GOOGLE VOICE RECOGNITION BASED ON HOME AUTOMATION WITH SMART BLUETOOTH SOCKET

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Abstract : By progressing information technologies now a days, the home living syatems has been increasingly supplanted by smart home. Google Smart home style can bring large benefits to people. This technology becomes ubiquitous in these years. Enterprises cannot integrate the functional divisions of smart home mode. Customers do not get the products they need. Therefore, we have to build a tailor-made function for users. we have use the Google Home's voice recognition with the conception of machine-learning about fulfilling the users' needs by a smart home pattern with the design of machine learning. In this experiment let users give comments to Google Home's voice recognition, then transfer the Bluetooth signal to Raspberry Pi to control devices.

***IndexTerms* – smart home; IoT; machine; raspberry pi; bluetooth 4.0**

I. INTRODUCTION

The development of Internet Of Things had been evolved in several study fields .In this field, numerous studies of smart home systems certificate that smart home becomes a important role in IoT studies. Smart home entails the buildings which furnish are expedience circumstance to suffice the needs of modern lifestyle. Therefore, among all the applications of technology industry development technology, the construction of living needs in response to the smart home during the current stage become the inevitable trend of housing construction. Smart home is mainly in the construction of residential housing must provide convenient functions, such as security, disaster prevention, health care, and comfortable, and energy savings which rely on sustainable development and carbon reduction function. By playing a specific effect to enhance the quality of living space, the construction of these tasks needs to use the technology of communication technology. Through the Netcom facilities platform, the integration to play a specific effect to enhance the quality of living space and to achieve the purpose of smart home. Smart home is a one of the variety of home automation equipment. It plays efficient service functions to ensure the safety of house living, health living environment, and to provide a comfortable quality of house living. To create humanized living environment, smart home can also reduce the waste of electricity to bring great benefits. The problem may be quite tricky to install the extra system function or replace the responsible company. If you want to add system, you will need to destroy the decoration which may be expensive. This paper is committed to the way through the machine learning that users do not need to spend a lot of costs under the premise of the need to use the smart home system functions. In addition to the convenience of the system of smart home, it needs to be improved control convenience. Lärka and Markus Schinle proposed smart home with mobile devices to get the convenience of remote control. Not only can efficiently deal with the home systems but also to further enhance the user's desire to use the home system. The system expands the wisdom of the family system to smart city system. This paper focuses on researching the machine learning model to combine Google Home's with Google Assistant Personal Voice Assistant to customize a service to meet the new needs of users. The goal is by learning the user's voice commands that Google Home can use Bluetooth to open the Smart Bluetooth Socket to control devices. Home Automation is conveniences installed and designed to perform chore in your living place. Smart homes are often referred to as intelligent homes as they perform services that become part of our life. Many of the automated systems that silently perform their jobs unnoticed this is automation at its best. Speech Recognition is a technology allowing the computer to identify and understand words spoken by a person using a microphone or telephone. Using a set of pre-programmed commands and instructions, user can talk with computer. Computer system that understands input speech enables user to have conversations with the computer. User and the computer speaking as commands or in response to events, input, or other feedback would be included in these conversations. Speaking is easier and more sensitive than selecting buttons and menu items. Human speech has changed over many thousands of years to become an efficient method of sharing information and giving instructions. Home automation system has been around for more than a decade. The main concept is to form a network connecting the electrical and electronic appliances in a house. This is a growing technology, which has changed the way people live.

II. RELATED WORK

2.1 Internet of Things

Internet of Things (IOT) is to allow all the functions of independent objects to achieve interoperability on the Internet. Internet of things has wireless network technology as an infrastructure for things and objects connection. Due to Internet of things, everyone can use electronic tags to connect real objects to the Internet. These tags can be found on their specific information. In the era, the Internet of Things has involved rapidly. Everyone's life is getting more and more convenience. Therefore, in the era that network developed prevailing and high penetration of mobile devices and use Internet of Things to develop a conception of smart home. The system combines the mechanisms of the home with the network and performing remote operations through mobile devices and voice-activated technology. The major companies have also launched such as Amazon-echo, Apple TV 4 Home-Kit and other intelligent home control center products. Google also had officially launched the Google Home as the products. Google Home is a smart home control center with remote control of home appliances and monitoring of home environmental data. However, Google Home itself combines the home wireless play center and Google Smart Voice Assistant. Google Assistant voice assistance allows users to simple control instructions to achieve the needs of the functions by speaking commands. Seyit Alperen Celtek proposed smart home and the user's remote interaction mode, through voice controls the Smart Bluetooth Socket and to combine with the machine learning to achieve the new model which can satisfy the needs of smart home users.

2.2 Machine Learning

Machine learning is the branch of "artificial intelligence". In this field, aiming to automatically analyzes the law from the data, and use the algorithm to predict the unknown information. Machine learning has developed into a multi field interdisciplinary, involving the theory of probability, statistics, approximation, computational complexity theory and other disciplines in the past 30 years. Bluetooth helps to connect the coordinates and through three different machine learning methods (K-meanings analysis, support vector machine analysis, and linear discriminant analysis) to carry out Bluetooth indoor positioning. Machine learning mainly with the inferred statistics is more closely, So it is called Statistical Learning Theory. In this paper, the method of keyword analysis is primarily used to make the device understand and implement the user's commands. In this paper, we use LSA (Latent Semantic Analysis) and TF-IDF (term frequency– inverse document frequency)to analyze user' s commands.

2.3 Rasberry pi

Raspberry Pi is also a Linux single board computer. British Raspberry Foundation developed Raspberry Pi which aimed to promote basic computer science with low-cost hardware and free software. The 700 bit BCM2835 processor, 256MB of memory (B-type has been upgraded to 256 MB of memory). Raspberry Pi use the SD card as a storage medium and has an Ethernet, two USB interfaces, HDMI (support sound output) and RCA terminal output support. The operating system is open source of Linux. In the studies of the Internet of things, the raspberry pi has many applications. Its operating system can not only operate itself but also has access to wireless networks and Bluetooth chips. With the development of things networking conditions, raspberry itself has variety of hardware connections with USB interface.

2.3 Bluetooth 4.0

Yuan-Yu Ding proposed Smart Bluetooth Socket which uses Bluetooth 4.0 chip and control chip through the Raspberry Pi to control the Smart Bluetooth Socket. Smart Bluetooth Socket is a device of IoT .This device has RTC (Real Time Clock) device to record time. It records the time at a certain point and in time switch or after a certain period to turn off the device or open the device. User can uses the background control device program to control the function. Smart Bluetooth socket structure includes the different modules like Bluetooth module, RTC module, Bluetooth smart socket. In this development, it can find a technology which has not only low power consumption but also carry fast reaction time. Bluetooth technology is currently responsible for maintaining its technical standards by the Bluetooth Technology Consortium, which has more than 20,000 corporate members whose territory is distributed in telecommunications, computers, and consumer electronics. The RTC module which is used in this experiment refers to an electronic device that can output the actual time like a clock. It is usually used to integrate circuit and is also called a clock chip.

III. SYSTEM OVERVIEW

The block diagram of voice control home appliances is illustrated in below Fig Android application act as interface between smart phone and Bluetooth. Users give the input via the smart phone either by using touch button or voice command. To ensure the Arduino Uno can communicate with the android, we used a different character for identifying different function of the speed of fan and switch ON/OFF the light. For example to turn on the fan at lower speed, we have set ' speed 1' in android with character ' A' , ' speed 2' for character ' B' and etc. When the user touch the ' speed 1' button, the character ' A' will be sent to the Arduino and the output of ' speed 1' will be turn on. Figs. 3 and 4 shows an example of the programming in the Android application and Arduino Uno respectively. In this system, we used four relays in which three relays are for controlling different speed of fan and one relay to control the light bulb. Normally open circuit concept has been implemented in the voice control home appliances with Android application. Based on this concept, the output are functioned when the current are given to the circuit to trigger the relay. In this paper, voice recognition and touch screen button are successfully developed for home appliances using android via smart phone. Two home appliances that have been chosen for this project are fan and light. Inside this system the users can control the speed of fan and switch off/on the light from the smart phone. We used smart phone which act as remote control to control the home appliances up 20 meters. We have successfully developed a voice control home appliances system which can make our life easier.

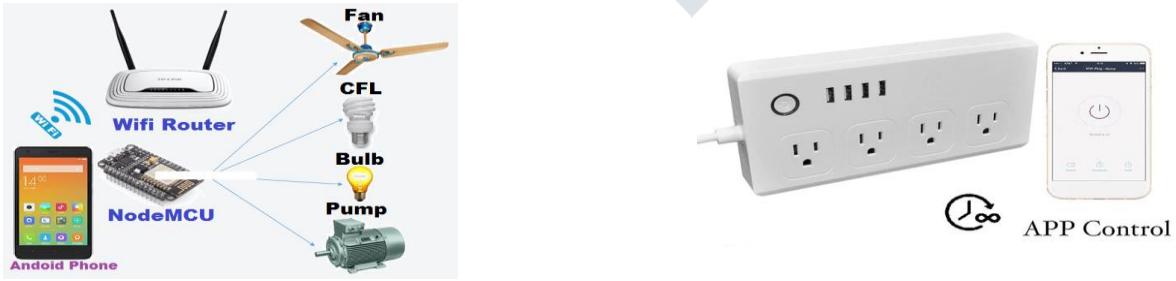

Fig.1 .System Overview

The overview of a home automation is shown in fig. The system consists of an android developed application which controls the different home appliances. The system consists of the micro controller in which electrical appliances are directly interfaced to the microcontroller. The home automation system is controlled and monitored from the remote location using Android Smart Phone. The android phone communicates with the web server through internet and sends the signal to the microcontroller which acts as hub in the home automation system. Any internet connections 3G network or4G can be used on the used Smart phone device. The features of home automation includes

1. Controlling energy management devices such as lights, fans
2. Voice activation is used for switching functions.

3. Provides security by having user authentication to accesses devices

Home automation is building automation for home, called a Smart Home. A home automation system will control lighting, climate, entertainment systems, and other appliances. It may also include home security such as access control and alarm systems. When this connected with the Internet, home devices are an important constituent of the Internet of Things. A home automation system is a technological solution that enables automating the bulk of electronic, electrical and technology based tasks within a home. It uses a combination of hardware and software technologies that enable control and management over appliances and devices within a house. Home automation is also known as domotics, and a home with an automation system is also known as a smart home. Home automation describes a system of networked, controllable devices that work together to make your home more comfortable, efficient, and secure. You " speak" with your automated home through a remote control or smart device. Home Automation industry is growing rapidly. This is fuelled by the need to provide supporting systems for the elderly and the disabled, especially those who live alone. Coupled with this, the world population is confirmed to be getting older. Home automation systems must comply with the household standards and convenience of usage. This paper details the overall design of a wireless home automation system (WHAS) which has been built and implemented. The automation centres on recognition of voice commands and uses low-power RF ZigBee wireless communication modules which are relatively at low cost.

3.1 Experimental Setup

The fig below shows the experimental setup of google home automation system. This is the smart bluetooth socket of home automation system.

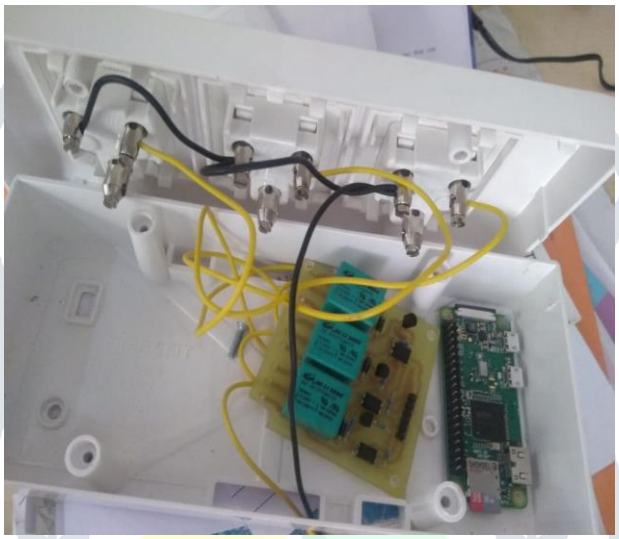

fig. 2 Experimental setup

3.2 System Architecture and Research Method:

A. System Architecture:

The overall system architecture is shown in below Figure. Users through the Google Home voice control instructions to understand the meaning of commands. Through the Raspberry Pi, it sent the signal to drive the Smart Bluetooth Socket or control the relevant electrical appliances. These manipulations will be recorded in the cloud's database for future analysis applications. The functions of each part in below Figure (1)API.ai: compile the AI's code for Google Home, and analysis the records of commands which returned from Google Home for statistics. (2)Raspberry Pi's back end & Cloud Database: programming BluePy's code to operate the Bluetooth and Smart Bluetooth Sockets. (3) Google Home: When the AU receives an instruction about turning on the device, turn on Bluetooth and its pairing function, and return the situation to tell the user whether the device is turned on. (4) Raspberry Pi: Return the service records of Smart Bluetooth Socket to the Cloud Database. When Raspberry Pi receives a Bluetooth match request, turn the Smart Bluetooth Socket on or off through Bluetooth. (5) User: Give instructions to turn the device on. (6) Smart Bluetooth Sockets: By Raspberry Pi' s attachment switch on its power.

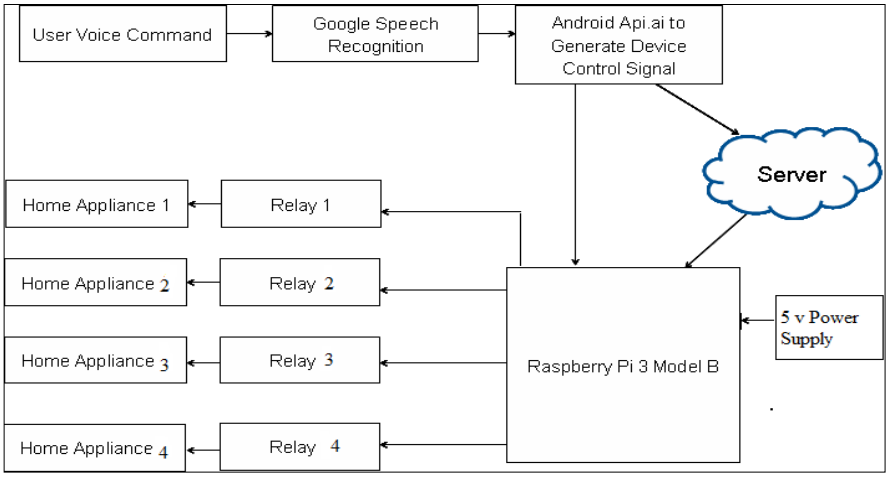

fig. 2 Experimental setup

The home automation control using speech recognition system to facilitate the elderly and physically challenged people with an easily operated home automation system that operates fully on voice commands. One of the major problems in our present day society is wastage of energy, whereby energy consumption is continuously increasing year by year. Users through the Google Home voice control instructions to understand the meaning of commands. Through the Raspberry Pi, it sent the signal to drive the Smart Bluetooth Socket or control the relevant electrical appliances. These manipulations will be recorded in the cloud's database for future analysis applications. In this system, we used two relays which are use for controlling on or off AC device and one relay to control the TV. Normally open circuit concept has been implemented in the voice control home appliances with application.

B Software development of android application

The smart applications can be developed using several platforms such as Android, Windows, iPhone. The application for home automation system is developed in android phone. Java programming language with SDK (Software development kit) is used to develop the applications. SDK is a set of software development tools which allows to create the applications for a software package, software framework, hardware platform and computer system or similar development platforms. Eclipse which runs on Windows 7 platform officially supports integrated development environment (IDE which is used as conjunction with (Android Development Tools).The designed app for the home automation system provides the following functionalities to the user:

1. Remote connection through internet to the web server.
2. Provides IP and user authentication.
3. Controlling and monitoring of home appliances.
4. Scheduling tasks and to home automation system.
5. Password change option.
6. Provides voice activation for switching functions.

This paper investigates the establishment of an open domain chatbot database through the services provided by API.ai and compiles an API.ai that can interact with the user on the basis of the specific keywords. Once the user issues the instruction, the API.ai will set the protocol according to the intent. In response to the user's instructions and in the intention, we established the thesaurus (as an entity).

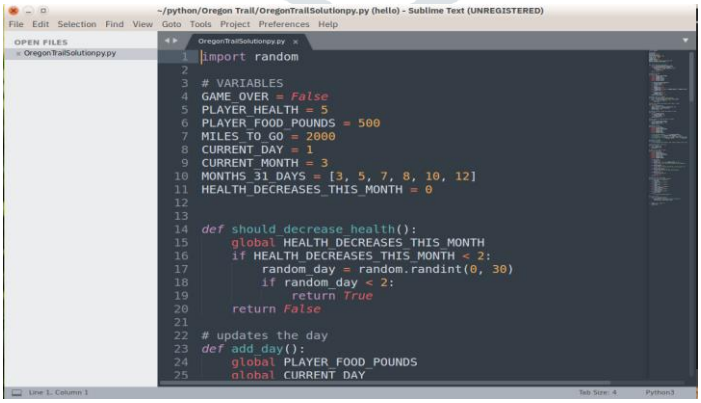

fig. 3 Python IDE

IV. RESULTS AND DISCUSSION

We have analyzed performance of speech Recognition based home automation for three device commands Fan, Bulb and TV. We have extracted accuracy, True acceptance, True Rejection, False Acceptance, and False Rejection by conducting experiment on 100 real time speech inputs for each device command.

Device ON/OFF Command	Accuracy	True Acceptance	True Rejection	False Acceptance	False Rejection
Fan	95%	92%	8%	4%	96%
Bulb	94%	91%	9%	5%	95%
TV	96%	94%	6%	3%	97%

Table no. 1: results

V. CONCLUSION

In this paper we proposed architecture for a new intelligent family service for users through the machine learning applications. The system is highly feasible to complete the smart home control through machine learning using Google Home voice command, Raspberry Pi and Smart Bluetooth Socket. In the future, we will further improve the system structure and machine learning ability. We will try to figure out how to work with different users in the system to complete the machine learning training and to meet the needs of users. In addition, we hope to build a combining machine learn and remote operation of smart home to integrate the smart home model. We will try to manipulate more intelligent smart home devices with mobile devices.

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