

# Use of IoT for Home Automation System

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**Abstract**—Advancement in IoT-based application has become the state-of-the art technology among the researcher due to the availability of Internet everywhere. To make the application more user-friendly, web-based and android based technologies have gained their importance in this cutting-edge technology. In this paper, a smart energy-efficient house automation system is proposed that can access and control home equipment from every corner of the world. For this system, the Internet connectivity module is attached to the main supply unit of the home system which can be accessed through the Internet. For wireless connectivity, the static IP address is used. House automation is based on the multimodal application that can be operated using the voice recognition command of the user using Google Assistant or through a web-based application. Thus, the main objective of this work is to make our house automation system more secure and intelligent.

**Keywords**—House automation, Relay, Node MCU (ESP8266), IFTTT, Adafruit, Internet of Things (IoT), Google Assistant, Voice Control, Smartphone.

## I. INTRODUCTION

Human-machine interaction (HMI) has become, more realistic in today's life due to the progress in technology [1]-[3]. Today, HMI research has moved one step ahead of and moved onto the Internet, which was previously used for communication but now a days it used for things, i.e., IoT (Internet of Things) [4] – [6]. The main objective of this application is to connect any things over the Internet which can be accessed from anywhere.

IoT applications are not restricted to one field. It has shown the substantial contribution from the small-scale applications to the large-scale applications like E-commerce [7], Coal Mine [8], Wearable device [9], Smart Grid [10], Laboratory Monitoring [11], Agriculture [12] and many other areas [13]-[16].

However, we have received a great improvement in technology, yet power consumption is one of the big problems all over the world.

India, sharing about the 17% of the world's population has finite energy resources and share approximately 0.6%, 0.4%, and 7%, for world gas, oil, and coal reserves individually [20]. Though, in India, the electricity consumption due to ICT usage has risen from 24 TWH to 31 TWH in the last five years (for the period 2009-2014). This has resulted in the energy consumption of approximately 6.5% in 2015 [19].

Therefore, saving power is the primary concern, which is the primary objective of this project. To save power consumption, we have suggested a smart, energy-efficient house automation system using IoT. Hence, the aim of this research to save energy (lowering the electricity bills) whilst at the same time provide the safety and security of

the household appliances.

## II. SMART HOUSE AUTOMATION SYSTEM

As need for electricity is growing day-by-day, consequently, smart house is the future area of research to offer remote access for controlling the household appliance using IoT [21]-[24]. This enables the user to control the house automation device such as fan, bulb, etc., with no even making any physical contact.

Research conducted on house automation system has been reported in [21], [23], [24], [26]-[28]. Most of the prior system based on these techniques is either based on DTMF or Bluetooth system [9], [21], [26], [27], [29]-[31]. The fundamental problem with DTMF-based house automation needs a dedicated PSTN channel for communication among main supply units and controlling devices. Instead, Bluetooth is handy for short-range communication which requires the operating appliance within the short range.

House automation using MQTT is shown in the [28] for sending/receiving data from the sensor. For that Raspberry pi is used as a gateway for gain access to the information from the sensor which is used for measuring the temperature and humidity of the room. Another house automation system is shown in the [23] which are based on Raspberry pi and users can control their home-based appliance using the web-based interface. In [26], house automation using mobile has been reported in which the system is constructed using ZigBee.

IoT has provided the applications to convert the non-smart devices into smart devices, which enable users to access these devices by using the internet. It converts the home into a smart home and offers a more reliable method of managing the home appliance. Also, security may be added with the support of an installed camera in the house, which can be tracked through the Internet. Therefore, user can keep an eye on their home and can turn ON/OFF their home appliances which will go to save both electricity and electric bills.

Other characteristics that can be included in the smart home for security purpose is to incorporate the sensors and cameras that can prevent the burglar from being entered into house. Also, which makes the system more intelligent, that can switch on the light and fan of the room as soon as it finds the presence of the person. With this motivation, we have developed IoT based house automation system that utilizes voice as well as web-based service for managing the home appliance. Also for safety and security reasons, the user-define command is set which allows the operation of the system.

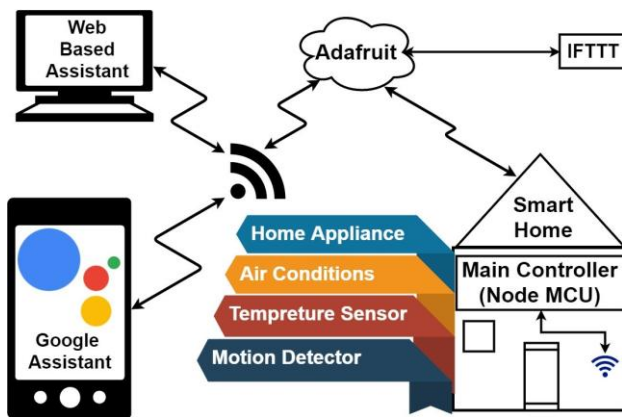


Fig.1. Smart house automation system architecture

## II. DESIGN AND IMPLEMENTATION

speech is one of the most significant inputs used for man-machine interaction [32] therefore to make smart homes more user-friendly google assistance together with web-based applications that could be used to control the home system.

the benefit of multimodal is that in the presence of the noisy background surrounding the performance of the google assistance degrades hence in such a scenario web-based application can help control the appliance of the system thus the proposed model is designed to offer better flexibility and making the system strong figure.1. shows the general design of the smart house automation system.

as illustrated in figure.1. the smart home can be realized with the main controller unit that is connected with the 24-hour available wi-fi network to assurance that the wi-fi connection does not switch off the main controller is automated to establish an automatic connection with the available network and connected to the auto power backup further the sub-units are connected with the main controller so that the devices which are not smart here in this case we are referring to the old home appliance system can be turned into the smart appliance thus users can access and control their smart home using google help and web-based service using an IoT-based application that uses ADFRUIT and IFTTT to preserve the communication link

### System Specification

- NodeMcu (ESP8266).
- IFTTT.

- Adafruit.
- Arduino Software (IDE).

nodemcu ESP8266 is an open-source firmware that affords the flexibility to design the IoT-based application [33] due its low cost nodemcu is more popularity and it has wi-fi-enabled features. it also offers NodeJS which requires less computation time to execute the task and use Lua script language therefore making the device operate much quicker and it the first choice for IoT applications.

IFTTT abbreviates for IF THIS THEN THAT is an interface that offers the web-based service in which the device is linked with the mobile application [34]. hence making use of device to work based on the mobile application using conditional statements ADAFRUIT is a library that supports the MQTT ( message queue telemetry transport ) [28] [35] it behaves like an MQTT broker. MQTT works is based on a protocol service which provides the sending and receiving of the data feed. the benefit of MQTT is that it offers a faster rate of transmission of the data and requires less data byte for the connectivity it needs 80 bytes for creating the connection among the device to the server and 20 bytes from server to device. Arduino IDE software is used to compile the code [36].

### B. working models

the laboring of the smart house automation is shown in figure.2. as shown the primary requirement of working model is internet connectivity to access your smart home one can access their smart home either through the web-based service or through Google assistance.

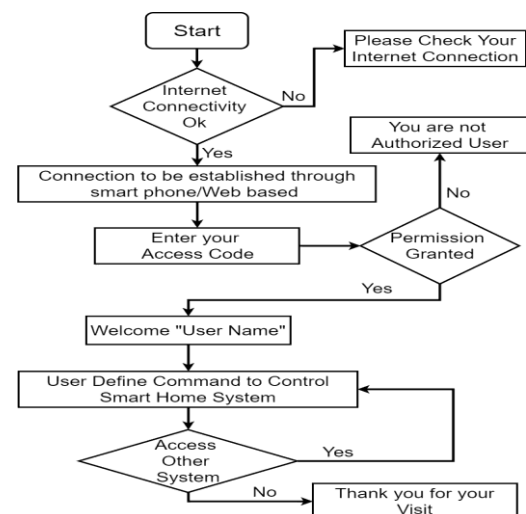


Fig.2. System flow on the smart house automation system using Google assistant.

Initially, Google assistant is used for controlling/monitoring our smart home and in case of noisy background home automation can be connected through web based service. For security purpose we have provided the user access code that will be asked by the Google assistant to verify which will prevent unauthorized smart home access. After successful connection, users will be able to access their smart home appliance using an IFTTT statement command. It will be accessed through the Adafruit for creating the connectivity between the Google assistant and the NodeMcu which is the main control unit of the smart home automation. The home appliance is connected to the main controller unit with the sets of relay. The functions of these relays are to act as an ON/OFF switch on the main control unit.

In this paper we have shown the example of the main control unit that we have designed for your smart home.

Figure 3 shows the connection of the main unit with the

Node Mcu. For continuous operation of the circuit, power backup is also provided with the help of rechargeable battery. Figure 4 shows the IoT home automation dashboard developed on Adafruit. Finally, with the help of Google assistant, based on the user command the home appliance can be turned ON/OFF with the help of the designed system as shown in Figure 5. Here, we have shown the example of turning the three bulbs. However, any home appliance can be connected through the proposed control unit. In this paper, we have presented the step-by-step procedure of smart home automation controller unit. With the help of the design control unit, home appliance can be converted into a smart and intelligent device using IoT. The working of the proposed model was experimentally shown with help of connecting the three bulbs. Proposed system has two advantages. First, using the IoT connectivity, we can monitor and access our smart home easily from anywhere, which will definitely will prove to be energy efficient. Secondly, it acts as a helping hand for the old age and differently abled person. For future work we would like to add up more controlling units that can make our smart home more intelligent that can be practically deployed in the real time situation.

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