

Internet based and Energy Saving SmartHome Automation System

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ABSTRACT

Advances in IOT applications have become the cutting-edge technology among researchers as a result of the widespread availability of the Internet. This paper proposes a Smart Energy Efficient Home Automation System" that can access and control home equipment from anywhere in the world. Home automation is based on a multimodal programme that can be controlled using the Google Assistant's voice recognition feature or a web-based application. As a result, the main purpose of this project is to improve the security and intelligence of our home automation system.

Keywords:-*Home Automation; Relay; Node MCU; IFTTT; IoT; Google Assistant, Voice Control; Smartphone.*

INTRODUCTION

As a result of various technological advancements, human-machine interaction (HMI) has become more widespread in daily life. HMI research has now advanced a step further by connecting to the Internet, which was once used for networking but is now being used for things (the Internet of Things)(IoT). This application's goal is to connect anything that can be accessed from anywhere in the world.

IoT applications aren't limited to one area. In areas like e-commerce, coal mining, wearable devices, smart grids, laboratory tracking, agriculture, and many others, it has showed the effectiveness of small-scale applications to large-scale applications. Despite rapid technological advancements, power consumption remains the major issue around the world.

As the demand for energy develops, the rate of increase in energy consumption is rapid. As a result, energy saving is the key

issue and the fundamental purpose of this project. IoT-based home automation system that saves energy. As a result, the review's aim is to cut energy usage while still maintaining the safety and security of household appliances. Home automation takes this concept a step further by allowing homes to utilize less mechanical and electrical resources while also decreasing human work by placing operational systems at our fingertips.

LITERATURE SURVEY

Cell phone-based Bluetooth home automation system:

In a Bluetooth-based home automation system, household appliances are connected to the Arduino BT board at input output ports via relay. The programme for the Arduino BT board is written in the high-level interactive C language for microcontrollers, and the connection is made via Bluetooth. Only authorized users have access to the equipment, which are password-protected.

A Bluetooth device is used for wireless communication.

Cell phone-based GSM-based home automation system:

GSM-based home automation is attracting attention because to the mobile phone and GSM technology. For GSM communication, we examined at SMS-based home automation, GPRS-based home automation, and Dual Tone Multi Frequency (DTMF)- based home automation.

Using cell phones to control a Wi-Fi-based home automation system:

The server, the hardware interface module, and the software package are three essential components of a Wi-Fi-based home automation system. The layout of the system model is depicted in diagram. Using Wi-Fi technology, the server and the hardware Interface module connect with one another. The same technique is used to access the server-side web application. The software of modern home automation system is split into two parts: server application software and microcontroller firmware (Arduino). The Arduino software, which is written in C and runs on an IDE, is included with the microcontroller. The Arduino software is responsible for collecting events from linked sensors, then applying actions to actuators and preprogramming them on the server.

Raspberry pie home automation with wireless sensors using smart phone:

The Home Automation System was created using a Raspberry Pi and the algorithm and subject of an email. Raspberry Pi is a reliable platform for implementing powerful and cost-effective smart home automation. In numerous aspects, Raspberry Pi home automation is superior to conventional home automation solutions. For example, when using DTMF (Dual Tone Multi-Frequency) with home automation, the call charge is a major

drawback, but this is not the case with their recommended solution. Because this approach simply makes use of Gmail's previously built web server service, as well as the web server's design and memory space necessary are bypassed in Home Automation utilizing web server. The switching action was identified using LED.

PROBLEM STATEMENT

Customers can use a home automation system to control a number of electric appliances. Many available, well-established home automation systems require wired connectivity. This isn't an issue unless the system is designed ahead of time and installed during the physical progress of the structure.

Bluetooth technology was used to provide wireless remote-control access to the user. Despite its excellent accuracy, this system was only designed to give facilities and support to the old and disabled.

The existing system has the drawback of not giving a graphical user interface to the user. The user needs memorize all AT commands to control the linked devices.

We can control all of the devices in the proposed system with an Android phone and a web server. We create a home automation system based on internet of things (IOT) concepts that allows us to automate fundamental house functions like lighting, cooling systems, refrigerators, and other household appliances.

Smart Home Automation System

The concept of a smart house is built on automation. Wi-Fi is frequently utilised for monitoring and control from a distance. When home equipment is remotely monitored and controlled through the Internet, they are considered part of the Internet of Things. Users speak to the device using voice commands to manage the appliances in their home, modify the

temperature of the thermostat if one is present, and interact with the Google Assistant to get real-time information and updates on their home condition. The

NodeMCU (ESP8266) and Relay, as well as their driving circuits, are the main components of an IoT-based home automation system.

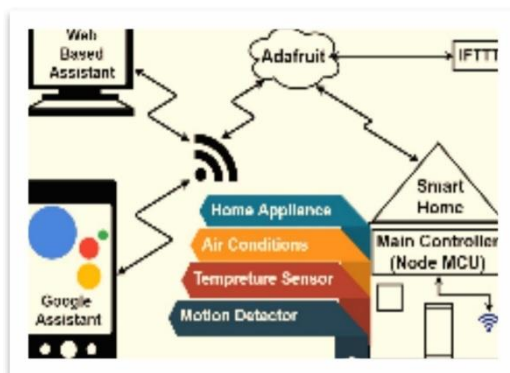


Fig.1:-Smart Home Automation Architecture

Design and implementation of the system

One of the most practical inputs for man-machine interaction is speech. To make a smart home more user-friendly, a web-based application and Google assistance can be used to control the system. The benefits of using both the Google assistant and the web-based application include that the Google voice assistant will not operate properly if there is noise in the surrounding. When it comes to operating the environment, the web-based application is really useful.

Figure 1 illustrates the smart home automation architecture, which includes the main control unit, which communicates with the house appliances over a 24/7 Wi-Fi enabled network. It is linked to the power backup service to ensure that the Wi-Fi is always on.

Air conditioners, televisions, fans, and lights are all connected to the primary control unit. The main control unit is synchronized with the Google assistance and web-based application to send commands to the household appliances. Adafruit and IFTTT are used to connect the gadgets.

The smart home automation uses the following modules.

- If This Then That (IFTTT)
- Main control unit (Node MCU-ESP8266)
- Arduino software
- Ada fruit

IFTTT is a service that allows you to access web-based applications from your mobile device. It is simple to provide conditional statements to the control unit using mobile devices.

Adafruit is a MQTT library (Message Queue Telemetry Transport). It performs the role of a MQTT broker. MQTT is a protocol service that allows you to transmit and receive feed data.

MQTT has the advantage of providing a faster pace of data transmission and using less data bytes for communication. The device-to-server connection takes 80 bytes, while the server-to-device connection takes 20 bytes. To compile the code, the Arduino IDE is utilised. The smart house is controlled via the main control unit. We use the open-source firmware Node MCU-ESP8266. The Node MCU gives you the freedom to create IoT-based applications. The Wi-Fi capability of the Node MCU comes at a low cost. It

developed the communication between the devices using commands via Node js and Lua Script.

Working model

The working mechanism of smart house management utilising IoT is illustrated in Figure 2. The first condition for turning a house into a smart home is to have internet access.

After all devices have been properly connected to the main control unit, users can utilise the If This Then That instructions to operate their household appliances. The Adafruit was used to link

the Google.

Assistant and the main control unit, which sends commands to the home appliances. The ON and OFF orders are sent from the main control unit to appliances.

As a first step, the Google Assistant sends commands to the central control unit to complete the process. If there is a noisy environment, the commands are forwarded through a web-based application. We employ user access codes for the user to run the Google Assistant to provide security to the suggested model. Unauthorized access to the smart home will be prevented.

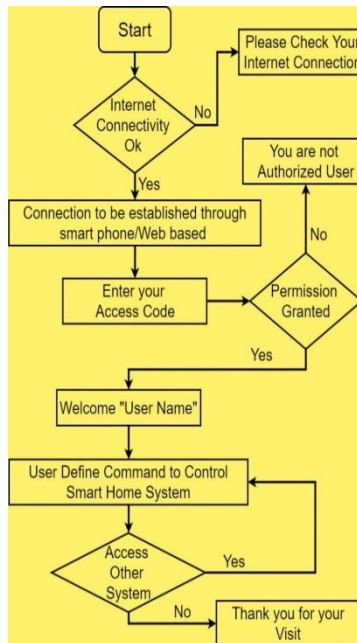


Fig.2:-System flow on Smart Home Automation System using Google-Assistant

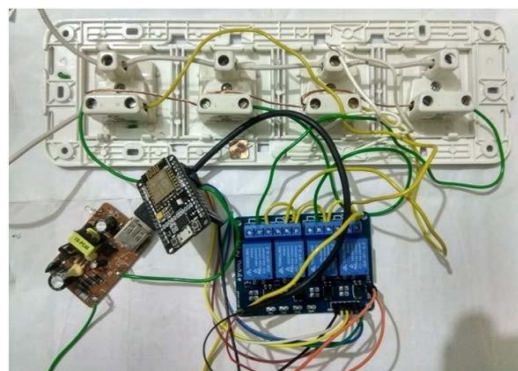


Fig.3:-Internal Architecture of Main Controller Unit



Fig.4:-Prototype model of control unit along with home appliance

Figure 3 demonstrates how the smart home's main control unit (Node MCU) operates the devices. A rechargeable battery configuration is constructed to provide continuous power to the Node MCU.

Figure 4 depicts how lights can be turned off and on with the use of Google Assistant and voice commands. The three bulbs in the illustration represent the smart home environment.

Algorithm1: Node MCU

Input: Sensor values
Output: On/Off
S -> light sensor Value,
R-> Refrigerator
T->Television
L-> Light
I-> Infrared Sensor Value

1. While (true) do
2. If (S==1)&&(I==1) then
3. L=0; R=1; T=1;
4. Else if (S==0) and (I==1) then
5. L=1; R=1, T=1;
6. Else if (S==1) and (I==0) then
7. L=0; R=0, T=0;
8. Else if (S==0) and (I=0) then
9. L=1; R=0, T=0;
10. End if
11. End while

End

Algorithm shows the main controller unit working procedure using NODE MCU-ESP8266.

Experiment Analysis

In the experimental analysis we used Television, and lights to operate in the smart home environment.

To test the degree of interference, the suggested smart home architecture has a

fixed number of Wi-Fi spots. Customers in the proposed smart home architecture engage in two types of activities: continuous energy consumption and switching off gadgets. The energy consumption of user appliances is calculated by taking into account the user's functionality. Figures 5, 6 depict the energy usage of household items such as televisions, and lights.

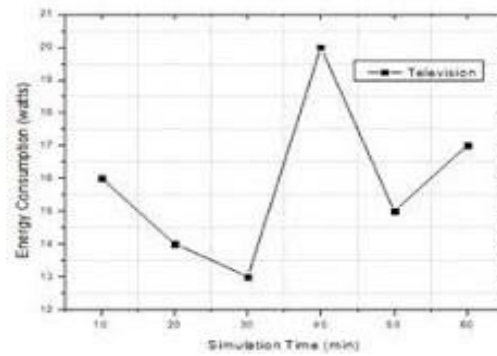


Fig.5:-Energy Usage of the Television using proposed model

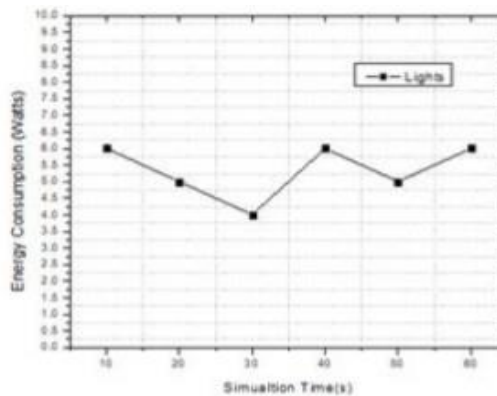


Fig.6:- Energy usage of the lights using proposed model

CONCLUSION

The smart home automation concept for homes and buildings was described in this study. It makes use of the Internet of Things to transform homes into smart homes. The main control unit connects all of the household's equipment. The Google assistant and a web-based application are used to send commands to the smart home, which are then utilized to control the devices. It allows users to turn gadgets off and on from anywhere and at any time. The smart home's energy consumption will be reduced as a result. Three items, including a television, and lights, were used to conduct the experiment. When compared to a traditional home, the smart house uses less energy.

FUTURE SCOPE

There are a number of improvements that might be made to this system to improve sensing and detection accuracy.

- a) There are a variety of different sensors that can be used to improve home security and control, such as a pressure sensor that can be placed outside the home to detect when someone is about to enter.
- b) A smart garage that can detect the length of a car and determine which block it should be parked in, as well as navigate the car through the garage to make parking easier for the homeowner.

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