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IoT Based Home Automation via Voice Assistant

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Abstract: *This project presents the overall design of Home Automation System (HAS) with low cost and wireless system. It specifically focuses on the development of an IOT based home automation system that is able to control various components via internet or be automatically programmed to operate from ambient conditions. In this project, we design the development of a firmware for smart control which can successfully be automated minimizing human interaction to preserve the integrity within whole electrical devices in the home. We used ESP32 MCU, a popular open source IOT platform, to execute the process of automation. Different components of the system will use different transmission mode that will be implemented to communicate the control of the devices by the user through ESP32 MCU to the actual appliance. The main control system implements wireless technology to provide remote access from smart phone. We are using a cloud server-based communication that would add to the practicality of the project by enabling unrestricted access of the appliances to the user irrespective of the distance factor. We provided a data transmission network to create a stronger automation. The system intended to control electrical appliances and devices in house with relatively low cost design, user-friendly interface and ease of installation. The status of the appliance would be available, along with the control on an android platform. This system is designed to assist and provide support in order to Ifulfil the needs of elderly and disabled in home. Also, the smart home concept in the system improves the standard living at home.*

Keywords: Automation, Embedded system, IOT, efiiciency

I. INTRODUCTION

Internet of Things (IOT) is a concept where each device is assign to an IP address and through that IP address anyone makes that device identifiable on internet. The mechanical and digital machines are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. Basically, it started as the "Internet of Computers." Research studies have forecast an explosive growth in the number of "things" or devices that will be connected to the Internet. The resulting network is called the "Internet of Things" (IoT). The recent developments in technology which permit the use of wireless controlling environments like, Bluetooth and Wi-Fi that have enabled different devices to have capabilities of connecting with each other. Using a WIFI shield to act as a Micro web server for the Arduino which eliminates the need for wired connections between the Arduino board and computer which reduces cost and enables it to work as a standalone device. The Wi-Fi shield needs connection to the internet from a wireless router or wireless hotspot and this would act as the gateway for the Arduino to communicate with the internet. With this in mind, an internet based home automation system for remote control and observing the status of home appliances is designed. Due to the advancement of wireless technology, there are several different type of connections are introduced such as GSM, WIFI, and BT. Each of the connection has their own unique specifications and applications. Among the four popular wireless connections that often implemented in HAS project, WIFI is being chosen with its suitable capability. The capabilities of WIFI are more than enough to be implemented in the design. Also, most of the current laptop/notebook or Smartphone come with built-in WIFI adapter. It will indirectly reduce the cost of this system.

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II. PROBLEM STATEMENT

In today's fast-paced world, manually controlling home appliances is inconvenient, time-consuming, and inefficient, especially for elderly and physically challenged people. Traditional switches do not allow remote access or automation. There is a need for a smart system that enables users to control home appliances remotely and hands-free using voice commands. Hence, an IoT-based home automation system using a voice assistant is proposed to provide comfort, energy efficiency, and enhanced control

III. LITERATURE REVIEW

A "Smart Energy Efficient Home Automation System using IOT", by Satyendra K. Vishwakarma, Prashant Upadhyaya, Babita Kumari, Arun Kumar Mishra.

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, ESP32 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.

"IOT Based Smart Security and Home Automation", by Shardha Somani, Parikshit Solunke, Shaunak Oke, Parth Medhi,

Prof. P. P. Laturkar.

This paper 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 consist two modules. Home automation that consists; fan light and door controller, and security module that consists; smoke sensor motion sensor and camera module.

IV. RESEARCH METHODOLOGY

The User gives a voice command through a voice assistant (Google Assistant / Alexa).
Voice command is converted into a digital instruction.
Command is sent to the cloud server via the internet.
IoT microcontroller (ESP8266/ESP32) receives the command.
Microcontroller processes the command.
Corresponding relay is triggered. Appliance is turned ON or OFF.

V. WORKING

The system works on the principle of voice-controlled IoT communication. When the user speaks a command like "Turn ON the light", the voice assistant recognizes the command and sends it to the cloud platform. The IoT controller connected to Wi-Fi fetches the command from the cloud and activates the respective relay module. The relay acts as a switch, controlling the electrical appliance. The appliance status can also be monitored through a mobile application.

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VI. BLOCK DIAGRAM

COMPENTS USED

1. IOT MICROCONTROLLER
2. (ESP8266/ESP32)
3. RELAY MODULE
4. VOICE ASSISTANT
5. CLOUD PLATFORM
6. POWER SUPPLY
7. HOME APPLIANCES

VII. COMPONENTS DESCRIPTION

IOT MICROCONTROLLER:

Acts as the brain of the system. Connects to Wifi.
Process commands from the cloud.

RELAY MODULE

Electrically isolates low-voltage control circuit from high-voltage appliances, Acts as an electronic switch.

VOICE ASSISTANT

Google Assistant or Amazon Alexa.
Converts human voice into digital commands.

CLOUD PLATFORM

Stores and transfers commands
Acts as a bridge between voice assistant and contoller

POWER SUPPLY

Provides required voltage to microcontroller and relay

HOME APPLIANCES

Lights, Fans, AC, TV, etc. Controlled the system

VIII. ADVANTAGES

1. Hands-free control using voice commands
2. Remote access from anywhere via the internet
3. Easy to use for elderly and disabled people
4. Energy-efficient appliance management
5. Low power consumption
6. Scalable and cost-effective
7. Improves safety and convenience

IX. LIMITATIONS

1. The Requires continuous internet connection
2. Voice recognition may fail in noisy environments
3. Limited security if not properly configured
4. Initial setup requires technical knowledge

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X. CONCLUSION

The IoT Based Home Automation via Voice Assistant system provides an efficient, flexible, and user-friendly solution for smart home control. By integrating IoT technology with voice assistants, the system offers hands-free operation, remote accessibility, and improved energy management. It is especially beneficial for elderly and physically challenged individuals.It is evident from this project 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.

XI. FUTURE SCOPE

Looking at the current situation we can build cross platform system that can be deployed on various platforms like iOS, Windows. Limitation to control only several devices can be removed by extending automation of all other home appliances. The prototype can include sensors to implement automatic control of the home appliances like; an LDR that can sense daylight and switch lamp accordingly, a PIR to detect motion and be used for security purposes making an alarm buzz, or a DHT11 sensor that's senses ambient temperature and humidity of atmosphere and switch fan/air conditioner accordingly. Scope of this project can be expanded to many areas by not restricting to only home, but to small offices.

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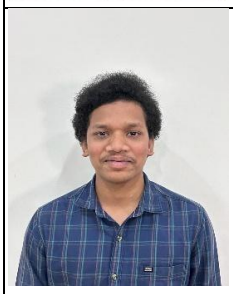	Name- Y Shashank Designation-Student USN –3VC23EE461 Phone Number–8073825875 E-mail id –shashankyadav86799@gmail.com
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