

Survey on Smart Home Automation using Raspberry Assistant

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Abstract

In Recent year Popularity of Home automation has been increasing due to low cost and simplicity through Smartphone and tablet connectivity. It is an automation of home or house hold activity. Raspberry Pi is a small computer, which was introduced in the year of 2012; it is currently a mainstream system subject to extensive availability that can be used in home automation. A low cost computing environment using Raspberry Pi based systems is very efficient to use as a proposed computing systems. In this ever changing global data changing communication, inexpensive internet communication and fast paced software development, security has become more of an issue.

Keywords:

Raspberry Pi, Google Assistant, Wi-Fi, Tablet, NodeMCU, Jasper.

1. Introduction

Raspberry Pi is known as the credit-card sized computer which was initially designed for education, inspired by the 1981 BBC Micro. It is a low-cost device through which Various applications of IoT can be developed. Knowledge of Linux Operating System will be required to work with a Raspberry Pi board. It runs on a Quad core ARM Cortex A-53. Raspberry Pi 3 is an open source platform in Internet . It has inbuilt Wi-Fi and Bluetooth connectivity. Node MCU is an arduino-like hardware. It is a development kit which helps us to create prototypes of our IoT product using Lua Script. We can also use the arduino IDE to code the Node MCU. Node MCU has to be included in the IDE which will help us use the kit with it. One of the most important parts of such an assistant is represented by speech recognition also called speech to text translation because it transforms human voice into a string of data than can be interpreted by the computer. However, in recent years cloud-based speech recognition systems have been developed a lot. In this way, all elements of a voice controlled assistant are placed in cloud. The most important ones from this category of assistants are Apple Siri, Google Assistant and Amazon Alexa. They are present in most smartphones and are based on artificial intelligence elements such as deep learning and neural networks. Apart from voice digital

assistants, other systems that have been developed using this idea are call centers, systems for selfmanagement.

A Voice Command System essentially means a system that processes voice as an input, decodes or understands the meaning of that input processes it and generates an appropriate voice output. Any voice command system need three basic components which are speech to text converter, query processor and a text to speech converter. Voice has been a very integral part of communication nowadays. Since, it is faster to process sound and voices than to process written text, hence voice command systems are omnipresent in computer devices. There have been some very good innovations in the field of speech recognition.

All of these imply knowledge of the operating system such as accessing the audio devices or knowledge of Python language to modify the initial form of the software part. In this way, the Google assistant can be embedded in a hardware device. This is an advantage in comparison with where a smartphone is used as an additional element in an assistive device for visually impaired individuals. Thus, the smartphone receives voice commands and it sends them the accesses a speaker or a motor to implement some tasks depending on the voice commands. The paper is organized as follows. In the second section the necessary changes to implement the Google assistant on the Raspberry Pi without the AIY Voice Kit are presented.

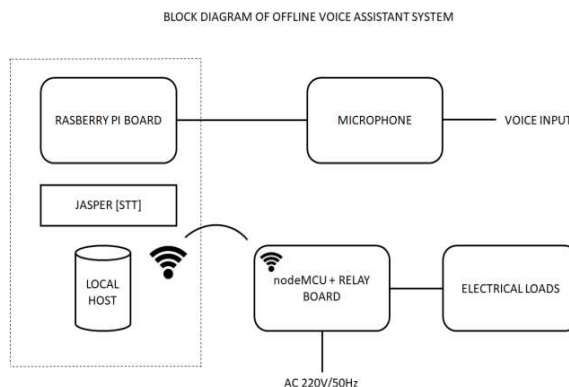


Figure 1: Block diagram

2. Proposed System

The world is fast moving towards AI and one of the most basic versions of AI is the smart voice assistant devices. The commercial ones like Alexa are a bit costly and is not customizable according to the customers need. Privacy issues comes up when your devices are connected to the cloud. Hence proposed model of smart voice assistant device which is named as ‘Paul’ will mainly have three features. The first one is that its customizable according to the needs of user. The user can feed in their info and program it according to the user requirements and load conditions of the home appliances. Since the project is built on an open source platform like Raspberry Pi and NodeMCU WiFi modules the model cost is effective. The second one being the usage of an Offline STT (Speech to Text) service provider that will help the data private and isolated. ‘Paul’ uses Jasper platform for converting the speech into text. The third and the very important feature is about controlling the electrical loads of the home appliances. This is done via home Wi-Fi network and the server is hosted on the Pi board making the whole process energy efficient and cost effective as the proposed system won’t be using a separate PC to carry out the automation task. The point to be noted here is that, the system uses the WiFi network as a replacement for connecting wires between the controller and switches of the electrical loads and does not use an active internet connection or broad band service provider.

Figure 1 represents the block diagram of offline Voice Assistant System. The user’s voice is received through the microphone. The speech is converted into text by Jasper platform, and stored in pi’s server. Fig 2.2 represents Jasper platform. This service provider will help the data to be private and isolated.

The node MCU Wifi modules act as slave and will be connected to the relay board that control the AC power loads. The nodeMCU with relay board can be easily integrated to the power socket boards instead of normal switch boards. This way the system makes sure the data is protected, the tasks can be customized and the setup can be easily integrated into an existing home system without disturbing the wiring and other aspect of home.

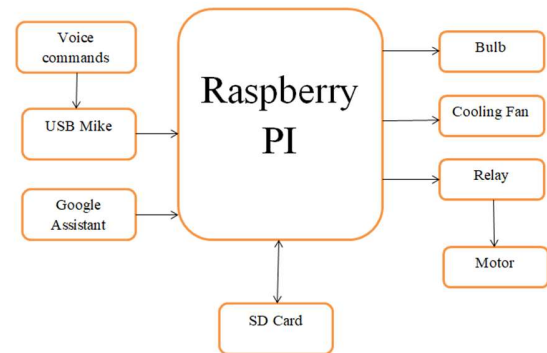


Figure 2: Block diagram of Raspberry Pi

Figure 2 represents block diagram of Raspberry Pi. The Raspberry Pi board comprises a program memory(RAM) , processor and graphics chip, CPU, GPU, Ethernet port, GPIO pins, Xbee socket, UART, USB Mike, SD Card containing Linux OS, Motor, Keyboard. They consume less power. It comes with a set of open source technologies i.e communication and multimedia web technologies.it also requires mass storage, for that we use SD flash memory card. The memory available in Raspberry Pi is more than 256MB or 512MB. The slot in Raspberry Pi permits us to insert an SD card and that can use it as our devices.The Raspberry Pi boards are used in many applications like Media streamer, Home Automation, Cosmic computer.

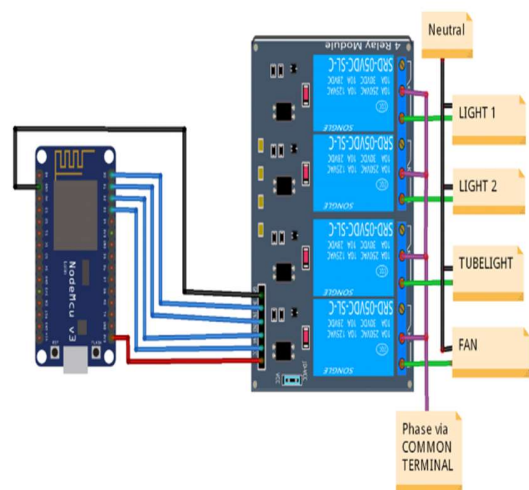


Figure 3: NodeMCU and Relay Board

Figure 3 represents the NodeMCU and Relay Board, which are connected to each other. The NodeMCU with relay board can be easily integrated to the power socket boards instead of normal switchboards. NodeMCU will be powered by an AC to DC converter taking AC power directly. Relay is a electrically operated switch. Generally used relay modules are 5v/12v. the relay uses an electromagnet switch electric appliances. Using relay is safe as there is no any physical contact between NodeMCU and AC devices. Relay basically act as a switch between electrical load and NodeMCU.

3. Literature Review

In this section, we will look at the available systems with their technology and their features, benefits, and limitations they have. Home automation systems currently focus on the easiest way to interface with smart homes.

Voice recognition by Google home and raspberry pi for smart socket control[1]. In this paper the author build a tailor-made function for users without attempt, they have made use of Google home's voice recognition with the conception of machine learning to prove the feasibility analysis about fulfilling the user's needs by a smart home pattern.

Implementation of Google Assistant on Raspberry Pi[2]. This paper indicates the implementation of voice Google Assistant on a Raspberry Pi microcomputer. Initially, the voice kit of Google is attached to a Raspberry Pi and a voice of Google Assistant is obtained. Instead of microphone and speaker, voice kit is presented.

Personal Google API Assistant system using Raspberry Pi[3]. In this paper, the Raspberry Pi collects information from sensors or takes in speech or gesture commands. Also, it discusses about design and development of an IoT system that includes sending voice commands and getting output in form of audio as well as visuals.

Review of Dynamic Digital Assistant using Raspberry Pi[4]. The main objective of this paper is to provide the voice information to the user. By using the Google assistant or alexa through the USB speaker or microphone. In this paper, we can operate or control some home automation system by using voice command to the system.

Using Raspberry Pi and GSM survey on home automation[5]. In this paper, a home automation application using RPI and GSM is developed. Programming is developed in python for RPI operation.

Home automation in this system controls lightning in house, HAVC (Heating, Ventilation and air conditioning).

Survey on Home automation systems[12]. In this paper, a detailed survey on different home automation systems considering parameters like type of communication, technology and efficiency systems. Different technologies like WiFi, Bluetooth and Zigbee are used for communication, and different devices are used.

Home Automation using Internet of Things[6]. This paper presents an idea or a concept for home automation using voice recognition. Today, home automation industry is growing widely: this is powered by the need to provide support for aged and physically handicapped people.

Remote Home Automated switching system[7]. this paper provides remote controlling and automation for homes and offices. These are very essential in switching from a traditional to LED based lighting system.

IOT based Home Automation System with Pattern Recognition[8]. In this paper, a home automation was designed and implemented using arduino mega 2560 as the microcontroller and WiFi as the method of monitoring and controlling the home appliances.

Raspberry Pi home Automation using Android Application[9]. This paper presents a low cost and flexible home control and monitoring system using a raspberry pi module and a static relay, with internet connectivity for accessing and controlling devices and appliances remotely using smartphone android application.

Smart Home Automation : GSM security system Design and Implementation[10]. Smart home automation has attracted the interest of the research community during the last decade, at a great manner. In this paper, a security system for smart home automation is proposed. Home security systems consist a constantly developing research field.

Home Automation using Raspberry Pi controlled via an Android Application[11]. The overall design of home automation system implements low cost wireless communication between a Raspberry Pi module and an android based application to the IP appliances present at home. This paper provides a combination of these two.

A Review of Home Automation System with speech recognition and machine learning[13]. Many of the technologies currently used in smart homes can be adapted to meet a number of needs. By emerging these

technologies in homes can eliminate the need of care and grant independence with day to day activities.

Economical Home Automation System using UNO[14]. Home automation or smart home industry have seen dramatic growth in past years and will continue to in future as per the market requirements and its benefits. In this proposed paper we have tried to develop a home automation system that is affordable than the available assistants.

Home Automation using WiFi connection[15]. This paper presents a design of monitoring and controlling home automation system from an android application based on WiFi interconnection. Automation is a technique or a system of controlling a process by electronic devices with reducing human involvement to a minimum.

Home Automation using ZigBee [16]. This paper shows the potential of Zigbee through the design and implementation of home automation system. The home automation will be necessary in modern era. Home automation is the digital connectivity among different appliances.

Development of a low cost GSM Bluetooth home automation system[17]. In today's age of digital technology and intelligent systems, home automation has become one of the fastest developing technology in the world as more and more people begin to see the idea of remotely monitoring and controlling their home appliances.

Home automation using IOT and mobile app[18]. This paper presents an idea or a concept for home automation using voice recognition. The app would be featuring the process of voice recognition that would be taking commands from user in order to control different home appliances that would be connected via IOT.

Smart home automation based on IOT and Android technology[19]. Accessibility of rapid portable systems like Gand Long Term Evolution(LTE) combined with less expensive and open advanced cells, versatile industry has seen a gigantic development as far as giving different administrations and applications.

Survey on IOT Technologies for home Automation system[20]. In this paper wireless technologies like Bluetooth, WiFi and Zigbee have been used in wide range of applications like modern home security systems using low cost, low power, less complexity RF module.

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4. Conclusion

The survey is just brief over view of some proposed methods for study in the area of raspberry pi. This project has proposed the idea of smart homes that can support a lot of home automation systems. It is an efficient approach for smart homes Tthe present proposed work is a low-cost efficient system.To develop automated technique in conjunction with the advantageous features of pre-defined method, robust method is needed which will produce favourably good result in compared to existent approaches. The smart home automation device is evidently asset which can make a home situation and the surroundings where the electronic apparatuses are associated computerized. Individuals can associate their electronic apparatuses through smart home. We are yet to implement the project. Only the Design phase is mentioned in this paper.

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