

Voice Control IoT Home Automation Using Voice Assistant & Raspberry PI

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ABSTRACT

In the current times, technology is improving day by day and new technologies are emerging regularly these changes brought a drastic change in the field of electronics and IoT. Due to the invention of the latest electronic devices, it became very much easy in developing new real-time products with IoT technology, One of the inventions using this latest Technology is Voice Control IoT Home Automation Using Voice Assistant and Raspberry Pi. The voice-controlled raspberry pi will help with the home automation in a way that it listens to the commands from users and checks with the data present in it if the data is present it does the required operation. This increases human comfort a lot. A voice assistant is developed using python for this application purpose and used for the operations.

Keywords

Raspberry pi, Python, Voice Assistant.

Introduction

The foremost aim of technology is to increase efficiency and decrease human effort. With the invention of the “Internet of Things” in the last decade, humans are enjoying the prevalent computing in today’s life. Generally, the main aim of home automation is to control the complete home devices from a single place or from any place in the world which is achieved using IoT. All the employees who are working in any industry come home with full stress and they want to relax by doing bath with hot water.

Geysers should be on prior to using them for approximately 15mins when the person wants a hot water bath as soon as he receives home is impossible but using this technology the person can on the geyser while he/she was on the way to home using their smartphone. And especially in Foreign Countries, the temperature varies at nights as well so it becomes tough for people who reside there at night times but using this the temperature in the air conditioners change automatically depending on the temperature in the room if the temperature is high air conditioners get activated if temperatures fall down very low automatically air conditioners get

off and heaters get on and in the night if a person wants to on the lights by just their voice command, they can on them. This completely reduces human effort.

Literature Review

In this section, let's see different home automation system products existing in the current market. Intuitive house control [1] project mainly focuses on the scheming house control system's which provides intuitive assistance for mankind based on working sensors mesh which was 1st existing project and next is Smart House using raspberry pi [2] this project mainly functions on how to control house appliances secluded using any Internet-capable mobile devices and next comes Smart home system [3] This project is based on this project controls the home appliances and also provides security to the house these are the some of the projects which are currently existing in the market. The proposed project mainly hubs on house automation by recognizing voice using the controller raspberry pi and voice assistant. This project makes the users more convenient and comfortable.

System Description

In this work, the data aggregator is Raspberry Pi, where all the information is collected and it is used as a processor, which performs calculations on the data obtained. All the analog sensors continuously measure the temperature of the surroundings. These analog signals are given to Raspberry Pi. The analog sensors include a temperature sensor. Since raspberry pi performs calculations with digital data, an A to D converter is required to convert sensors' analog input data to digital data which is already present inside the raspberry pi. Output (temperature) can be monitored continuously on the mobile application while executing. This can be simultaneously recorded on the Cloud to store data. Here USB mike is also used for taking the user input and use predefined commands it compares and performs the required operations. The thermostat is used when the temperature falls below 10 degrees and air conditioners are used when the temperature raises above 35 degrees. So continuous monitoring of temperature is very much important.

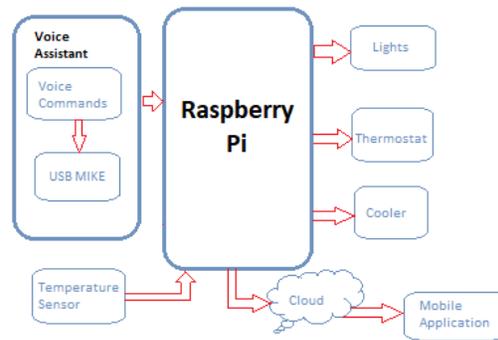


Fig.1 Block Diagram

Raspberry Pi 3B+

Raspberry Pi is one of the cheapest microcontrollers, also known as a card-sized system which is connected to a monitor or Smart TV using HDMI cables, and uses an external keyboard and external mouse to give input to the Raspberry Pi. It works on Linux operating system. Also, it supports different kinds of programming languages like Python, Java, etc. Raspberry Pi has many features, which are very helpful to build many applications. It is faster than another microcontroller because of its high clock speed i.e. 1.4 GHz. It can process high-end programs for applications like Cloud server, gaming, Weather Station console, etc.

USB Mics

Universal Serial Bus Mics are very powerful mics and work on all kinds of personal computers, Macbooks, Apple iPads. Raspberry pi ... this is a microphone that contains the necessary layout which can simply connect to a Universal Serial Bus port and start record. Generally, USB mics have adjustable stands so that they can be placed wherever required and can adjust based on our requirement. This is very much useful in passing commands to the board.

Temperature sensors

The temperature sensors are exact integrated temperature devices their output voltages are proportional to the Centigrade temperature. This output voltage can be evaluated to get a temperature reading in Celsius. The benefit of temperature sensors over thermistors is, external calibration is not required. The formula for converting the voltage to centigrade temperature for LM35 is *Temperature(in Centigrade) = Voltage Read by ADC / 10 mV*.

Coolers

Coolers or Direct current popularly known as dc fans are emerging in the latest times. Previously there used to be only the Ac devices which also require a large amount of current but now these dc devices are being introduced in the current market which also takes less power compared to ac devices and these are emerging in the latest technologies. This kind of Dc cooler is used very much nowadays.

System Implementation

The schematic diagram of this device is given below.

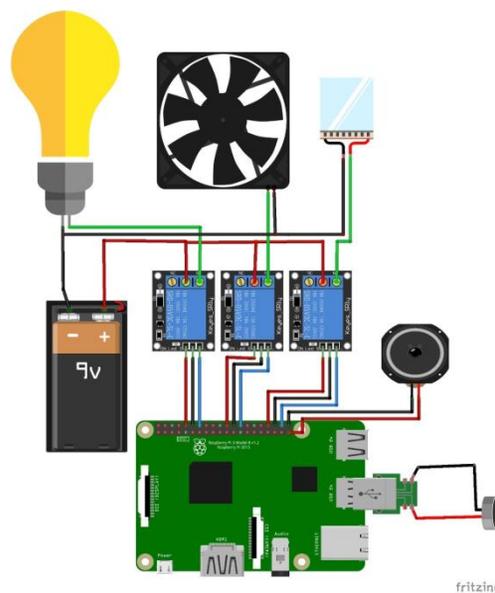


Fig.2 Schematic Diagram

All the sensors are connected to Raspberry Pi and necessary operations are handled by a raspberry pi.

The flow of execution of the implementation is given below.

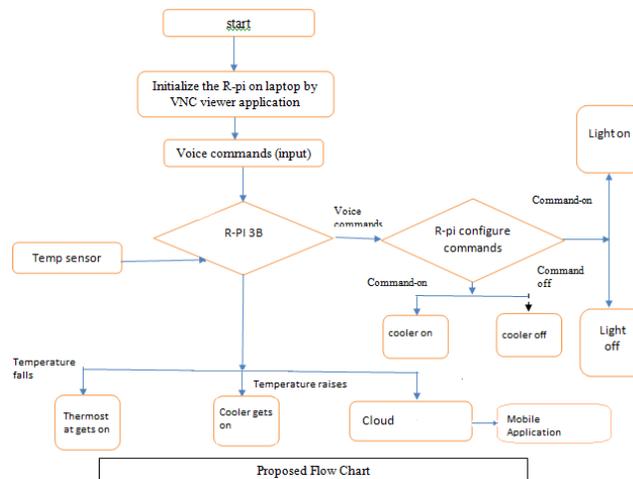


Fig.3 Flow Chart

The flow of execution of the proposed implementation is given below:

Firstly, the raspberry pi is initialized and then the voice commands are given through USB mike and raspberry pi configures the given commands to perform the pre-defined operations like on and off of the light and fan. Using a temperature sensor the temperature is monitored frequently this information is sent to the Firebase using the Firebase the information is transferred to the mobile application and the temperature can be seen in the mobile application and if the temperature raises cooler gets on automatically and if temperatures fall down then the thermostat is activated. This is the operation of our proposed system.

Software Implementation

Raspberry pi is used in this work and the software required for this work is Firebase cloud. In this implementation, python language is used for software interaction. The python program is saved in the external storage of the Raspberry pi. And it is connected using software named putty and the terminal of raspberry pi can be accessed using putty. This putty runs in a windows machine.

Results

The hardware setup is shown in below figure.



Fig.4 Application in android

The working model for the proposed system is implemented. All the values of the sensors are checked in such a way that they work similarly in all the conditions and can give output to all critical conditions. As we know that the clock speed of raspberry pi is high, the calculations performed on digital values are enough to get accurate values.

In figure 5, the temperature value is continuously displayed on the mobile application to which we connected through the cloud. The temperature value is updated every 2 minutes and will be displayed in-app within a fraction of seconds.

One should have a firebase account to send or receive data to the application. To store data in the cloud, a channel must be created. This channel has all the temperature values and status of electronic appliances.

The output on the application is observed as shown in the following figures:

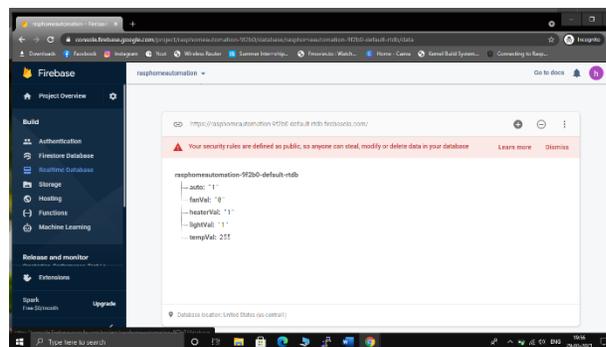


Fig.5 Output on firebase

While displaying on the application, the values are simultaneously updating in the Firebase cloud in the allocated channel. But the only problem with this is if the user wants to see the data in the cloud he/she must have connected to the Internet.

Conclusion

This system helps to give comfort to the users in the form of speed and accuracy. The information collected from the sensors is processed by the controller and sent to Google Firebase cloud. Then the system can use this data for analysis of the temperature and provide comforts to the users according to the conditions. The design and implementation of the work help controlling the devices from anywhere in the world. The status of the devices can be checked at any time the user needs. The developed system can be used/implemented in houses and offices. This device has a special feature that reduces the physical activity of users. This device is very simple and can be used by any person who doesn't know anything about the device and it is user understandable. This device can also be used for security purposes.

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