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Web based Solution for Smart Home Functionality Extension and Control, using Artificial Intelligence and Raspberry Pi

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Abstract - *Using voice commands to control smart devices has become very popular and common. There are already a number of devices on the market, which are powered by the existing online voice recognition services. Mechanisms are provided, to build custom voice commands controlled applications for such devices. On the other hand, there are various available voice recognition engines that can work in offline mode, which can be used to build custom voice processing applications, as well as voice commands enabled embedded devices. Our goal is to enable voice commands within the existing smart home automation (HA) system. We want to build the voice control module that can process the output of various speech-to-text engines, and convert it to actions within the HA system.*

Home automation (HA) systems let users monitor and control various devices and services, usually through the web or mobile applications. Recently, significant effort has been invested into developing voice control for home automation. Voice control is gaining popularity, as it facilitates the use of the HA systems. However, implementing the voice recognition module from scratch is challenging. Lots of training data is required, to achieve the needed accuracy of speech recognition.

The general goal of the home automation is to use networking technology to integrate the devices, appliances and services found in homes so that the entire domestic living space can be controlled centrally or remotely. "Home automation is a very promising area. Its main benefits range from increased comfort and greater safety and security, to a more rational use of energy and other resources, allowing for significant savings. It also offers powerful means for helping and supporting the special needs of people with disabilities and, in particular, the elderly. This application domain is very important and will steadily increase in the future

The idea behind this is to control home devices with voice. On the market there are many devices available to do that. But making your own is awesome. Build your personal assistant that will do the work for you. Just your assistant requires voice commands. According to voice commands home appliances will switch ON/OFF. Enable voice control in the smart home automation system. We identify possible architectures, depending on the voice recognition service API. We implement two of the proposed architectures, and compare them in terms of the performance and development cost.

The aim of the project is to create a convenient and user friendly environment for the home occupants. It also aims to intelligently coordinate all appliances communicating together, thereby ensuring greater comfort. One suitable programming method for home automation systems.

This project presents the development of a smart home using Google assistant. The idea behind this is to control home devices with voice. On the market there are many devices available to do that. But making your own is awesome. Build your personal assistant that will do the work for you. Just your assistant requires voice commands. In this project single board computer i.e. Raspberry pi 3 is used which includes creating Adafruit account then linking to IFTTT website then adding to Google Assistant for voice commands. Home Automation System is an emerging technology and also a need of today. The main objectives of home automation are controlling, management and coordination of home appliances in a comfortable, effective and secure way either centrally orremotely.

In this home automation appliances like Bulb, cooling Fan and Motor are used which can be controlled easily using the Google assistance from the voice control. Here we will install Google assistance in the raspberry pi and Raspberry pi will be attached with a mike which takes all the voice commands through which it will automatically control the home alliances. As the user give the voice command to the mike according to that the home appliances can be switched ON/OFF accordingly.

In this proposed system, Raspberry pi is installed with an Adafruit account with IFTTT website then adding to Google Assistant for voice commands. A USB Mike is provided with the raspberry pi to give the voice commands to control the home appliances.

Key Words: voice command, home automation

1. INTRODUCTION

This project presents the development of a smart home using Google assistant. The idea behind this is to control home devices with voice. On the market there are many devices available to do that. But making your own is awesome. Build your personal assistant that will do the work for you. Just your assistant requires voice commands. In this project single board computer i.e. Raspberry pi 3 is used which includes creating Adafruit account then linking to IFTTT website then adding to Google Assistant for voice

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1.1 System Architecture

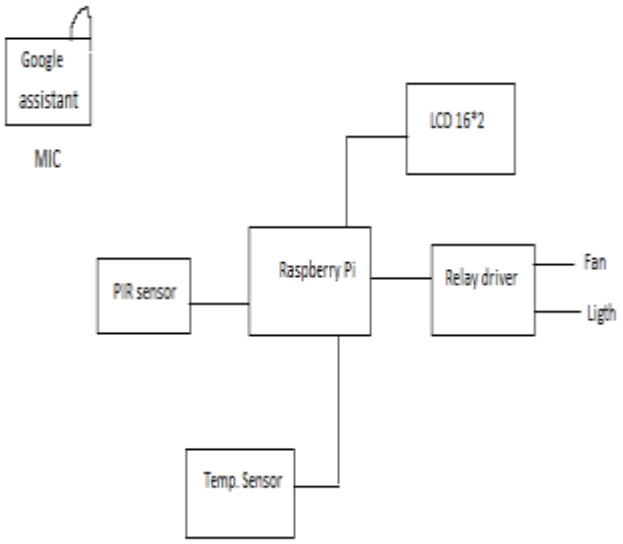

Fig. Architecture of the HA Using Artificial Intelligence & Raspberry pi

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1.2 Details of Implementation

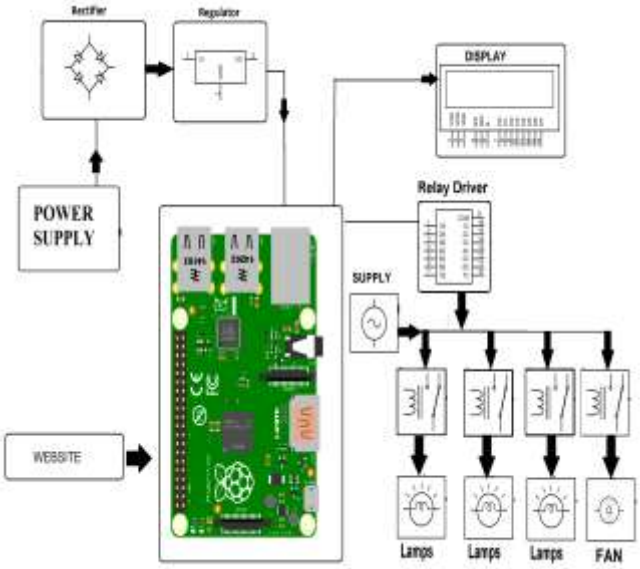

Fig shows the circuit diagram of our project.It consists of following hardware components:

1.2.1. Raspberry pi 3 model B+

1.2.2. PIR sensor

1.2.3. Temperature sensor (LM35)

1.2.4. Relay Module

1.2.5. LCD display (16*2)

1.2.1. Raspberry pi 3 model B+

The Raspberry Pi 3 Model B is the third generation Raspberry Pi. This powerful credit card sized single board computer can be used for many applications and original Raspberry Pi Model B+ and Raspberry Pi 2 Model B.

Processor speed ranges from 700 Mhz to 1.4GHz for the Pi 3 Model B+;on board memory ranges from 256 MB to 1GB RAM. Secure Digital (SD) cards are used to store the operating system and program memory in either SDHC or Micro SDHC sizes. The boards have one to four USB ports. For video output, HDMI and composite video are supported, with a standard 3.5 mm tip-ring –sleeve jack for audio output. Lower-level output is provided by a number of GPIO pins, which support common protocols like I2C.The B-models have an 8P8C Ethernet port and the Pi 3 and Pi Zero W have on board Wi-Fi 802.11n and Bluetoot.

1.2.2 PIR Motion Detector (HC – SR501):

HC-SR501 is based on infrared technology, automatic control module, using Germany imported LHI778 probe design, high sensitivity, high reliability, ultra-low voltage operating mode, widely used in various auto-sensing electrical equipment, especially for battery-powered automatic controlled products. The PIR (Passive Infra-Red) Sensor is a pyro electric device that detects motion by measuring changes in the infrared (heat) levels emitted by surrounding objects. When motion is detected the PIR Sensor outputs a high signal on its output pin. This logic signal can be read by a microcontroller and can be used to control other circuitry. The delay time / blocking time are adjustable using the potentiometers on-board. It can detect the signal from 10-12 feet. Its operating voltage is 5V DC. This sensor can be used to detect theft in a home when owner not present.3

1.2.3. LM35 Precision Centigrade Temperature Sensors:

LM35 is a precision integrated circuit temperature measuring device. Its output is voltage which is linear to the temperature. LM35 device draws only 60 μA from the supply, it has very low self-heating of less than 0.1°C in still air. r-LM 35 is an integrated circuit temperature sensor which can be used to detect the temperature in a centigrade scale(−55°C to 150°C).The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry it draws only 60mA from its supply, it has very low selfheating. In this system, it is used to adjust the HVAC (Humidity, Ventilation and AC) system in a home. LM 35 is less prone to oxidation and can measure high voltage range than that of thermocouples.

1.2.4. Relay Module 5V 4-channel:

It is a 5V 4-channel relay board used to control various appliances. It can be used with or without microcontrollers. Each 5V relay needs 20mA driving current. It has LEDs for indication of output status.

1.2.5. 16x2 LCD Display:

A 16x2 LCD means displays 16 characters per line and there are 2 such lines.LCD (Liquid Crystal Display) screens is an electronic display module. It is economical and easy programmable. These are preferred over seven-segment and other multi segment LEDs.

2. RESULT

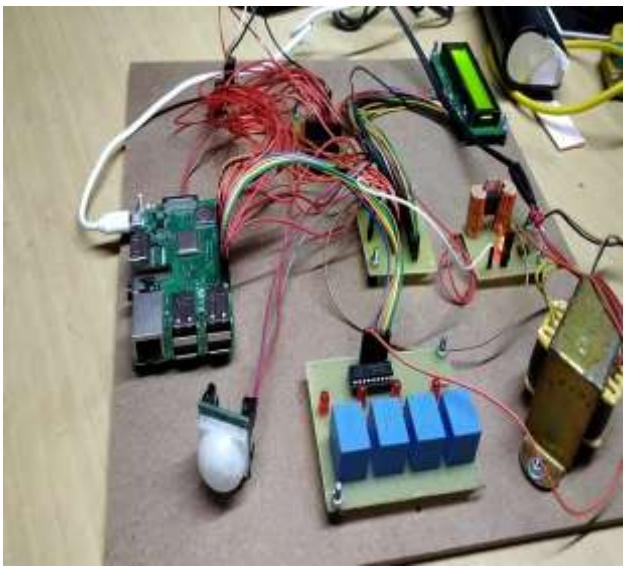

Fig. view of the home automation system showing different sensors and modules placed in the required places.

Fig .Sending command through Voice cb 16 App

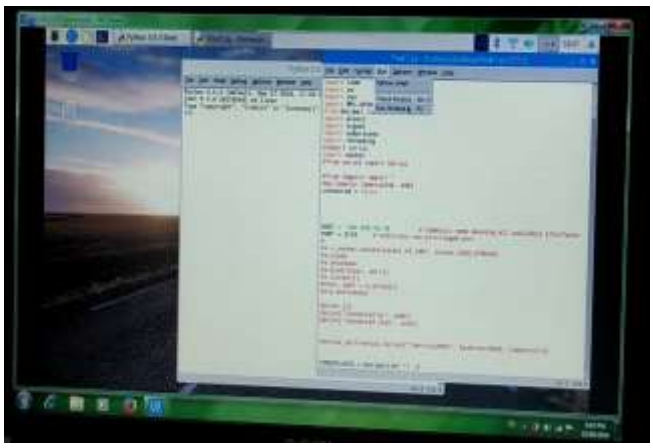

Fig. Output on vnc viewer

3. CONCLUSION

According to this system, a smart voice control home automation system is deployed into the Raspberry pi using Adafruit account with IFTTT website and Google assistance API within it. Through which a user can control the home appliances just by giving the voice as input.

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