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Home Assistant System Using IoT and Google Assistant

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Abstract - *Today's World is moving to digitalization where everything is made easy and comfortable for people. A smart home can be easily designed with the help of automated machines and wireless connectivity. Most of the existing systems which are available in the market use a Raspberry Pi or Arduino chipset. These are programmed to control a set of devices inside a house, which are given instructions using a mobile application or a web-based UI. It is proposed to have a system that focuses on controlling the device using voice recognition and artificial intelligence while being interactive as well. This is accomplished by making use of the open-sourced API of Google Assistant by Google Inc. Smart automated home application system using IoT (Internet of Things) have designed through which basic house facility can be handled by the device from any place such as ON and OFF of Light, Fan, AC. All the devices can be easily handled with the help of device NodeMCU ESP8266, Internet Connection. Different sensors are connected to node MCU and can operate from any part of the world with help of Adafruit. This makes the life of the common man very easy.*

Key Words: Adafruit, Google Assistant, IFTTT, IoT, NodeMCUESP8266.

1. INTRODUCTION

The Internet of Things (IoT) interconnects computing and communication devices through its applications. The IoT makes the world very prominent way by home automation, smart health care services, smart cities, etc. Many people may visualize the existing smart home as one remote controller for every household appliance cooking the rice, starting air conditioner, heating water for bath automatically, and shading the window automatically during the night. To a certain degree, home automation equivalents smart homes. They both bring out the smart living condition and make our life more convenient and fast [1]. Early home automation began with labor-saving machines. Self-reliant electric or gas-powered home appliances became sustainable in the 1900s with the outline of electric power distribution led to the introduction of washing machines (1904), water heater (1889), refrigerator, sewing machines, dishwashers, and clothes dryers.

IoT (internet of things) in recent years has become the lifestyle of the human being with great potential [2-3]. Even it is focusing on a different task that is a requirement of human intelligence. In today's scenario, IoT has opened doors to cover up all requirements of human dealings in their daily life. Examples like purchasing goods, monitoring resources, and remotely control them from any corner of the world [4]. Even a fridge can be interactive with home automation refers to remotely monitoring the conditions of the home and performing the required actuation. Through a home assistant, household devices such as light bulbs, Television, fan, etc. are assigned a distinctive address and are linked through a common home gateway. These can be remotely accessed and controlled from any PC, mobile, or laptop. Hence the system can drastically decrease energy consumption and get better the living environment as well as enhancing indoor safety. The IoT architecture is shown in figure 1.

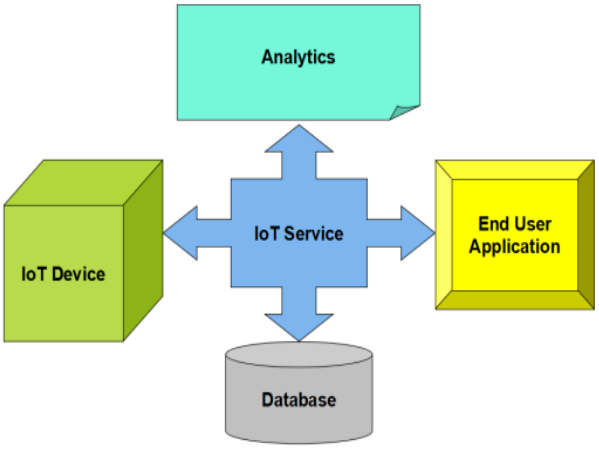

Fig -1: IoT Architecture

In this paper, Section 2 presents a literature review. System design and its implementation details are explained in Section 3. Section 4 describes both hardware and software components used by this system. Section 5 presents results and finally concluded in Section 6.

2. LITERATURE REVIEW

Homera Durani, Mitul Sheth, Madhuri Vaghasia, Shyam Kotech, 2018 [5] have developed a system that consists of three isolated sub-systems:

a) Subsystem consisting Blynk App module to get the status of the equipment;

b) Sub-system attach multiple sensors like DHT11 temperature sensor to measure temperature, PIR sensor to detect motion and an ultrasonic sensor to measure the distance can be attached;

c) Subsystem consisting of a master microcontroller act as the central coordinator that communicates with other subsystems via Wi-Fi. The master microcontrollers also interfaced with a relay module to control the appliance. The sensor data are fetched to the user interface facilitated by smartphones or tablets from the various sensors using an ESP8266 as the private server.

Mohammad Miraj Shekh, Asha S. R, Hariprakash, Harshitha, 2018 [6] have developed a Real-Time Clock (RTC) based home automation that controls the devices in a timely and systematic manner. These devices can be controlled by using wireless technology. RTC with EEPROM can store all the working constraints in the devices or types of equipment. This system brings automation to the industry or home. All the home appliances will be organized by a mobile app. The appliances in the industry or home will be interfaced with a centralized micro controller NODE MCU for systematic working. This controller also interfaced with Wi-Fi to receive the control commands from the Wi-Fi shield (Wi-Fi hotspot). The operator can switch the light to turn ON or OFF. Once the Wi-Fi is switched ON, the system will send the data to Wi-Fi present at the microcontroller.

Li Xinyu, GuYue, GuoJiaqi, Nayyar Vidur, Shu Chang, Zhang Lufan, 2015 [7] have developed a Home appliance system being controlled by the voice command. It is used to control the local area appliances over Wi-Fi.

Aboli Mane, Pooja Pol, Amar Patil, Prof. Mahesh Patil, 2018 [8] have designed a system to solve the problems of common peoples in day-to-day life. Atomizing home by using NodeMCU which is a Wi-Fi model and using Blynk app. Blynk app is used as a third-party app. It provides an open-source to make the design automation at a lesser price.

The related works reveal that presently there exists a system neither at cheaper rates nor easy to handle. Various systems are hard to install, difficult to use and maintain. Current systems are generally proprietary, closed, and not very user-friendly based on Arduino or GSM or low-cost home security system [9] and home automation system. In the existing system, most of the system is built with Blynk app. This Blynk App takes memory space to run on the mobile device [10-11].

Hence it is proposed to control the home appliances through the internet over the voice. This system has the advantages of using less memory space and thus it requires a mobile browser or Google assistant for controlling appliances by voice.

3. SYSTEM DESIGN AND IMPLEMENTATION

The system architecture is shown in figure 2 which explains the home automation system. The system of home automation contains components namely smartphone, Adafruit, NodeMCU [12], and relay. Smartphones Used to control appliances through the internet. Adafruit and Google Assistant are used to control the appliances. AdaFruit is a web application used for embedded applications. The home appliances are controlled by the NODEMCUESP8266. NodeMCU is an open-source IoT platform. It is used to connect the adafruit and the relay. The commands are passed through the NODEMCU. The main usage of the relay is transmitting and receiving the information, called Morse code where the input signals used to be either 1 or 0. These changes in signals were mechanically noted in terms of ON and OFF of a light bulb or a beep sound, (i.e.) pulses of 1s and 0s are converted as mechanical ON and OFF using electromagnets.

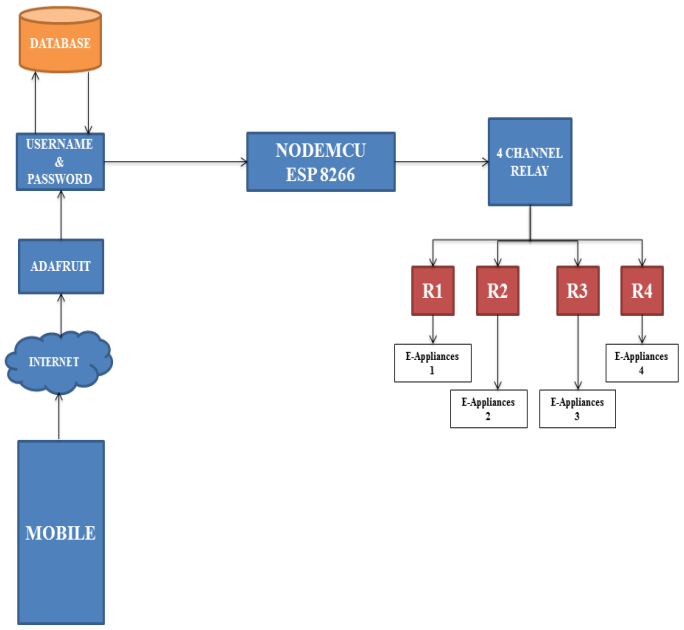

Fig -2: System Architecture of Home Automation System

The controlling device is connected with the Wi-Fi module through a hotspot which is in turn created by the module. This module also is connected with the microcontroller. The controller generates the required command to the relay board and the relay board acts as a switch between the circuits. The required appliances can be connected to the relay board. Now, these appliances will be controlled by using IoT.

i. Activity Diagram

In the Unified Modeling Language, activity diagrams are intended to model both computational and organizational processes. The activity diagram of the home automation system is shown in figure 3. The existing adafruit user can log in to the adafruit account, else a new adafruit account to be created. Next, Code to NODEMCU ESP8266 with the adafruit Authentication Key is uploaded into the system. The working modules are listed below.

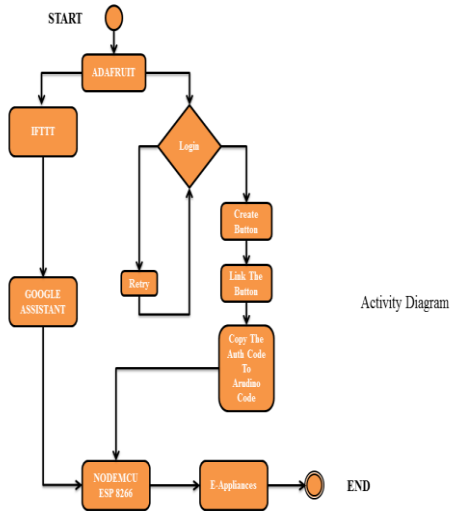

Fig -3: Activity Diagram of Home Automation System

This system consists of the following models namely,

- Upload Code To ESP 8266 – downloading and installing the Arduino IDE
- AdaFruit Button Creation – used to create buttons
- IFTTT
- Google Assistant

The working procedures are briefly explained in the following section.

4. COMPONENTS USED

i. Hardware

1. NODEMCU ESP8266

NodeMCU is an open-source IoT platform. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware that is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the development kits. The firmware uses the Lua scripting language. It works on the principle of the eLua project and is constructed on the ESP8266 SDK 0.9.5. It uses many open source projects, such as lua-cjson, and spiffs. NodeMCU was created shortly after the release of ESP8266. The ESP8266 is a Wi-Fi SoC integrated with a TensilicaXtensa LX106 core, widely used in IoT applications. The NodeMCU pin diagram is shown in figure 4 and its specification is shown in table 1.

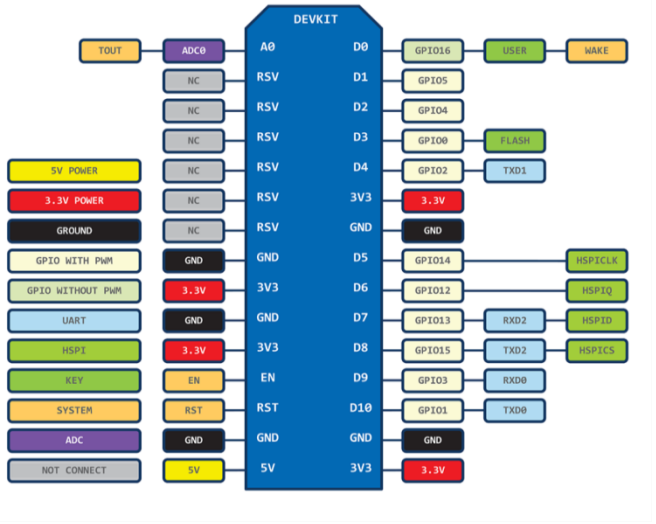

Fig -4: NODEMCU ESP8266 Pin Diagram

Table 1 NODEEMCU ESP8266 Specifications

Wireless Standard	IEEE 802.11 b/g/n
Frequency Range	2.412 - 2.484 GHz
Power Transmission	802.11b : +16 ± 2 dBm (at 11 Mbps) 802.11g : +14 ± 2 dBm (at 54 Mbps) 802.11n : +13 ± 2 dBM (at HT20, MCS7)
Receiving Sensitivity	802.11b : -93 dBm (at 11 Mbps, CCK) 802.11g : -85 dBm (at 54 Mbps, OFDM) 802.11n : -82 dBm (at HT20, MCS7)
Wireless Form	On-board PCB Antenna
IO Capability	UART, I2C, PWM, GPIO, 1 ADC
Electrical Characteristic	3.3 V Operated 15 mA output current per GPIO pin 12 - 200 mA working current Less than 200 uA standby current
Operating Temperature	-40 to +125 ºC
Serial Transmission	110 - 921600 bps, TCP Client 5
Wireless Network Type	STA / AP / STA + AP
Security Type	WEP / WPA-PSK / WPA2-PSK
Encryption Type	WEP64 / WEP128 / TKIP / AES

Firmware Upgrade	Local Serial Port, OTA Remote Upgrade
Network Protocol	IPv4, TCP / UDP / FTP / HTTP
User Configuration	AT + Order Set, Web Android / iOS, Smart Link APP

ii. Software

1. Adafruit

Adafruit is a prototype platform (open-source) based on easy-to-use hardware and software. It involves a circuit board, that can be encoded called a microcontroller, and convenient software called Arduino IDE (Integrated Development Environment). This platform is very helpful to compose and upload the computer code to the physical board. The following figures give a screenshot of procedures carried on this platform.

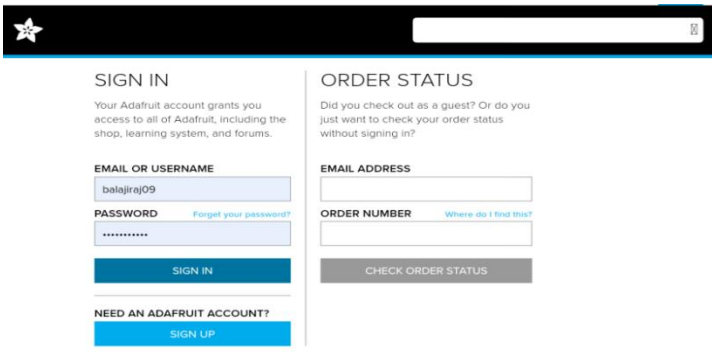

Fig -5: Login Adafruit account

Fig -6: Creating new dashboard to add buttons

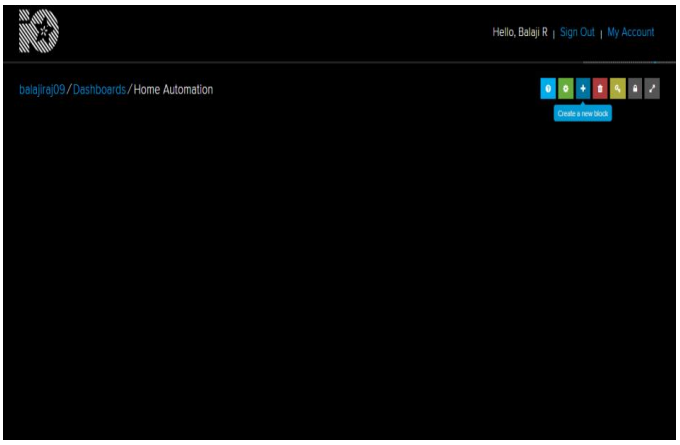

Fig -7: Add icon on the right side of the dashboard

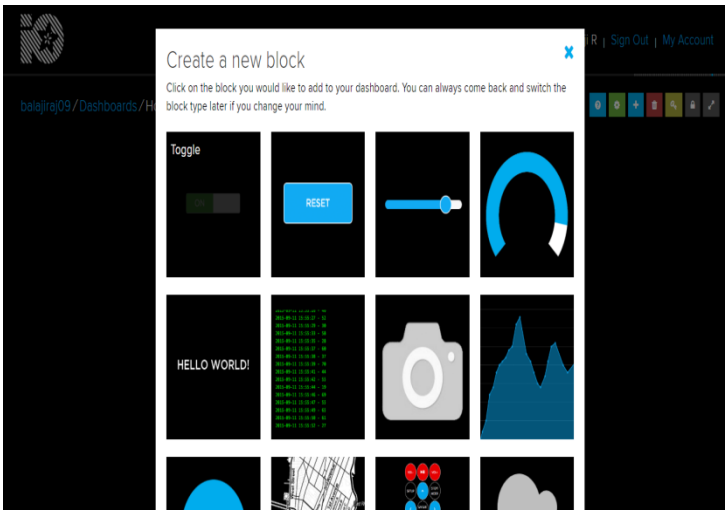

Fig -8: Selecting toggle

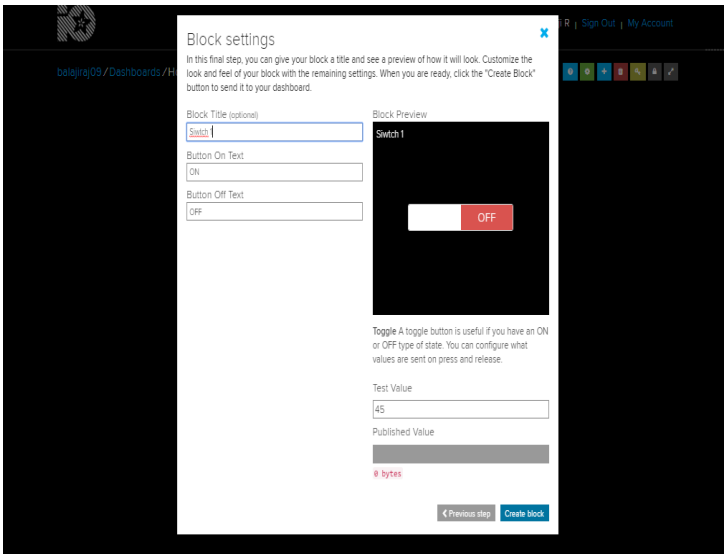

Fig -9: Naming Buttons

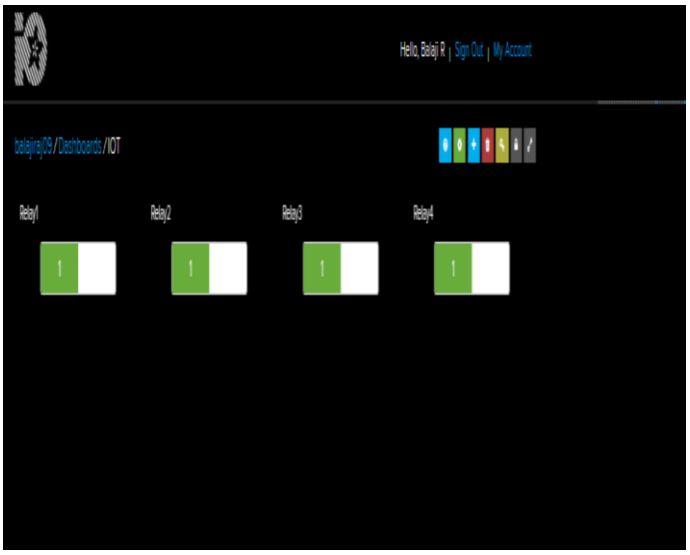

Fig -10: After Creation of Toggles

2. IFTTT

IFTTT is the short form of If This Then That. It is a service that is designed to make it as easy to carry out a whole range of tasks via its automated or on-demand service. The main service of IFTTT is to do automatic actions. IFTTT was recently renamed as 'applets'. It is an app called DO for ON-OFF actions and also called recipes. The IFTTT applets are shown in figure 11.

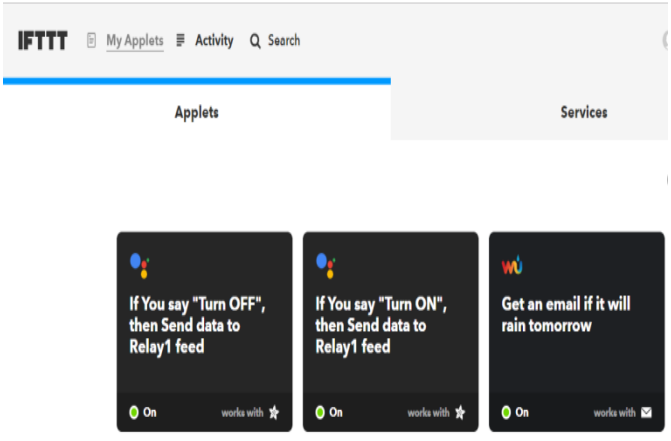

Fig -11: IFTTT Applets

3. GOOGLE Assistant

Google Assistant is an artificial intelligence-based virtual assistant and it is developed by Google that is primarily available on mobile and smart home devices. Google Assistant is used to searching the Internet, schedule events and alarms, adjust hardware settings on the user's device, and show the information from the user's Google account. Google Home speakers enable users to speak voice commands to interact with services through Google's assistant software. A large number of services, both in-house and third-party, are integrated, allowing users to control the playback of videos or photos, listen to music or receive news updates entirely by voice, etc. Google Home devices also have integrated support for home automation, letting users control smart home appliances with their voice.

5. RESULTS

This section displays the obtained results from the automation system. This system is entirely controlled by using the internet of things. After getting the confirmation and the notification from the controlling devices, the connected appliances got switched ON. The following figures 12 & figure 13 show the screenshots of the home automation system.

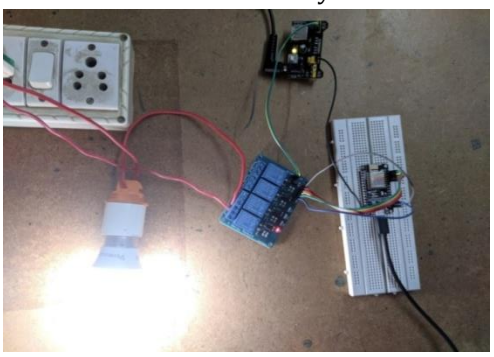

Fig -12: Implementation Prototype

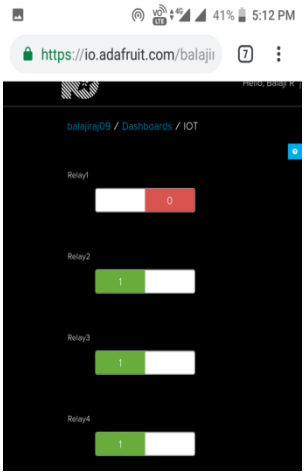

Fig -13: Relay ON State

6. CONCLUSION

Introduced advanced era for home management system and security to make human life easier and luxuries. This paper deals with the problem faced by peoples in day-to-day life. This work makes things less complex and available at low prices.

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