Application of IoT Principles to Design a Smart Home

K.Swanitha

Department of Computer Science and Engineering
Pragati Engineering College ,Surampalem, Andhra Pradesh, India

M.Mansi
Department of Computer Science and Engineering
Pragati Engineering College ,Surampalem, Andhra Pradesh, India

P.Susmitha
Department of Computer Science and Engineering
Pragati Engineering College ,Surampalem, Andhra Pradesh, India

R.Soniya Priya
Department of Computer Science and Engineering
Pragati Engineering College ,Surampalem, Andhra Pradesh, India

M.Avinash
Department of Computer Science and Engineering
Pragati Engineering College ,Surampalem, Andhra Pradesh, India

Mr.Y.Manas Kumar
Department of Computer Science and Engineering
Pragati Engineering College ,Surampalem, Andhra Pradesh, India

Abstract- Theoretical-Internet of Things (IoT) is an idea that envisions all items around us as a component of web. Our project introduces a thought or an idea for home computerization utilizing voice acknowledgment, also the development of a prototype for controlling smart homes devices through IoT and controlling of dumb devices through IoT by the means of Wi-Fi driven chipset solution – ESP8266. Contrary to the other projects, this work is directed towards a sensor approach and an ontology modelling of the smart home. This is also acknowledged by the need to give frameworks which offers help to matured and physically impaired individuals, particularly individuals who lives alone. Smart home or home automation can be said as the residential extension of building automation, it also involves the automation and controlling of lightings, ACs, ventilation and security which also includes home appliances such as dryers/washers, ovens or refrigerators/freezers which uses Wi-Fi for monitoring via remote for ease of use. Now a day's speed of the processing and communication through smart mobile devices at very affordable costs, to improve the life style concept relevant to smart life, like smart T.V, Smart cities, smart phones, smart life, smart schools and Internet of Things.

Keywords – IoT, Smart, Automation ,Sensors ,Digital, Assistant

I. INTRODUCTION

Internet of Things (IoT) is an ideal buzzing technology to influence the Internet and communication technologies. IoT allows people and things to be connected anytime, anyplace, with anything and anyone, by using ideally in any path/network and any service. This project introduces a thought or an idea for home computerization utilizing voice acknowledgment, also the development of a prototype for controlling smart homes devices through IoT and controlling of dumb devices through IoT by the means of Wi-Fi driven chipset solution – ESP8266.This is also acknowledged by the need to give frameworks which offers help to matured and physically impaired individuals, particularly individuals who lives alone. Smart home or home automation can be said as the residential extension of building automation, it also involves the automation and controlling of lightings, ACs, ventilation and security which also includes home appliances such as dryers/washers, ovens or refrigerators/freezers which uses Wi-Fi for monitoring via remote for ease of use. Now a day's speed of the processing and communication through smart mobile devices at very affordable costs, to improve the life style concept relevant to smart life, like smart T.V, Smart cities, smart phones, smart life, smart school and Internet of Things.

1.1 Introduction to IoT Technology -

- The term "Internet of Things" has come to describe a number of technologies and research disciplines that enable the Internet to reach out into the real world of physical objects.
- The Internet of Things, also called The Internet of Objects, refers to a wireless network between objects.
- From any time ,any place connectivity for anyone, we will now have connectivity for anything.

1.2 The Vision -

To improve human health and well-being is the ultimate goal of any economic, technological and social development. The rapid rising and aging of population is one of the macro powers that will transform the world dramatically, it has caused great pressure to food supply and healthcare systems all over the world, and the emerging technology breakthrough of the Internet-of-Things (IoT) is expected to offer promising solutions. Therefore, the application of IoT technologies for the food supply chain (FSC) (so-called Food-IoT) and in-home healthcare (IHH) (so called Health-IoT1) have been naturally highlighted in the strategic research roadmaps .

The phrase "Internet of Things" (IoT) was coined at the beginning of the 21st century by the MIT Auto-ID Centre with special mention to Kevin Ashton and David L. Brock. As a complex cyber-physical system, the IoT Integrates all kinds of sensing, identification, communication, networking, and informatics devices and systems, and seamlessly connects all the people and things upon interests, so that anybody, at any time and any place, through any device and media, can more efficiently access the information of any object and any service. “Ubiquitous” is the distinct feature of IoT technologies, so the IoT is often related to ubiquitous identification, ubiquitous sensing, ubiquitous computing, ubiquitous intelligence, etc.

Micro Electro Mechanical Systems (MEMS), mobile internet access, cloud computing, Radio Frequency Identification (RFID), Machine-to-Machine (M2M) communication, human machine interaction (HMI), middleware, Service Oriented Architecture (SOA), Enterprise Information System (EIS), data mining, etc. With various descriptions from various viewpoints, the IoT has become the new paradigm of the evolution of information and communication technology (ICT) .

1.3 Characteristics for Internet of Things -

- Event driven
- Ambient intelligence
- Flexible structure
- Semantic sharing
- Complex access technology

Anyone who says that the Internet has fundamentally changed society may be right, but at the same time, the greatest transformation actually still lies ahead of us. Several new technologies are now converging in a way that means the Internet is on the brink of a substantial expansion as objects large and small get connected and assume their own web identity.

Following on from the Internet of computers, when our servers and personal computers were connected to a global network, and the Internet of mobile telephones, when it was the turn of telephones and other mobile units, the next phase of development is the Internet of things, when more or less anything will be connected and managed in the virtual world. This revolution will be the Net’s largest enlargement ever and will have sweeping effects on every industry and all of our everyday lives.

Smart connectivity with existing networks and context-aware computation using network resources is an indispensable part of IoT. With the growing presence of WiFi and 4G-LTE wireless Internet access, the evolution towards ubiquitous information and communication networks is already evident. However, for the Internet of Things vision to successfully emerge, the computing paradigm will need to go beyond traditional mobile computing scenarios that use smart phones and portables, and evolve into connecting everyday existing objects and embedding intelligence into our environment. For technology to disappear from the consciousness of the user, the Internet of Things demands: a shared understanding of the situation of its users and their appliances, software architectures and pervasive communication networks to process and convey the contextual information to where it is relevant, and the analytics tools in the Internet of Things that aim for autonomous and smart behavior. With these three fundamental grounds in place, smart connectivity and context-aware computation can be accomplished.

A radical evolution of the current Internet into a Network of interconnected objects that not only harvests information from the environment (sensing) and interacts with the physical world (actuation/ command/control), but also uses existing Internet standards to provide services for information transfer, analytics, applications, and communications. Fuelled by the prevalence of devices enabled by open wireless technology such as Bluetooth, radio frequency identification (RFID), Wi-Fi, and telephonic data services as well as embedded sensor and actuator nodes, IoT has stepped out of its infancy and is on the verge of transforming the current static Internet into a fully integrated Future Internet.

The Internet revolution led to the interconnection between people at an unprecedented scale and pace. The next revolution will be the interconnection between objects to create a smart environment. Only in 2011 did the number of interconnected devices on the planet overtake the actual number of people. Currently there are 9 billion interconnected devices and it is expected to reach 24 billion devices by 2020. According to the GSMA, this amounts to $1.3 trillion revenue opportunities for mobile network operators alone spanning vertical segments such as health, automotive, utilities and consumer electronics.

1.4 Introduction to Embedded Systems -

Microcontroller is widely used in Embedded Systems products. An Embedded product uses the microprocessor(or microcontroller) to do one task & one task only. A printer is an example of Embedded system since the processor inside it perform one task only namely getting the data and printing it. Although microcontroller is preferred choice for many Embedded systems, there are times that a microcontroller is inadequate for the task. For this reason, in recent years many manufactures of general-purpose microprocessors such as INTEL, Motorola, AMD & Cyrix have targeted their microprocessors for the high end of Embedded market. One of the most critical needs of the embedded system is to decrease power consumptions and space. This can be achieved by integrating more functions into the CPU chips. All the embedded processors have low power consumptions in additions to some forms of I/O,ROM all on a single chip. In higher performance Embedded system, the trend is to integrate more & more function on the CPU chip & let the designer decide which feature he/she wants to use.

1.5 Examples of Embedded System-

- Automated tiller machines (ATMS).
- Integrated system in aircraft and missile.
- Cellular telephones and telephonic switches.
- Computer network equipment, including routers timeservers and firewalls
- Computer printers, Copiers.
- Engine controllers and antilock brake controllers for automobiles.
- Home automation products like thermostat, air conditioners sprinkles and security monitoring system.
- House hold appliances including microwave ovens, washing machines, TV sets DVD layers/recorders.
- Medical equipment.
- Multimedia appliances: internet radio receivers, TV set top boxes.
- Programmable logic controllers (PLC's) for industrial automation and monitoring.
- Stationary video game controllers.

1.6 Characteristics -

Embedded systems are designed to do some specific task, rather than be a general-purpose computer for multiple tasks. Some also have real-time performance constraints that must be met, for reasons such as safety and usability; others may have low or no performance requirements, allowing the system hardware to be simplified to reduce costs. Embedded systems are not always standalone devices. Many embedded systems consist of small, computerized parts within a larger device that serves a more general purpose. For example, the Gibson Robot Guitar features an embedded system for tuning the strings, but the overall purpose of the Robot Guitar is, of course, to play music. Similarly, an embedded system in an automobile provides a specific function as a subsystem of the car itself. The software written for embedded systems is often called firmware, and is usually stored in read-only memory or Flash memory chips rather than a disk drive. It often runs with limited computer hardware resources: small or no keyboard, screen, and little memory.

1.7 Following are the advantages of Embedded System -

- They are designed to do a specific task and have real time performance constraints which must be met.
- They allow the system hardware to be simplified so costs are reduced.
- They are usually in the form of small computerized parts in larger devices which serve a general purpose.

II. LITERATURE SURVEY

Personal digital assistants are also seeking to interact with users in a human–like way. With increasing sophistication, digital assistants promise to transform how individuals access information, communicate, shop, are entertained, control smart household appliances, and raise their children. Digital assistants will also undertake mundane tasks and free up time for users[1]. Amazon's voice recognition personal assistant Alexa, for example, can already perform many tasks. Alexa can shop (knowing everything one previously bought through Amazon); plan one's mornings, including accounting for upcoming meetings, traffic, and weather; entertain one with music; suggest movies, shows, or audio books; and control one's smart appliances at home. In 2016, Google showed a video of a suburban family undergoing its morning wakeup routine: "The dad made French press coffee while telling Google to turn on the lights and start playing music in his kids' rooms[2]. The mom asked if 'my package' had shipped. It did, Google said. The daughter asked for help with her Spanish homework." As a digital assistant—powered by sophisticated algorithms—learns more about its users, their routines, desires, and communications, it can excel in its role[3]. In a human–like manner, it can be funny—at just the appropriate level— and trustworthy. Digital assistants can provide more than information and services; they can anticipate a user's needs and requests. After all, being privy to so many of its users' activities, the assistant will become their digital shadow[4]. As Google's CEO noted, our phone should proactively bring up the right documents, schedule and map your meetings, let people know if you are late, suggest responses to messages, handle your payments and expenses, etc." The digital assistant, with its users' trust and consent, will likely become the key gateway to the internet. Because of personalization and customization, consumers will likely relinquish other less personal and useful interfaces, and increasingly rely on their digital assistants to anticipate and fulfil their needs. These technological developments promise to transform and improve the lives of consumers, yet they come at a cost. As they occupy a critical gatekeeper position in a multi–sided market, the assistants may not always operate with consumer interests in mind. Sales for digital assistants are accelerating, with 35.6 million people in the United States forecasted to use a smart speaker in 2017, up 129% from 2016[5]. Currently Google, Apple, and Amazon are jockeying for their digital assistant to become consumers' chief assistant. Samsung and Microsoft are also in the race, and Facebook is expected to enter with its assistant, "M." With Amazon controlling an estimated 70% of the smart– speaker market as of early 2017—versus 24% for Google Home—the stakes are great and go beyond the mere use of the digital assistant. In this competitive race, each super–platform wants its digital assistant to become the consumers' primary interface—with good reason. Digital assistants are already deploying ads and are likely to continue doing so in the future[6]. In 2017, users of Google's digital assistant received an ad for the movie "Beauty and the Beast" even when they simply asked, "OK Google, what's my day like?" (Google denied calling it a commercial; instead it wanted to "call out timely content."Amazon is currently testing ads with its digital assistant, and ads are expected to increase[7]. But the ad may not always appear through the digital assistant. A user might ask Google Home about good hotels in Palm Beach, and an advertisement for the Ritz Carlton might appear across its expanding platform of "free" services (such as sponsored search results, ads in emails, and display ads in videos). The ad might also appear across media (such as personal computers, smartphones, tablets, and soon, "smart" household appliances and driverless cars). Ultimately, as more people use a particular digital assistant, the more skills the assistant acquires, the better the assistant becomes in recognizing commands and faces, the better the assistant becomes in anticipating users' needs and responding to their requests. The platform, in turn, becomes more attractive to sellers and advertisers who want to target these users, which generates more revenue for the platform to connect its assistant with other technologies and ostensibly "free" services. As the digital economy shifts from a mobile–dominated world to an AI– dominated platform, the leading platforms' plans are clear: they "envision a future where humans do less thinking when it comes to the small decisions that make up daily life." Their aim is to increase the time users spend on their platform—on the gate which they control—which in turn delivers income from advertisements, referrals, and purchasing activities. Consequently, at least three key elements—data, network effects, and scope of platform's services—increase the likely switching costs and undermine a potential virtuous assistant's success. Although these elements favour the super–platform, a popular virtuous assistant remains possible[8]. Despite the possibility for such a virtuous assistant, we are rather pessimistic. Perhaps the easiest way to explain our pessimism is to ask the following: Which search engine did you use today ? Did you opt for one which does not harvest information and retains your anonymity or for one which tracks your behavior to better target you with personalized ads? Did you limit the ability of your phone apps to access personal and geo location information? Do you often change the default option? When downloading an app or update, do you read the terms and conditions? Even if you did, did you still accept the terms despite not certainly knowing who will access your data and what they will do

with it? In sum, a virtuous assistant is possible. Its presence might possibly limit the ability of the dominant digital assistant to abuse its power. But in reality, the majority of users may lack the incentive to switch. Google assistant is an artificial intelligence based on voice command, in this Google assistant can control home applicants like fan, light, ac, and smart home device . We know that how popular Google for uses. Everyone has a smart phone nowadays. With the help of smart phone, we can handle smart home devices like home, light, fans, ac, etc. We also use in the zone of comfort and luxuries of life[9]. Basically, this Google assistant also use handicap who can't reach the switch . That's the way of comfortability and easy handling life. Hardly and mostly use in disable and handicap people because they always need help to anyone, they are not self-dependent this Google assistant we can command through the voice because they can't reach the switch. To make Google assistant we use a different platform Google assistant IFTTT (if then this that)¬ These two basic platform use to making a Google assistant Google Assistant Google assistant is a command service. This belongs internet of things . This Google assistant hardly demand in future that also a way of saving electricity . When you forget to cut off the light and you are not a home that you apply this device. The bigger advantage of Google assistant is you can control app when you are out of the station there was a not distance limit . You can handle Google assistant by using a single app. There was no foundation and not a boundary to using this app. This is an online service in this smart device can connect to give facilities to communicate between them. IoT is a concept reflecting a connected set of anyone, anything, anytime, anyplace, any service, and any network.17,25 This enables making the environment around us smart, potentially giving rise to many medical applications such as remote health monitoring to engage in intervention/prevention programs and improvement of adherence with treatment and medication at home and by health care providers. Thanks to recent advances in voice-driven technologies, voice-activated commands are evolving into an integral component of the IoT. Voice-controlled IoT is already ubiquitous and is getting more ranging from intelligent personal assistance such as Apple's Siri, Amazon Alexa, Google's Google Now, and Microsoft's Cortana to the devices that learn each individual person's unique voice and create an interface where that voice can reliably interact with a variety of applications, such as a physician speaking directly to the electronic medical record and hearing it back or voice enabled medical transcription allowing doctors and nurses to record what they say as text, rather than having to type or handwrite forms.26,27 It is estimated that 40%-60% of American adults already use voice search in their everyday lives, and that 50% of all queries will be voice searches by 2020.28,29 This figure will only grow as voice-enabled assistant devices like the Amazon Echo and Google Home become more commonplace and interactions more normal. Recent improvements in voice-enabled assistant devices not only reduce their cost (at time of writing of this review, popular devices such as Amazon Echo are available for under $50) but also include many interactive features allowing users to connect to the world and facilitate self-care. For instance, these voice-enabled devices can help users order pizza, call an on-demand transportation service (e.g. Uber, Lyft, etc), control home appliances (e.g.: lights), tell the TV what show to put on, request media playback, ask what the weather will be like next week, order groceries for tomorrow's dinner, and much more[10]. There are several efforts taking place to utilize these smart speaker systems for better health care delivery and outcomes ranging from drug delivery to voice-activated technology for home-based exercise systems and caregiver engagement. But these efforts are still in infancy and we couldn't identify any clinical trial demonstrating the feasibility, acceptability, and/or effectiveness of such technologies for the purpose of diabetic foot management. Recently, few industrially supported initiatives have encouraged researchers to explore solutions for the use of voice-enabled technologies for managing diabetes. For example, in 2017 Amazon paired with Merck and Luminary Labs to launch the "Alexa Diabetes Challenge", calling on innovators to create Alexa voice-enabled solutions to improve lives of those with type 2 diabetes. On its first call on April 2017, the challenge received 96 submissions from a variety of innovators, including research institutions, software companies, start-ups, and health care providers. On October 2017, Sugar pod application by Well pepper was announced as the winner. The winner of the challenge suggested to build a voice-enabled IOT scale and diabetic foot scanner, and also a voice-powered interactive care plan. Sugar pod is a comprehensive diabetes care plan solution that provides tailored tasks based on patient preferences. It delivers patient experiences via SMS, email, web, and a mobile application—and one day, through voice interfaces thanks to the grant awarded by the "Alexa Diabetes Challenge". The major focus of this platform is to improve patient engagement with treatment plans[11].Security experts have raised concerns about the security and privacy risks with internet-connected devices in homes. Concerns include privacy risks due to pairing and discovery protocols that leak information about devices in the home insecure communication leaking sensitive information about the home and the residents and vulnerabilities in the devices that can allow an attacker to remotely spy on residents or disrupt their lives. Researchers have begun analyzing smart home platforms and devices .Findings include over-privileged applications on smart home platforms and vulnerable devices like locks and lightbulbs .Attacks have also occurred in the wild: the massive Mirai DDoS botnet attack disrupted the internet for millions of users ,a glitch in the Nest thermostat left

users in the cold , a baby monitor was hacked and a vulnerability in Foscam cameras left thousands of users vulnerable to similar attack , and recent reports suggest that internet-connected smart TVs can be used to record conversations[12].Furthermore, a recent report indicates that IoT malware and ransom ware attacks are on the rise. In response to these concerns, researchers have begun to develop designs for more secure smart home platforms.

2.1 Existing System -

In olden days there was no home automation. The man should keep efforts in home to control all appliances. But after coming the home automation there are some many advantages and also disadvantages .Before the home automation human efforts is more ,power consumption is more, no safety etc. But after coming home automation we can reduce the human efforts ,less power consumption, safety, security .in home automation there are some technologies ,such as, Bluetooth system, IoT system ,Raspberry pie etc. But in this project, we are going to using to IoT technology .Because we can control our home appliances from anywhere, but it is not possible in Bluetooth system because the Bluetooth range is 150 m only, it is the big disadvantage in Bluetooth system. we can control our home appliances around 150m only. But in IoT we can control from any place. For e.g.:-In olden days we went tour for 1 week and forgot to off the light in bed room there is loss of power consumption, But now with the help of "NODE MCU". We can control from any place their we can save the power.

2.2 Proposed System-

The system is proposed on the basis of the given ESP8266 (currently ESP8266EX) is a chip which is a highly integrated Wi-Fi SoC solution where in the Internet of Things industry, the users overcomes the efficient power usage efficiently, design and performance also provides networkable foundation of networkable foundation for facilitating end-point IoT developments. The vendors repeatedly created the ESP8266 chip at their cores includes multitude of modules. As well as the Olimex, Adafruit, Sparkfun WeMos, ESPert (ESPresso) all make various modules. ESP8266 can act either as the slave to a host MCU or as a standalone application. When it acts as a host, it promptly boots up from flash. The high-speed cache helps to increase the system performance and the system memory gets optimized. The step used in the produce of the devices includes multiple stages of the following: The proposed devices system can be adapted to recognized user voice and recognized voice commands .The system goals to be low cost, robust and flexibility. The recognitions of the voice command by using a dedicated hardware module with Arduino Uno microcontroller board for processing the commands and control. Here the microcontroller used in the current prototype is the node MCU which comes with embedded system which control all the electronic applications in the home can be managed and control.

III. METHODOLOGY

3.1 Overview of the Project -

A smart home automation is a home it gives its residents the consolation, amenity and ease of operation of system at all, randomly of where the operation actually is in the home. A smart house usually having of electrical instrument such as air conditioners, lighting, fans, room-heaters, air-coolers and microwave oven ,T.V, etc.; and electronic gadgets such as personal computers, music systems, laptops, audio-systems and mobile phones etc. These all gadgets and appliances can be controlled and connected as remotely, using over a secure channel net with software application, from anywhere of the house. A smart house having of three things: (i) home network internally, (ii) intelligent controlling and (iii) Automation with wireless or wired. These frameworks methods and gadgets inside a home can likewise be overseen either from inside home, or can be connected to administrations and frameworks from outside the home. These apparatuses and devices are for the most part associated with specific sensors, in order to make these naturally adjusted to specific circumstances and thus influence the tenants to feel good. A versatile savvy home would be the one that uses machine learning strategies to find designs in the occupants' day by day exercises, and create robotization decides and activities that copy these activities. The figures below show us the basic concept of the smart home. From here its known as automated homes, intelligent buildings, and integrated home systems are a recent design development. Smart homes incorporate common devices that control features of the home. Originally, smart home technology was used to control environmental systems such as lighting and heating, but recently the use of smart technology has developed so that almost any electrical component

within the house can be included in the system. Moreover, smart home technology does not simply turn devices on and off; it can monitor the internal environment and the activities that are being undertaken whilst the house is occupied. The result of these modifications to the technology is that a smart home can now monitor the activities of the occupant of a home, independently operate devices in set predefined patterns or independently, as the user requires.

Figure 1. Smart Home Concept

The point is decrease physical developments and work by the people, by detecting and proactively reacting to their necessities. This critical application area is anticipated to relentlessly increment later on. As of late, more research on keen homes has been completed in applying the standards of omnipresent processing. A shrewd home modifies its capacities according to the tenants' needs, as per the data it gathers from the occupants, home PCs and setting. In such a shrewd situation the means including the data preparing and arrange innovation are straightforward to the client. These can be utilized to speak with the savvy electrical gadgets through brilliant cell phones, for example, cell phone or tablet. A SHAS can make utilization of different intuitive advances, for example, voice-acknowledgment, signal control, retina eye development and then some. In this project, we utilize voice-acknowledgment to control keen home apparatuses. Moving far from the conventional strategies, for example, console or changes to control the gadgets, voice control is one of the least demanding techniques to give include charges. Additionally, voice acknowledgment is a more customized type of control, since it can be adapted and customized to a particular speaker's voice. Voice recognition varies unmistakably from speech acknowledgment. In discourse acknowledgment the subject of investigation is the talked content, while in voice acknowledgment the subject of examination is the voice of speaker and the talked content stays auxiliary here. The rest of the paper is organized as follows. In section II we provide a critical review of recent literature on the development of gesture and voice controlled IoT applications.

3.2 Block Diagram -

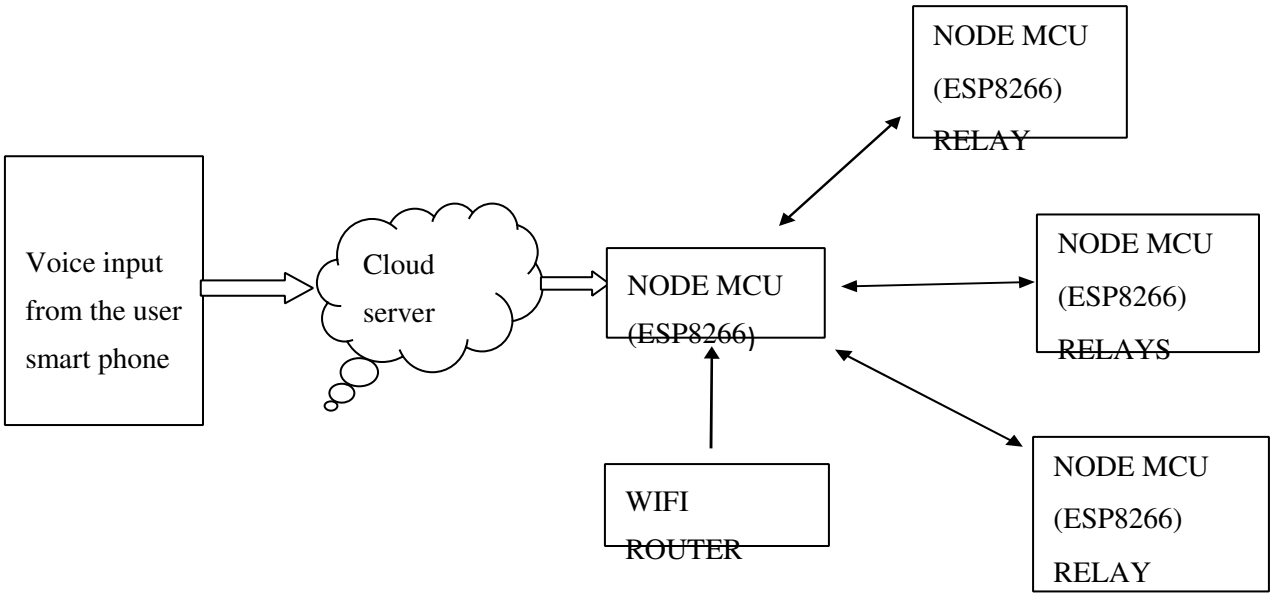

Figure 2. Block Diagram of IoT based Digital Assistant

3.3 Algorithm of the project-

Step-1: Start.
Step-2: Connect the regulated power supply.
Step-3: Connect your phone to the Hotspot that was mentioned in your code.
Step-4: Through this Hotspot both the hardware and software devices are connected.
Step-5: Now, give the voice command to Google assistant for example, lamp on, lamp off etc.
Step-6: The relay 230V switch changes to 5V and this allows to operate the voice commands.
Step-7: Finally, home appliances are operated by using different commands using the Google assistant.
Step-8: Stop.

IV. RESULTS AND DISCUSSIONS

4.1 Inputs –

Google_Assistant_Home_Automation_naik | Arduino 1.8.9

File Edit Sketch Tools Help

Google_Assistant_Home_Automation_naik

```
#include <ESP8266WiFi.h>
#include <Adafruit_MQTT.h>
#include <Adafruit_MQTT_Client.h>

#define Relay1   D1
#define Relay2   D2
#define Relay3   D3

#define net_led  14

#define WLAN_SSID       "Raspberry Pi2"                    // Your SSID
#define WLAN_PASS       "GR426374"                        // Your password

/************************ Adafruit.io Setup ***********************************/

#define AIO_SERVER      "io.adafruit.com"                 //Adafruit Server
#define AIO_SERVERPORT  1883
#define AIO_USERNAME    "bkprojects117"                     // Username
#define AIO_KEY         "01b21b9ee1d44e9f94b63c235ef6bc21"     // Auth Key

//WIFI CLIENT
WiFiClient client;

Adafruit_MQTT_Client mqtt(&client, AIO_SERVER, AIO_SERVERPORT, AIO_USERNAME, AIO_KEY);

Adafruit_MQTT_Subscribe Light1 = Adafruit_MQTT_Subscribe(&mqtt, AIO_USERNAME"/feeds/Relay1"); // Feeds name should be same everywhere
Adafruit_MQTT_Subscribe Light2 = Adafruit_MQTT_Subscribe(&mqtt, AIO_USERNAME "/feeds/Relay2");
```

Figure 3. Defining the Header Files

Google_Assistant_Home_Automation_naik | Arduino 1.8.9

File Edit Sketch Tools Help

Google_Assistant_Home_Automation_naik

```
    delay(500);
    Serial.print(".");
  }
  Serial.println();

  Serial.println("WiFi connected");
  digitalWrite(net_led, HIGH);
  delay(500);
  digitalWrite(net_led, LOW);
  delay(500);
  digitalWrite(net_led, HIGH);
  delay(500);
  digitalWrite(net_led, LOW);
  delay(500);
  digitalWrite(net_led, HIGH);
  delay(500);
  digitalWrite(net_led, LOW);
  delay(500);
  Serial.println("IP address: ");
  Serial.println(WiFi.localIP());

  mqtt.subscribe(&Light1);
  mqtt.subscribe(&Light2);
  mqtt.subscribe(&Light3);
}

void loop() {
```

Figure 4. Relay Operations

Google_Assistant_Home_Automation_naik | Arduino 1.8.9

File Edit Sketch Tools Help

Google_Assistant_Home_Automation_naik

```
void loop() {

  MQTT_connect();

  Adafruit_MQTT_Subscribe *subscription;
  while ((subscription = mqtt.readSubscription(20000))) {
    if (subscription == &Light1) {
      Serial.print(F("Got1: "));
      Serial.println((char *)Light1.lastread);
      int Light1_State = atoi((char *)Light1.lastread);
      digitalWrite(Relay1, Light1_State);
    }

    if (subscription == &Light2) {
      Serial.print(F("Got2: "));
      Serial.println((char *)Light2.lastread);
      int Light2_State = atoi((char *)Light2.lastread);
      digitalWrite(Relay2, Light2_State);
    }

    if (subscription == &Light3) {
      Serial.print(F("Got3: "));
      Serial.println((char *)Light3.lastread);
      int Light3_State = atoi((char *)Light3.lastread);
      digitalWrite(Relay3, Light3_State);
    }
```

Figure 5. Conditional Input

We designed these projects using IoT technology &Wireless technology, using the IoT technology we can control our home appliances from anywhere.

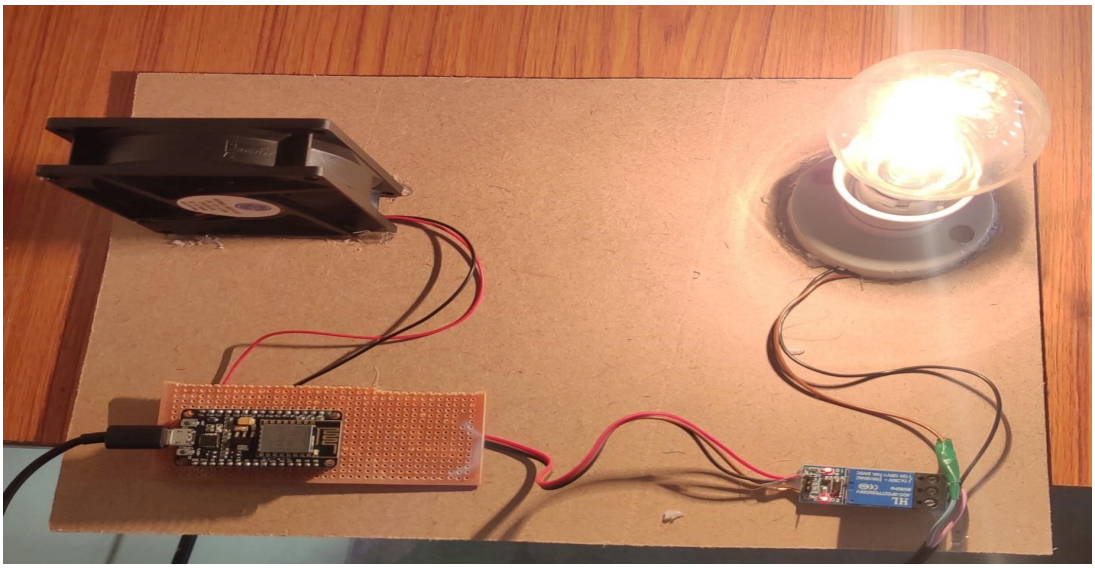

Figure 6. Project Output

From this project we observed and learnt that we can control our home appliances by using voice command through digital Assistant installed in our smart phone we can control our home appliances from anywhere.

4.2 Applications-

There are several application domains which will be impacted by the emerging Internet of Things. The applications can be classified based on the type of network availability, coverage, scale, heterogeneity, repeatability, user involvement and impact.

We categorize the applications into four application domains:

(1) Personal and Home
(2) Enterprise
(3) Utilities
(4) Mobile

There is a huge crossover in applications and the use of data between domains. For instance, the Personal and Home IoT produces electricity usage data in the house and makes it available to the electricity (utility) company which can in turn optimize the supply and demand in the Utility IoT. The internet enables sharing of data between different service providers in a seamless manner creating multiple business opportunities.

Applications

1. The applications are limited only by your imagination
2. Turning lights down /off at night
3. Operating outside lights0 Turning lights or radio on / off when someone approaches the house, simulating occupancy
4. Operating television, hot water heater, kettle, toaster etc. ready for your use
5. Optimizing use of low-cost electricity
6. Working with intelligent electrical white goods e.g. washing machine, fridge, microwave etc

4.3 Advantages-

1. Reduces human efforts
2. Power saving

3. Safety
4. Time saving
5. Remote control
6. Flexibility & Convenience

V. CONCLUSIONS AND FUTURE DIRECTIONS

5.1 Conclusion-

The project "**ADVANCED HOME AUTOMATION BASED ON IoT USING GOOGLE ASSISTANT"** has been successfully designed and test. It has been developed by integrating features of all the hardware components used. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit. Secondly, using highly advanced IC's and with the help of growing technology the project has been successfully implemented.

5.2 Future Scope-

Our Project is a real-Time project which we can easily implement in our home. It has that capability which can change our way of living. Certainly, this Project can be improved in Future. On the better half, we try to list some points for future aspect.

- Since, this model works on DC power system. As, we know our home appliances works on AC power system. These two-power models are polar apart but, using a "relay we can use this prototyping in AC power system too.
- As far as privacy is concerned, we don't have any security feature. In future model, we try to add some security package to enhance privacy.
- In case of full flow of Door, we have low watt servo rotor which doesn't allow us to rotate full door 180 degree. Along with it, we have manual error which limit the exact displacement of door path.
- We can have a customized-own app for android and another mobile platform.

REFERENCES

[1] Vera smarter home control. Accessed March 7, 2017, Online at http://getvera.com/

[2] Wink hub. Accessed March 7, 2017, Online at https://www.wink.com/products/wink-hub/.

[3] Amazon shares data with Arkansas prosecutor in murder case, Mar. 2017. Accessed March 6, 2017, Online at http://bigstory.ap.org/article/1110e4449c3f4191909e4010da935056/amazon-sharesdata-arkansas-prosecutor-murder-case.

[4] Amazon Echo. Accessed March 7, 2017, Online at https://www.amazon.com/Amazon-Echo-BluetoothSpeaker-with-WiFi-Alexa /dp/ B00 X4WHP5E.

[5] Apple Home Kit. Accessed March 7, 2017, Online at https://www.apple.com/ios/home/.

[6] O. Arias, J. Wurm, K. Hoang, and Y. Jin. Privacy and security in Internet of Things and wearable devices. IEEE Transactions on Multi-Scale Computing Systems, 1(2):99–109, Nov. 2016. DOI 10.1109/TMSCS.2015.2498605.

[7] K. Baxter, C. Courage, and K. Caine. Understanding Your Users: A Practical Guide to User Research Methods. Morgan Kaufmann, second edition, 2015.

[8] N. Bilton. Nest thermostat glitch leaves users in the cold. The New York Times, Jan. 2016. Accessed March 7, 2017, Online at https://www.nytimes.com/2016/01/14/fashion/nestthermostat-glitch-battery-dies-software-freeze.html.

[9] A. J. Brush, B. Lee, R. Mahajan, and S. Agarwal. Home automation in the wild: Challenges and opportunities. In Proceedings of the Conference on Human Factors in Computing Systems (CHI), 2011. DOI 10.1145/1978942.1979249.

[10] J. bum Woo and Y. kyung Lim. User experience in do-it-yourself-style smart homes. In Proceedings of the ACM International Joint Conference on Pervasive and Ubiquitous Computing (UbiComp), 2015. DOI 10.1145/2750858.2806063.

[11] D. J. Butler, J. Huang, F. Roesner, and M. Cakmak. The privacy-utility tradeoff for remotely teleoperated robots. In Proceedings of the Annual ACM/IEEE International Conference on Human-Robot Interaction, 2015. DOI 10.1145/2696454.2696484.

[12] E. K. Choe, S. Consolvo, J. Jung, B. L. Harrison, S. N. Patel, and J. A. Kientz. Investigating receptiveness to sensing and inference in the home using sensor proxies. In Proceedings of the International Conference on Ubiquitous Computing (UbiComp), 2012.