

Home Automation System Based on IoT

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Abstract — The idea of a smart home has been getting a lot of attention for the last few years. Intelligent decision-making, safe identification and authentication of IoT devices, data security, constant connectivity, and privacy concerns are the main hurdles in a smart home. The current solutions only address one or two of these problems, however what is required today is a smart home automation system that is not only secure but also has analytical and intelligent decision-making capabilities. There is a need to save energy in every aspect due to the rise in population as well as the usage of energy. One of the main causes of energy loss is the inability of remote sites to access and manage home appliances. A website or Android application is used by users to give instructions to these systems. It is automation of things through computing, where everything and physical objects can be connected to make them programmable so they can communicate with people. Using voice recognition, this project offers a simple control system based on voice recognition. To automate our homes and offices, and to improve the standard of living, we need the Global System for Mobile to devices Communication. It is timesaving and reduces the human efforts used for security purposes. For example, in hospitals patients who are unable to do things can set up the devices and can control the device using an Android phone. You need the Global System for Mobile to devices Communication. GSM modem and microcontroller that is Arduino UNO, which will be performed by using programming. We will use our smartphones to deliver voice commands to the AC appliances. Such systems have been found already in a lot of places for a wide variety of applications. All of these systems are covered in this work.

Keywords—*Internet of Things (IoT), GSM, HC-05 Bluetooth Module, Relay Module, Android App, Smartphone.*

I. INTRODUCTION

Many nations around the world are paying attention and giving priority to the development of energy efficiency. The automation of things through

computing, where everything and physical objects can be connected to make them programmable so they can communicate with people. Offering a straightforward control system through a home automation system is one strategy. Using voice command, this project provides a simple control system. In order to automate our homes and offices, and to improve standard of living, we need the Global System for Mobile to devices Communication. Human effort is reduced and time is saved. Additionally, it provides home security. Offering a straightforward control system through a home automation system is one strategy. It consists of two important things i.e GSM modem and microcontroller that is Arduino UNO, which will be performed by using programming. We will use our smartphones to deliver voice commands to the AC appliances. We have use the HC-05 Bluetooth Module which we connected to our devices. The application software uses google voice to perform speech recognition. The microcontroller is used and communication between the microcontroller and the application is done using Wi-Fi, internet.

The following areas were the project's primary focus:

1. We will be able to reduce human effort by using this project. It will be a small contribution to helping older and disabled people.
2. The most common applications of home automation are lighting control, outdoor lawn irrigation, fan, blub, air conditioner and security systems.

II. LITERATURE REVIEW

In the research paper, [1] In the study titled "IoT based Speech Recognition System," the authors concentrated on voice recognition to provide an easy-to-use control system for the aged, sick, and crippled. The goal is to create a low-cost voice recognition system that will make it simple to use equipment in hospitals and smart

homes. It displays a voice-activated smart house with a variety of features that uses the ESP-32 as the wireless option. Voice commands are detected by a special hardware component called The Control of Speech, and ESP-32 is employed to send the detected data to the database. Raspberry Pi interprets verbal commands from the user and controls the family unit's equipment by analysing data from the database on the acceptance unit. In the research paper [2] The paper "Home Automation and RFID-Based IoT Security" provides a summary of current IoT security research in home automation, in particular those using authentication methods in various devices, and related technologies in radio frequency identification (RFID) on network levels. Issues with IoT security are discussed, and numerous security vulnerabilities at each tier are examined. This article will explain cross-layer heterogeneous integration as an IoT area and show how it can offer some potential solutions. In the research paper [3] The light sensor was set up such that it would correctly detect when the laser was damaged and would not unintentionally trip in diverse lighting conditions. The outputs of the subsystems that control the temperature and lighting have also been verified to function. In particular, it has been tested and is confirmed to be sending the right signals to the subsystem BJT switches, which regulate furnace and lighting operations. Overall, the project has been operating in accordance with the design brief and has upheld a high standard of quality that can be incorporated into contemporary residence. In the research paper [4] Home automation system includes monitoring and controlling appliances, lighting, appliances, security systems, and more. In order to bridge the gap regarding the methodology to be chosen, the paper "Home Automation System" compares home automation methodologies including GSM, Voice recognition, Bluetooth, and IoT from the end-users' point of view. After reading this paper, the readers should be able to select an approach that best suits them and can also work accordingly in this projects. In the research paper [5] We noted that the raspberry pi-based home security system has been successfully developed and verified. Not only has the raspberry pi been helpful for live streaming, but it has also been used for the camera as a movement recognition component, resulting in the capturing and causation notification being done if there is any detection of movement. In the research paper [6] This

project is flexible, user-friendly, and simple to use, so it can be said that this system has higher accuracy with great efficiency. This home automation system works according to user needs and demands, and also the modes of function work as desired during implementation. Users must issue the appropriate commands via their smartphone, and the system operates in accordance with the prescribed algorithm. [7] An architecture using Arduino is proposed and put into practise for smart house control and monitoring systems. It provides a fundamental understanding of how to use an Arduino Uno board in conjunction with a desktop application to secure various home appliances and control them. In our project, we attempted to create an embedded system that satisfies the key requirements of home automation for the regulation of temperature and humidity, habitat security, and lighting. These factors led to the development of a desktop application that communicates with an Arduino through its serial connection. In the research paper [8] We learned that the development of smart home technologies is now inevitable in this computer age. It's a clever piece of technology that raises our standard of living. We are totally dependent on a system that runs entirely automatically. In order to maximise the effectiveness of solar power, we are deploying sun tracking technology. Two distinct user functions—one handled manually and the other automatically—are provided. This home has biometric or password security, and its ability to sense threats gives it the power to defend itself. In the research paper [9] The prototype for a smart home is a low-cost Wi-Fi-based automation system that was constructed from plywood. After that, wiring and hardware installation are completed. The Arduino Software's programming stage is then finished. Any issues that arise during project construction are discovered and resolved during the testing phase in order to improve and optimise the design. To avoid making the same mistake, several improvements are also made. Based on IoT, a local control system using Wi-Fi and a remote control is built. Virtuino is a suitable Wi-Fi-based Android software that is used because it has an intuitive user interface and can effectively operate with Arduino Mega to control and monitor via smart phone. In the research paper [10] Security and a number of device control options are provided by raspberry. Mobile phones have made life more comfortable while also

making it possible for easy access via portable devices. It allows users complete discretion, which makes it trustworthy because it always consults users before making any judgements, assists when important decisions must be made, and enables quick decisions to be made in an emergency. In the research paper [11] At present, Automatic Speech Recognition (ASR) is effectively utilized for communication between human and machines. The paper ‘Automated Speech Recognition System’ analysis the accuracy of feature extraction based on modeling which is implemented using MFCC and HMM for two different types connected and continuous speech.

III. METHODOLOGY

Systems using wireless communication can be made by linking up stand-alone appliances that are present at home or in the office and integrating to form a cooperating network. The system is integrated via a variety of technologies, including Bluetooth and Wi-Fi. In this project, we must install an Android app which will receive our commands. Our Smart phone should pair with the Bluetooth module HC-05.

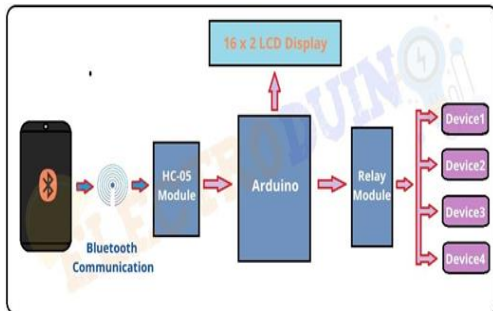


Figure 1: Flow Chart

A class 2 Bluetooth module for transparent wireless communication, the HC-05. It already has a slave Bluetooth device configuration. Its operation becomes obvious to the user once it has been linked with a master Bluetooth device, such as a computer, smartphone, or tablet. In home automation systems, real-time monitoring has been a crucial component. The user can be alerted instantly when the status of the devices changes. A PC typically handles the transfer of user commands to a server. The user commands are processed by the server, which then sends them to the appropriate units. This may facilitate appliance control. We defined the commands in Arduino code. These instructions are transmitted to the Bluetooth module, which Arduino then decodes. Once more,

these instructions are relayed to the appropriate relay, which will manage the device. Relays are electrical switches that may be activated or deactivated, allowing electricity to flow or not. Relays can be controlled by low voltages, such as the 5V supplied by the Arduino pins. Relay Module, which has three channels, is being used here.

Relay Module, which has three channels, is being used here. In order to utilise this module with an Arduino, it should be powered by 5V. Other relay modules use 3.3V to power themselves. Later, the LCD Display module will display the status of home appliances, such as ON or OFF. As an illustration, use the voice command "turn ON light". The Arduino will compare it to a predefined instruction. If so, Arduino will direct the relay module to switch on by sending a command. Along with being connected to the appropriate relay module, the device will also be ON. A connected fan will turn on if relay 1 is set to the ON position. The device's status will also be shown on the LCD display module at the same time.

Tools used each have its own functionality in the system as listed below:

IV. TOOLS AND COMPONENTS

1. Arduino: A microcontroller board called Arduino Uno is based on the ATmega328P. It has a 16 MHz ceramic resonator, 6 analogue inputs, 14 digital input/output pins (6 can be used as PWM outputs), a USB port, a power jack, an ICSP header, and a reset button.



Figure 2: Arduino

2. Relay Module: An electrically controlled switch is a relay. A set of fully operational contact terminals

plus a set of inputting terminals for one or more control signals compose this device. The switch may contain any number of connections with various contact arrangements, Such as make contact, break contact or combination of both.



Figure 3: Relay Module

3.HC-05 Bluetooth Module: A Bluetooth BLE module is a piece of technology that sets a mechanism for data transmission between devices and serves as an interface for wireless Bluetooth Low energy connections between any two devices.

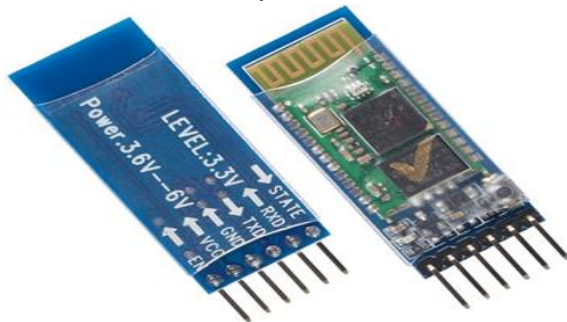


Figure 4: HC-05 Bluetooth Module

4.Bulb: Visual LEDs are employed as indication lamps in a variety of electrical equipment, as rear-window and brake lights in automobiles, and as alphanumeric displays or even full-color posters on billboards and signs.



Figure 5: Bulb

V. IMPLEMENTATION

Home automation utilising the Internet of Things (IOT) is automation that enables customers to manage their equipment online. The Arduino circuit must be connected to the user's appliances if they are to be controlled remotely. In order to allow the devices to be controlled from anywhere in the globe using the Internet, the user must additionally link the to the HC-05 Module. In order to receive the triggering signals the Wi-Fi module is linked to the Firebase real-time database using database secrets.

We created an Android app for the front end to send signals the Arduino circuit. To convey signals via the Internet, we built the project around a real time database. Using the publicly available firebase API, the android app is connected to data base.

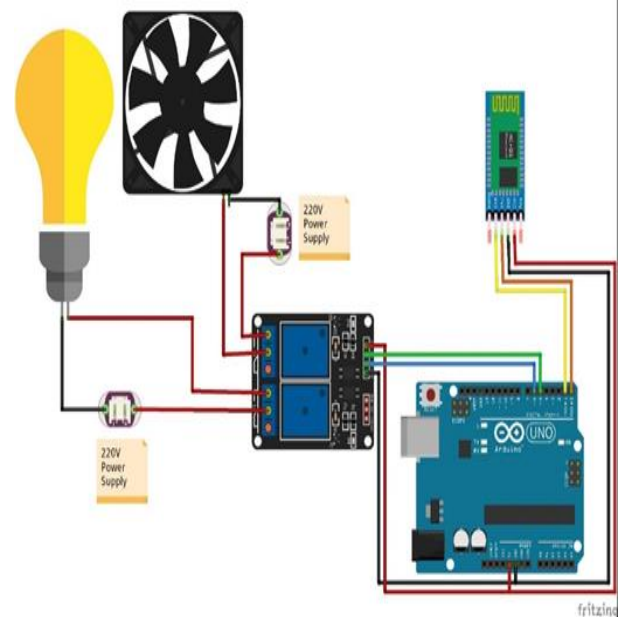


Figure 6: Circuit Diagram

VI. LIMITATIONS

- Those who speak rapidly, mash words together, or have an accent may have trouble getting their words transliterated by speech recognition software.
- When more than one speaker is present and being recorded, accuracy suffers as well.
- But above limitations can be prohibited by using advanced sensors and voice recognition application.

VII. RESULTANDDISSCUSION

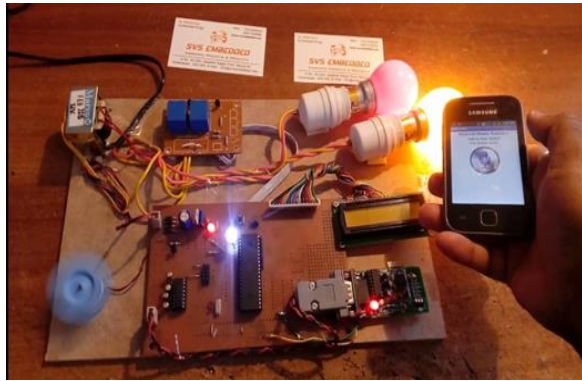


Figure 7: Home Automation System

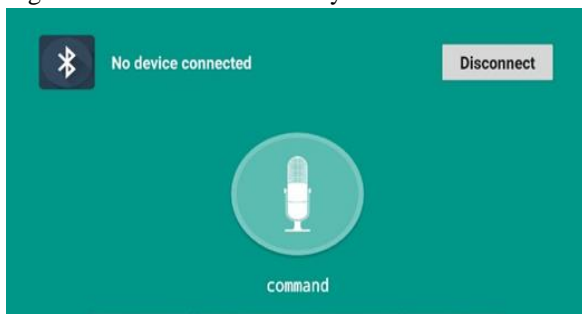


Figure 8: Interface of the application used for voice Command

VII. FUTURE SCOPE

In the future, home automation systems will be heavily reliant on artificial intelligence. Smart home appliances are unable to communicate with one another, and AI will gather information to better understand human nature. Future voice commands will be available in a number of languages. Also this system will be used for security and defence systems.

VIII. CONCLUSION

Three principles form the basis of home automation systems.

- Cost-efficient
- Ecologically safe
- Enhance Standard of living

It is a low cost project where the components are locally available and used to control a wide range of home appliances including security lamps, Television, Air conditioning system, and even the entire house lightning system. Home automation makes living more convenient and can potentially save your energy

and Maintenance costs. Home automation makes living more convenient and can potentially save your energy and Maintenance costs.

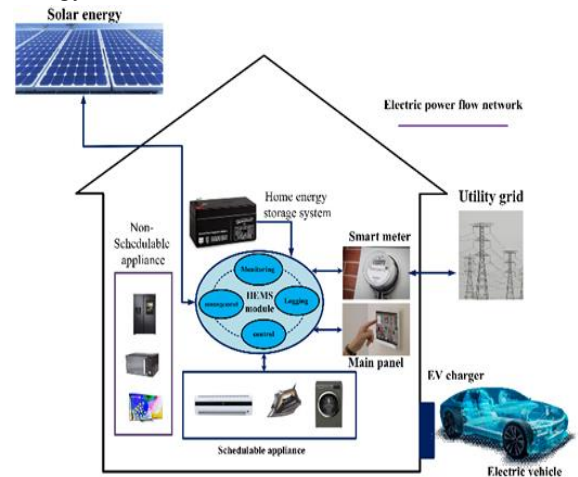


Figure 9: Automated Home

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