https://doi.org/10.46335/IJIES.2025.10.9.2 **e-ISSN: 2456-3463**
Vol. 10, No. 9, 20xx, PP. 8-11

International Journal of Innovations in Engineering and Science, www.ijies.net

Home Automation Using Wi-Fi

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Received on*: 17 May,2025* ***Revised on****: 24 June,2025* ***Published on****: 26 June,2025*

Abstract *– The advent of IoT (Internet of Things) technology has revolutionized home automation, offering enhanced convenience, energy efficiency, and control. This project focuses on implementing a simple yet effective home automation system using an Arduino microcontroller and the ESP8266-01 Wi-Fi module to control two electrical loads - a fan and a lamp. The system enables users to remotely operate these appliances via a smartphone or computer connected to a Wi-Fi network. This solution highlights how IoT-driven automation can be accessible and practical for everyday users, bridging the gap between modern technology and traditional home settings. Future enhancements can include additional security measures and broader compatibility with third-party systems, further optimizing the user experience.*

Keywords- *Home automation, Wi-Fi network, Computer Vision*

I INTRODUCTION

Home monitoring system and control system are a device that is implemented using Internet of Things. The Internet of Things is the inter-networking of physical devices, vehicles, buildings, and other items embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data. The home monitoring system monitors doors and windows of your home and notifies you of any new access of your property via a data feed. Home monitoring system consists of sensors to detect intrusion and captures and sends multiple pictures of the intruder to the user anywhere through Internet.

There are many different types of home automation system available. These systems are typically designed and purchased for different purposes. In fact, one of the major problems in the area is that these different systems are neither interoperable nor interconnected. There are number of issues involve when designing a home automation system. It should also provide a user-friendly interface on the host side, so that the devices can be easily setup, monitored and controlled. In smart home systems, the internet is also use to ensure remote control. For years, the internet has been widely use for the various processes such as surfing on the pages, searching information, chatting, downloading and installation.

II LITERATURE REVIEW

Rani and workmates [1] introduced a voice-activated home automation solution that leverages artificial intelligence and natural language processing (NLP) approach. Users can manage household devices by issuing voice commands through a mobile device, which are then analyzed using predefined NLP algorithms. However, the system's scope is limited to appliance control and does not comprise broader functionalities such as environmental monitoring, invasion of detection, motion sensing, and other aspects of home automation.

K Eeswari et. al. [2], initiated, configuration of the light sensor was accurately adjusted to perceive the

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interruption of the laser beam without triggering erroneously from varying ambient light conditions. In addition, the functionality of the temperature and light control subsystems has been verified. Notably, thorough testing of the firmware has validated its ability to generate correct signals for the subsystem's BJT switches, governing both lighting and furnace functions. In summary, the project has adhered to its design specifications and upheld exemplary quality standards suitable for seamless integration into contemporary households.

Govindraj et al. [3] presented A cutting-edge home automation solution using IoT technologies is poised to transform traditional home management systems. This innovative system integrates an Android application to oversee and regulate various aspects of the home environment, including appliances, temperature, motion, and gas levels. It operates through a satellite hub and a radio frequency transceiver, ensuring seamless control and monitoring from anywhere. Sensor data is captured and securely stored on the Thing Speak cloud platform, facilitating convenient access and analysis. A central base station orchestrates commands for home automation, ensuring efficient control. Moreover, a dedicated mobile application interfaces with the satellite station, base station, and cloud server, enabling comprehensive home management with direct graphical representations of sensor data.

Kundu and colleagues [4] introduced a comprehensive home security, regulation, and surveillance mechanism, which oversees environmental parameters like temperature, humidity, and fire hazards while managing household devices through various channels. Control and monitoring functionalities are carried out through voice commands, electrical switches, and online connectivity. The security aspect entails alerting the user upon detection of a home intruder. Notably, the system is engineered for seamless wireless communication between the user and the domicile, devoid of geographical constraints.

Yekhande and associates [5], proposed a smart home framework utilizing Arduino was introduced, providing both gestate and implementation. It offers foundational control of household devices and enhances security through Arduino UNO, managed via a desktop interface. Our project aimed to create an embedded system for basic home automation tasks, including lighting, security, and climate control. A desktop program was developed for seamless interaction with Arduino via the serial interface.

III METHODOLOGY

The hardware architecture comprises an Arduino board as the central processing unit, an ESP8266-01 module for wireless connectivity, relays for load switching, and necessary power supply components. The Arduino is programmed to communicate with the ESP8266-01, enabling the receipt of commands from a custom-built web interface or mobile application. Each load (fan and lamp) is connected to the relays, which are triggered based on user commands, ensuring seamless operation.

This system not only allows remote switching but also incorporates features such as status monitoring, where the current state (ON/OFF) of the appliances is displayed on the interface. The design ensures safety and scalability, allowing additional devices to be integrated with minimal modifications.

From a practical perspective, this project emphasizes cost-effectiveness and ease of implementation, using readily available components. The ESP8266-01 module ensures reliable wireless communication, while the Arduino offers a robust platform for automation tasks. The project serves as a foundation for more advanced home automation systems that could include voice control, energy usage analytics, or integration with smart assistants.

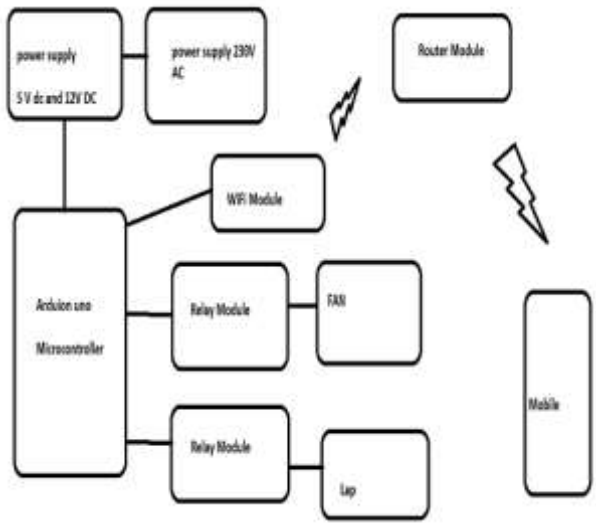

Figure 1: Proposed model of home automation system

This method allows users to use their smartphone to scan and after processing the image, applications will now request that the image be viewed on the Visual Cloud

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API or LCD and authentication, the user will now control the devices connected to the Arduino processor.

Figure 1 shows an overview of the operation of the automated home system. Three different devices, such as a fan, light, and TV, feature a Wi-Fi remote control and run by apps installed on Android or a smartphone. These devices are linked to an Arduino with help of input/output pin. These devices are joint to the local area network using a communication mode called Channel Relay module.

IV WORKING

Arduino is a development board and it is perfect for this model because it provides a lot of pins for interface relay settings, L, LCD and Wi-Fi. The channel relay unit is used to enable or disable low- voltage high-voltage equipment as indicated by the Arduino digital pin. In this model we have used four-channel exchange tournaments. L. It is easy to connect to Arduino instead of connecting each exchange individually. It can deliver up to 250V AC and up to 10 ampere current. The LCD monitor is used to display up to 16 characters in two characters. Arduino makes it easy to connect to the library available. In this model, the LCD monitor is used to show the location of the device whether it is on or off.

V SYSTEM IMPLEMENTATION

i. The Wi-Fi option in your smartphone is able to establish a linking between the client and the server, the Wi-Fi chip that provides TCP and IP
ii. Smart phone linked to the Wi-Fi module of the system.
iii. Each device/electronic/electrical appliance in the system is associated to the digital pins on the Arduino.
iv. An exchange rate is used to connect each device to an Arduino that helps convert high voltage to low voltage.
The channel relay module is used to switch on or off high voltage equipment with low DC voltage
v. Relays are used to connect each device to an Arduino, which helps convert a high voltage source to a low voltage source. The channel relay module is used to turn on or off high voltage devices with low DC voltage.
vi. A program loads on Arduino with a microchip chip that specifies what action to take when receiving specific inputs.
vii. Android applications have been developed that allow users to monitor and control devices from any remote location.
viii. LCD is used to indicate the location of all equipment images, accessories, displayed on the LCD for supervisory purposes, whether it is on or off.
ix. Successful Monitoring and controlling of appliances.

VII RESULT & DISCUSSION

The innovative smart home automation system, designed for seamless control of household appliances globally, utilizes a GSM module as a pivotal communication tool. Employing text messages as the communication channel between the main module and core functionalities like providing energy efficiency, enhancing safety and security, real time monitoring, creating a personalized and comfortable environment, coordination between devices. System not only empowers users to manage home appliances remotely but also provides robust security measures against potential intruders. The

functionality of the implemented features has been thoroughly validated, comprising a cohesive ensemble of a GSM module, PIR sensor, gas sensor, flame sensor, and home appliance controls. Through practical implementation, the system has yielded positive results, and each core feature's performance was rigorously tested for user functionality.

Fig. 2 Smart Home Automation System

As the figure shown above, results of the home automation system using wi-fi reflect a successful integration of smart technologies into the domestic environment. Through practical implementation, the system demonstrated its efficacy in providing residents with enhanced control, automation, and security. The seamless communication between wi-fi devices,

centralized management through cloud services, and user friendly mobile application contributed to a streamlined and efficient smart home experience.

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Overall, implementing a Home Automation System using wi-fi can enhance convenience, safety, efficiency and comfort in our life.

VI. CONCLUSION

This paper highlights the various aspects of security, management, and maintenance found in the wi-fi based home network automation. To make it easier for users to contact electrical appliances via their smartphones. As a widespread line on the web, a remote user will be able to scan the electric device with his or her camera and then process from the camera to select the fixed IP object which will then be sent to the Arduino connected to it. To do basic tasks such as turning it on and off. Because switches require fewer wires. It also consumes electricity inside the building when the load is in a closed state and provides 100 percent efficiency.

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