

## HOME AUTOMATION USING IOT BY NODEMCU ESP8266

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### ABSTRACT

The Internet of Things (IoT) has transformed our lifestyle, and interact with technology. One of the most promising applications of IoT is in the realm of home automation. In this paper, we explore the potential of IoT-based home automation systems to improve the comfort, convenience, and energy efficiency of modern homes. Our results show that our system can provide significant energy savings and improve user comfort and convenience. We also discuss the challenges and opportunities for future research in this field, including security, privacy, interoperability, and scalability issues. Our paper provides a comprehensive overview of the current state of IoT-based home automation and identifies key areas for future research and development. We review the state of the art in IoT technologies and their application to home automation, actuators, wireless communication protocols, and cloud computing platforms. We describe a prototype IoT-based home automation system that we developed and evaluated in a real-world setting.

**Keywords:** Internet of Things, Home automation, convenience, security, communication protocols

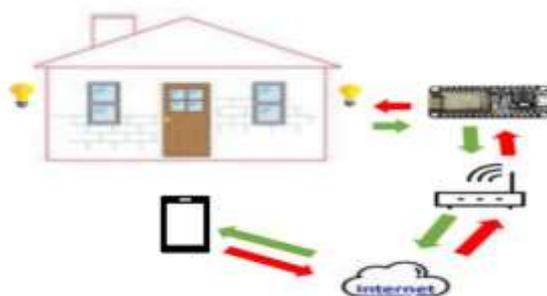
### I. INTRODUCTION

The advent of the Internet of Things (IoT) has revolutionized the way we interact with technology in our daily lives. IoT-based systems can connect various devices, sensors, and actuators to the internet, enabling them to communicate with each other and with users. One of the most promising applications of IoT is in the realm of home automation. IoT-based home automation systems can provide users with greater comfort, convenience, and energy efficiency in their homes. The paper will be organized as follows: first, we will provide a brief overview of IoT and its applications in various fields, including home automation. Second, we will review the existing literature on IoT-based home automation systems and identify research gaps that our study aims to address. Third, we will describe the methodology used to develop and evaluate our IoT-based home automation system. Fourth, we will present the results of our evaluation and compare them with those of previous studies. Fifth, we will discuss the implications of our findings for the design and implementation of IoT-based home automation systems. Finally, we will conclude the paper by summarizing the main findings and proposing directions for future research. The goal of this research paper is to explore the potential of IoT-based home automation systems and to evaluate their performance in a real-world setting. We will also describe the design and implementation of a prototype IoT-based home automation system and evaluate its performance in terms of energy savings, user satisfaction, and system reliability.

### II. METHODOLOGY

#### IoT scheme for Home Automation Description:

Real Time home automation in an advance project to control all devices in systematic manner. The devices can be controlled through wireless from anywhere in the world. Technology of RTC with EEPROM can be record all the working parameters in the devices or appliances. Basically, the project is a concept to bring automation in the industry or home. All the home appliances will be controlled by mobile app or website by login. The appliances in the industry or home will be interfaced with micro controller NODE MCU (ESP8266) for the systematic working.



**Figure 1:** IoT scheme for Home Automation

As there are many platforms over which a home automation system can be executed of the currently available platforms -ESP8266, WiFi, Arduino, Bluetooth was found on which we can use home automation systems. We are using ESP8266 over Arduino as in Arduino we have to install wifi module on the outside while in ESP8266 wifi module is pre-installed and instead of Bluetooth module, we are using wifi as in Bluetooth the range of the network is less while in wifi it has wide range. These platforms were found most suitable due to they are available at low cost, consistent, and simplicity when used for individual control home automation systems which our project work is on.

1. Through Bluetooth Network: In this technology we make use of an Arduino Bluetooth board. The electronic devices are connected to the Input/Output ports of the Bluetooth module with the help of relays. An interactive software program is necessary to provide a user interface.
2. Through Wifi Network: It consists of three main modules- the server, the hardware interface and the software. The appliances are connected to the NodeMCU Input/Output ports using relays. These hardwares can be connected with the software and hence can be controlled by using mobile phones.
3. Through Zigbee Network: The system consists of a PIC microcontroller and a Voice Recognition system. The voice commands are transmitted to the zigbee module using the PIC microcontroller.

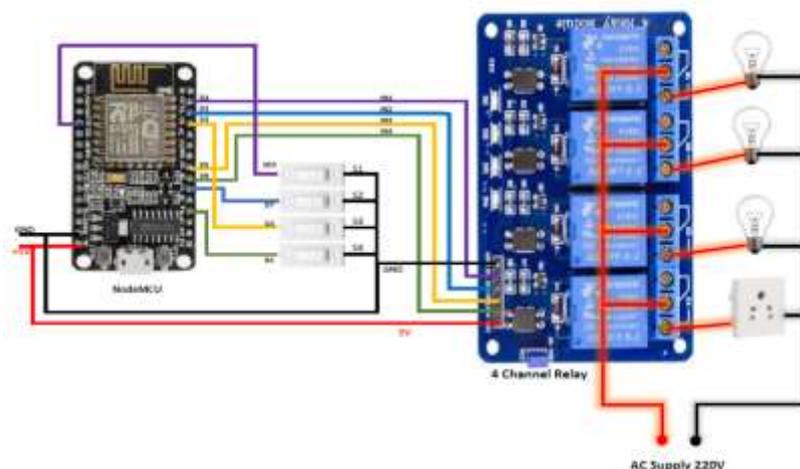
#### **Explanation for using Node MCU over Arduino UNO**

1. Architecture Based Difference: Node MCU (ESP8266) is a microcontroller with a built-in wifi ability whereas Arduino UNO microcontroller has to connect an external Wifi module.
2. Operating Voltage: The boards based on the ESP will have a longer operation time because these boards could operate under 4 V compare with Arduino boards need 5 V.
3. Current Consumption: The current consumption is significant for battery-based projects to increase the working period of the project. As Node MCU has low power consumption in comparison to Arduino, it is more preferable to be used in Battery based projects. Hence, for developing the actual project, priorities are given to low-cost availability, reliability, flexibility, and simplicity. Therefore, Node MCU(ESP8266) which has Wifi capability is utilized. This project includes development of software interface with backend,

### **III. MODELING AND ANALYSIS**

The Home Automation System is operating with NodeMCU ESP8266 controller and the command is given by the Sinric pro in a mobile phone using the WiFi network. The NodeMCU ESP8266 has an inbuilt WiFi module and the devices connected with Home Automation System like Google home or Alexa. Both WiFi is connected with an authentication token id. The Home Automation project is using the WiFi enabled board ESP8266 based NodeMCU development board. It is an open-source stage for developing WiFi based embedded systems and it is based on the most preferable ESP8266 WiFi module, running the NodeMCU firmware. NodeMCU was born out to overcome the limitations with the previous versions of the ESP8266 module which was not compatible with breadboards. It was difficult to program. The NodeMCU board is easy to use. Low cost and that quickly ingratiated it to the heart of makers and it is one of the most useful boards today. For this project four channel relay modules are added to the ESP8266 board. The project flow includes the control of NodeMCU's GPIO from a webpage on any device connected on the same network as the board. The status of the GPIO's control the relays and causes the relay to substitute between normally open (NO) and normally close (NC) condition depending on the state of the GPIO,

thus effectively turning the connected appliances “ON” or “OFF”. Now the operation is done by giving supply either Micro USB or Vin, GND pins. It can operate by Sinric pro or google home application or any Home Automation application in mobile phone i.e., Android or iPhone by manual and via Google Assistant with voice. The Hardware is operated according to our commands.



**Figure 2:** Circuit diagram of NodeMCU based home automation system.

#### IV. RESULTS AND DISCUSSION

Home automation is Automation technology which makes the work easier in all characteristics related to home. This method recommends a low-cost solution and home automation done using IOT system which uses mobile devices to control and analyse the basic home functions automatically through internet from anywhere within a short span of time.

#### V. CONCLUSION

The paper is focused on five different techniques such as home automation system by using symmetric encryption scheme, Ethernet-based Smart Home intelligent system, home automation by using set of sensors, low-cost Wi-Fi based automatic system for Smart Home, monitoring and controlling the home appliances through World Wide Web. But there are some issues stand up in each method. So, this proposed method will help to solve the problems related to home automation and an Arduino controller kit increases the performance of the proposed methodology expressively.

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