IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 20, April 2026
Impact Factor: 8.2

IOT Based Smart Home Automation System

Mrs. Swati Y. Kale[1], Miss. Snehal Salunke[2], Miss. Samiksha Jadhav[3], Miss. Amruta Rajguru[4], Miss. Ishwari Popalghat[5], Mis. Aditi Sanap[6]

Prof, Students Computer Engineering Department, Adsul's Technical Campus, Ahilyanagar, India [1,2,3,4]

Students, Information & Technology Engineering Department, Adsul's Technical Campus, Ahilyanagar, India[5,6]

Abstract: *: "The Internet of Things (IoT) is rapidly becoming a disruptive technology with significant business potential. It involves wireless communication between everyday objects and devices, collectively known as "Things." The aim of the project is to create a smart wireless automated home system and control home appliances using Wi-Fi as the communication channel. Although there are several wireless communication techniques, such as ZigBee, Wi-Fi, Bluetooth, and GSM, they have limitations, and hence the project will utilize IoT-based Smart Home Automation. The project focuses on managing home appliances and offering smart security by sending an email with an image to the owner via the internet when an object is detected. The "Node MCU" Module will be used to implement the project, and it will be particularly useful for the handicapped and the elderly.*

Keywords: IOT, ESP8266 , Wifi, Smart Phone, Home Automation

I. INTRODUCTION

Home automation refers to the use of microcontroller or computer technology to manage and control household appliances. It has gained popularity due to its ability to provide convenience, security, and efficiency. By using sensors that detect the state of the appliances and sending updates to a web server, users can remotely access and adjust their appliances' state, even when away from home. This paper presents a method for controlling household appliances through a web server. The IoT-based smart security and smart home automation solution aims to offer simplicity and comfort. The system consists of two components: wireless home security and home automation. The current prototype of the system alerts the owner via email if any human movement is detected near the home's entry. If the user confirms that the person entering the house is not an intruder but an unexpected guest, they can open the door and turn on various appliances in the house, which are also controlled by the system's micro-controller. Similarly, users can make arrangements to control appliances from their doorstep before entering the house to make themselves comfortable. The same sensors used for home security can also be used for home automation, allowing both challenges to be tackled together. One key advantage of this IoT solution is that it can use 3G or 4G services when Wi-Fi is not available. This project overcomes existing limitations to provide simple, convenient, and comfortable smart security and smart home automation.

Home automation is a topic which is gaining popularity day by day, because of large advantages. One can achieve home automation by simply connecting home appliance electrical devices to the internet or cloud storage. The reason for this surge demand of network enabled home automation is reaching the zenith in recent days for its simplicity and comparable affordability. Platforms based on cloud computing help to connect to the thing's surroundings everyone so that one can find it easy to access anything and everything at any time and place in a user-friendly manner using custom defined portals. Hence, cloud act as a front end to access IOT. Here Proposed system is assumed, a system which can control devices through wireless based network or cloud-based approach. In project IOT is used as a based home automation system which goal is to develop a home automation system that gives the user complete control over all remotely controllable aspects of his or her home. The automation system will have ability to be controlled from a central host PC, the internet, and also remotely accessed. The concept of "Home Automation" has been in existence for several years. "Smart Home", "Intelligent Home" are terms that followed and is been used to introduce the concept of networking appliance within the house. Home Automation Systems (HASs) includes centralized control and distance

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 20, April 2026 Impact Factor: 8.2

status monitoring of lighting, security system, and other appliances and systems within a house. HASs enables energy efficiency, improves the security systems, and certainly the comfort and ease of users. In the present emerging market, HASs is gaining popularity and has attracted the interests of many users. HASs comes with its own challenges. Mainly being, in the present day, end users especially elderly and disabled, even though hugely benefited, aren't seen to accept the system due to the complexity and cost factors. In relevance and research towards the topic of home automation using IOT system and increasing demand of invention in home automation, this review contents the detail study of "Home Automation Using IoT System" and discuss the technologies used, features and limitations in home automation system. As this literature reviews aims to bring clear understanding about previous home automation systems and we are using previous proposed theories in purpose of learning and for better understating of the environment around the system. This survey research will summarize the various research approaches and the results obtained from the various systems and by studying this we will try to improve and will aim to meet the objectives of the system.

Aim & Objective:

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 intranet work 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.

II. LITERATURE SURVEY

• "Smart Energy Efficient Home Automation System using IOT", by Satyendra K. Vishwakarma, Prashant Upadhyaya, Babita Kumari, Arun Kumar Mishra [1] . This paper presents a step-by-step procedure of a smart home automation controller. It uses IOT to convert home appliances to smart and intelligent devices, with the help of design control. An energy efficient system is designed that accesses the smart home remotely using IOT connectivity. The proposed system mainly requires, Node MCU as the microcontroller unit, IFTTT to interpret voice commands, Adafruit a library that supports MQTT acts as an MQTT broker and Arduino IDE to code the microcontroller. This multimodal system uses Google Assistant along with a web-based application to control the smart home. The smart home is implemented with main controller unit that is connected with the 24- hour available Wi-Fi network. To ensure, that the Wi-Fi connection do not turn off, the main controller is programmed to establish automatic connection with the available network and connected to the auto power backup. "Visual Machine Intelligence for Home Automation", by Suraj, Ish Kool, Dharmendra Kumar, Shovan Barman.

• The paper [2] presents a vision-based machine intelligence system to sense on/off state of common home appliance. The proposed method of sensing the state of appliances results on a novel home automation system. The accessibility of the suite of devices in the home over a remote network is facilitated by the IP Addressing methods in the IOT. This project uses two boards viz. Raspberry Pi and Intel Galileo Gen 2. The communication between the User devices, Raspberry Pi and the Intel Galileo boards happens over a wireless network. The UDP protocol is deployed to facilitate the wireless communication of the nodes present in the home automation network. A Pi Cam and a USB Logitech camera attached to the rotating shaft of two different servo motor capture snapshots that are passed as inputs to the Machine Learning based models trained using dlib-C++ to detect the state of the operation of the appliances. The proposed method uses visual modality to automate the appliances, as privacy concerns may emerge while using the images from some specific places, as a counter to this issue, an SPDT switch is added to the Raspberry Pi which when turned off ensures that even if the images are taken from the webcams, they are just passed as inputs to the machine learning models and are not displayed on the website when the users access the website on the server address obtained from Raspberry Pi.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 20, April 2026 Impact Factor: 8.2

• The paper "IOT Based Smart Security and Home Automation", by ShardhaSomani, Parikshit Solunke, ShaunakOke, Parth Medhi, Prof. P. P. Laturkar [3], focuses on a system that provides features of Home Automation relying on IOT to operate easily, in addition to that it includes a camera module and provides home security. The android application basically converts Smartphone into a remote for all home appliances. Security is achieved with motion sensors if movement is sensed at the entrance of the house; a notification is sent that contains a photo of house entrance in real time. This notification will be received by the owner of the house via internet such that app can trigger a notification. So, owner can raise an alarm in case of any intrusion or he/she can toggle the appliances like opening the door if the person is a guest. The system uses Raspberry Pi, a small sized computer which acts as server for the system. The smart home consists two modules. Home automation that consists; fan light and door controller, and security module that consists; smoke sensor motion sensor and camera module.

• This paper titled "Enhance Smart Home Automation System based on Internet of Things", by Tushar Chourasia and Prashant Kumar Jain [4] proposes a system that develops a model to reduce the computation overhead in existing smart home solutions that uses various encryption technologies like AES, ECHD, hybrid, etc. these solutions use intermediate gateway for connecting various sensor devices. The proposed model provides a method for automation with sensor-based learning. The system uses temperature sensor for development but other sensors can also be used as per requirement. These smart home devices with sensors can configure 9 themselves autonomously and can operate without human intervention. This work minimizes encryption decryption and focuses on authentication and automation of smart home devices with learning. The system bypasses local gateway mentioned in existing system to provide better security for smart home devices and sensor data and save computation overhead. The real time broker cloud is directly connected with smart home and manages all incoming and outgoing request between users and devices. The main purpose to use real time broker cloud is save time of cryptographic operations.

III. EXISTING SYSTEM

A. Bluetooth based home automation system Home automation systems : that use smartphone, Arduino board, and Bluetooth technology are cost-effective and secure. The Bluetooth system uses a PC or smartphone as the receiver device, providing good security, high communication rate, and real-time performance, all at a low cost. However, the main drawback of Bluetooth-based home automation systems is that the network has a limited range of only 10 meters. As a result, if the smartphone moves out of range, it will not be able to control the home appliances.

B. Voice recognition based home automation The proposed home automation system is based on voice recognition technology and was developed and tested by a researcher. The system uses Bluetooth technology to enable wireless connection between a smartphone and the Arduino UNO. This system is particularly beneficial for individuals with disabilities or elderly individuals who can manage home appliances by speaking voice commands. However, the primary disadvantage of this system is that communication between the user and the voice recognition tool is dependent on the signal-to-noise ratio (SNR). In the presence of noise, the system's ability to perform accurately can be compromised, leading to communication issues. The researcher's proposed home automation system utilizes voice recognition technology to enable individuals with disabilities or the elderly to control household appliances through voice commands. The system uses Bluetooth technology to establish a wireless connection between a smartphone and the Arduino UNO. The Bluetooth technology offers a reliable and low-cost option for wireless communication, enabling the system to be implemented at a relatively low cost. However, the system has a drawback in that its performance depends on the SNR, which can cause communication issues if the voice signal is too noisy. Nonetheless, the system can still be beneficial to individuals who may have difficulty managing home appliances through traditional means

C. ZigBee Based Wireless Home Automation System A wireless home automation system utilizing ZigBee technology has been researched and analyzed. ZigBee technology is comparable to Bluetooth in that it is a widely-used transceiver standard with a low power and data rate. It has a physical range of 0.010 to 0.020 kilometers that can be increased up to

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 20, April 2026
Impact Factor: 8.2

0.0150 kilometers with the use of direct sequence spread spectrum (DSSS). This technology is often utilized for research and prototyping purposes.

D. GSM Based Home Automation System An intelligent home automation system was established utilizing Global System for Mobile communication (GSM). To communicate between the central module and the devices, text messages are used in GSM-based home automation systems. The primary limitation of a GSM-based home automation system is that the transmission of text messages to the system is not always guaranteed, which renders it an untrustworthy solution. These inadequacies of the current approaches have prompted the creation of an "IoT Based Smart Security and Smart Home Automation" system to address them.

IV. SYSTEM ARCHITECTURE

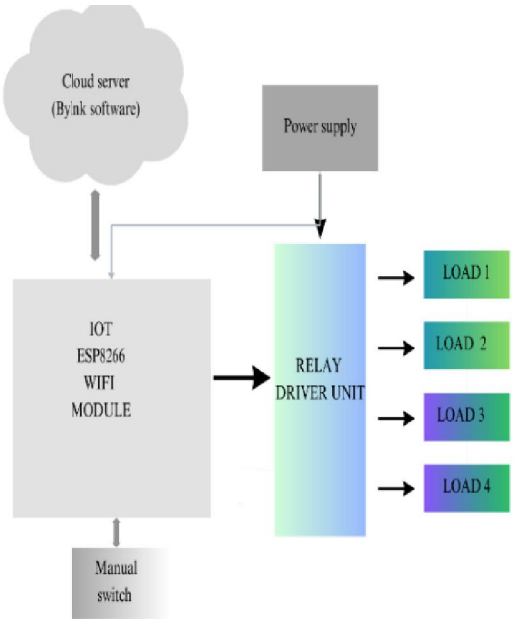

Fig. 1. Block Diagram

The block diagram gives the functionality of the overall work. The ESP8266 MCU unit is the microcontroller or the main controlling unit of the system. The user uses the mobile application in setting commands for functioning of the appliances. The mobile application interprets the command form in user in voice or switch mode and sends signal to the MCU unit, over a wireless network established by Wi-Fi communication. Hence the Wi-Fi module (actually inbuilt into ESP8266MCU), helps the microcontroller establish Wi-Fi communication with a device and take commands from an application over wireless network. The ESP8266 MCU on further receiving the signal then turns on/off the appliance with the help of relay. The ESP8266MCU, relay and the final appliances are physically connected. There is a power supply unit that powers the microcontroller, the relay as well as the final appliances. There is also a display unit that displays the status of the application. The working of the system, when used for home automation, is divided into three parts User access, Central Processing, and Output action. In the user access section, the user operates the system by giving a command using the Blynk Application. This feature is achieved by using the Blynk app which is an IoT platform, allowing controlling of electronic devices by providing a dashboard through which users can create different interfaces using widgets. The Blynk app is interfaced with commands given by the last end user. These commands are being set by the user itself on the app. It gives a service on a web platform that allows the user to create applets that automate the specified task. In the central Processing section, the input is received from the user in the ESP8266Microcontroller. The ESP8266Microcontroller processes the data as per the input and switches on/off the relay module loads. In central platform called Blynk, which allows users to control electronic devices by providing a

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 20, April 2026
Impact Factor: 8.2

dashboard where users can create interfaces with various widgets. To directly understand the commands given to the Blynk is interfaced to achieve it. It works with three main features that are Libraries (for hardware communication), Server (for communication between hardware and app) and App (for interface).

A. ESP8266:

The ESP8266 is a low-cost Wi-Fi microprocessor manufactured by Espressif Systems in Shanghai, China. It has a full TCP/IP stack and can function as a microcontroller. In August 2014, the ESP-01 module from a third-party company, Ai-Thinker, drew the attention of Western manufacturers. The ESP8266 connects microcontrollers to Wi-Fi networks and uses Hayes-style commands to make simple TCP/IP connections. Initially, there was little English-language documentation available about its chip and its order. The ESP8285 is a version of the ESP8266 with 1024 kB of built-in flash, making it possible to create single-chip Wi-Fi devices. The Node MCU ESP8266 development board includes the ESP-12E module, which contains the ESP8266 chip, powered by a Ten silica Xtensa 32-bit LX106 RISC microprocessor. This microprocessor supports RTOS and can operate at a configurable clock frequency of 80.00MHz to 160.00MHz. The Node MCU has 128 KB of RAM and 4096 KB of Flash memory to store data and programs. it is suitable for IoT projects due to its high processing power, built- in Wi-Fi and Bluetooth capabilities, and higher Sleep Operating capabilities.

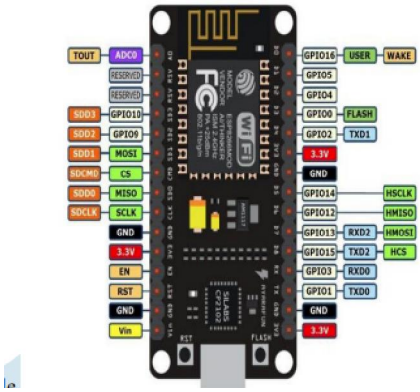

Fig. 2 ESP8266

B. Relay Module:

An electrically operated switch that controls the opening and closing of contacts is called a relay. In addition to the basic function of a relay, the single channel relay module comprises extra components that assist in connection and switching, along with indicators to indicate whether the relay is active and if the module has power.

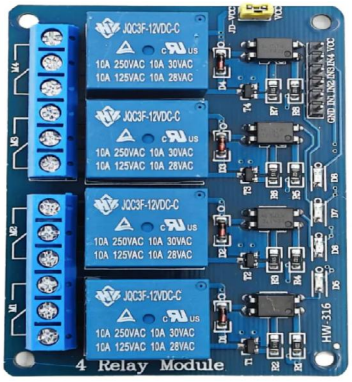

Fig. 3. Relay Module

DOI: 10.48175/568

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 20, April 2026
Impact Factor: 8.2

- Supply voltage – 3.75V to 6.00V
- Current when relay is in crescent condition: 0.02mA
- Current drawn by the relay when it's Turned on condition: 0.07mA
- Relay maximum contact voltage – 250.00 Ac Volts or 30 DC Volts
- Maximum relay current – 10000mA.

C. Blynk IOT:

Installation of the Blynk client Android application is made from the Google Play or Appstore for IOS. After the installation on a smart phone is completed, a new account should be created. If a private Blynk server is used, this information should be supplied during the installation. If the Blynk cloud server is used, it is free of charge only for a limited number of widgets. Therefore, for more complex projects (such as this one), it is advisable to use a private Blynk server, which is completely free of charge. In this case, however, the user should provide server installation, configuration and security measures. After a successful login, a new project should be launched, and then defined: the project name, the type of hardware which will be controlled, and the type of connection. After the project is defined, the Blynk server will generate a token which will be used for the authentication during the communication with the server. Blynk is a platform that enables remote control of Arduino, Raspberry Pi, and similar devices over the Internet through iOS and Android apps. The platform offers a digital dashboard with drag-and-drop widgets to create a graphical interface for your project. Setting up Blynk is straightforward, taking only a few minutes, and it supports a wide range of hardware options. Blynk is compatible with devices connected to the Internet through Wi-Fi, Ethernet, or the ESP8266 chip. To set up the Blynk App, users create a project, choose the microcontroller, and create toggle buttons for each relay, linking them to the digital pins of the microcontroller. Blynk then sends an authentication token to the project's registered email address, which should be kept for programming the Node MCU and configuring the IFTTT application.

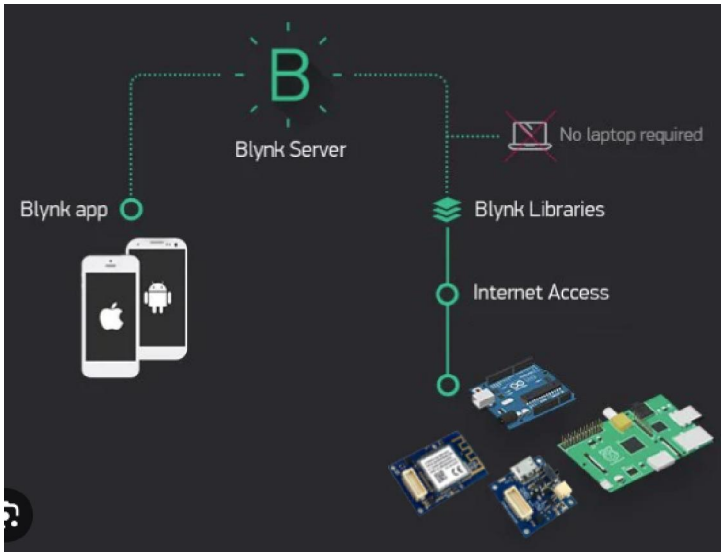

Fig. 4. Blynk IOT

D. LCD Display:

The 16x2 LCD Display with IIC/I2C interface featuring a green backlight and black characters is an efficient and user-friendly display module for embedded systems. It is widely used in electronics projects due to its compatibility with I2C communication, which minimizes the number of GPIO pins required for interfacing.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 20, April 2026
Impact Factor: 8.2

This display is ideal for various applications like robotics, IoT devices, home automation systems, and educational projects. Its green backlight ensures excellent readability, while the adjustable contrast allows users to fine-tune the display for optimal performance in different environments

Fig.5. 16x2 LCD Display

V. CONCLUSION

It is evident from this 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

Automation has become essential for everyone in the modern world. With the help of mobile applications and voice assistants, it is now possible to control household appliances. Although this technology is relatively new to most people in India, it is being adopted quickly. In the future, home automation systems will continue to evolve, making homes even smarter. Interconnected sensors such as motion sensors, light sensors, and temperature sensors will enable automated device switching based on specific conditions. This technology appeals to people worldwide because of its usability. Users can monitor their electricity usage, equipment condition, and receive notifications when necessary. As automation and IoT continue to advance, smart cities will be able to connect and create intelligent communities without problems like traffic accidents or pollution. Additionally, this technology can be used in agriculture to remotely operate field devices.

ACKNOWLEDGMENT

It gives us great pleasure in presenting the paper on “IOT based Smart Home Automation System”. We would like to take this opportunity to thank our guide, Prof. Swati Y. Kale, Professor, Computer Department, Adsul’s technical Campus, Ahlyanagar, for giving us all the help and guidance we needed. We are grateful to her for hers kind support, and valuable suggestions were very helpful.

REFERENCES

[1] Satyendra K. Vishwakarma, Prashant Upadhyaya, Babita Kumari, Arun Kumar Mishra, “Smart Energy Efficient Home Automation System using IOT”, 19 April 2019.

[2] Shardha Somani, Parikshit Solunke, Shaunak Oke, Parth Medhi, Prof. P. P. Laturkar, “IOT Based Smart Security and Home Automation”, 18 May 2018.

[3] Tui-Yi Yang, ChuSing Yang, Tien-Wen Sung; “A Dynamic Distributed Energy Management Algorithm of Home Sensor Network for Home Automation System”, Third International Conference on Computing Measurement Control and Sensor Network,22 May 2016.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 20, April 2026
Impact Factor: 8.2

[4] Tushar Churasia and Prashant Kumar Jain "Enhance Smart Home Automation System based on Internet of Things", by in Proceedings of the Third International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (ISMAC 2019),26 April 2019.
[5] Suraj, Ish Kool, Dharmendra Kumar, Shovan Barman, "Visual Machine Intelligence for Home Automation", 23 May 2022.
[6] Vikram.N, Harish.K. S, Nihaal.M.S, Raksha Umesh, Shetty Aashik Ashok Kumar; "A Low-Cost Home Automation System Using Wi-Fi based Wireless Sensor Network Incorporating internet of Things", in 2017 IEEE 7th International Advance Computing Conference. 13 July 2017.
[7] Mrs. Paul Jasmin Rani, Jason Bakthakumar, Praveen Kumaar.B, Praveen Kumaar.U, Santhosh Kumar; "Voice Controlled Home Automation System using Natural Language Processing and Internet of Things", Third International Conference on Science Technology Engineering & Management (ICONSTEM),2017.