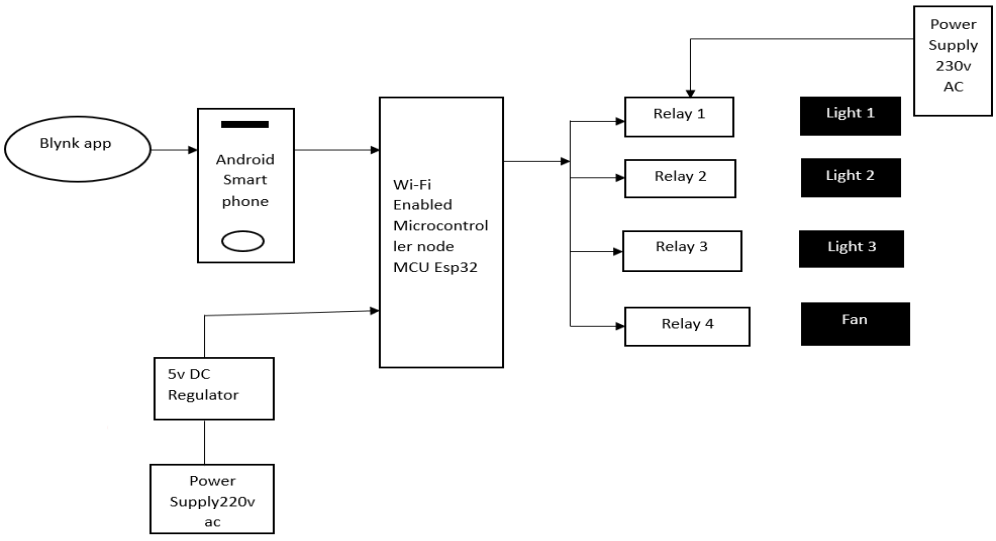

Figure .1 Home Automation Represent

5. FUTURE SCOPE

The future scope of smart homes is incredibly promising. With advancements in IoT, artificial intelligence, and connectivity, smart homes will become more intelligent, convenient, and personalized. We can expect seamless integration of devices from various manufacturers, allowing for easy control and automation. Artificial intelligence algorithms will learn user preferences, adapt to changing needs, and provide proactive recommendations. Energy management will be optimized, leveraging renewable sources and grid integration. Enhanced security and privacy measures will ensure the protection of user data and devices. Health monitoring, sustainability practices, and integration with smart cities will further enhance the smart home experience. Ultimately, smart homes of the future will transform our living spaces into intelligent ecosystems that prioritize comfort, convenience, energy efficiency, and overall well-being.

6. CONCLUSION

Smart home automation systems based on IoT offer tremendous benefits and possibilities. By connecting devices, sensors, and actuators within a home environment, these systems enable intelligent control, monitoring, and automation of various aspects such as security, energy management, and convenience. The integration of IoT technologies, data analytics, and artificial intelligence allows for personalized and adaptive experiences, where the system learns user preferences and adjusts automation accordingly. With features like voice control and remote access via mobile apps, users can conveniently manage their homes from anywhere. Moreover, the interoperability of devices and integration with smart grids and smart cities pave the way for a more connected and sustainable living. However, privacy and security considerations should be addressed to ensure the protection of user data and maintain trust in these systems. Overall, smart home automation systems based on IoT have the potential to transform our living spaces into more efficient, comfortable, and intelligent environments.

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