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Voice Recognition Based Home Automation using Raspberry Pi

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Abstract:- The aim of this project is to develop a system that will control the home appliances through voice and also provide security in the absence of the owner with the application of Raspberry Pi. The main objective of this project is to save time and man power . Python is used as a main programming language by default, provided by Raspberry Pi. Voice recognition is developed by using Google API. Our system will detect human presence using motion sensor, whenever a person enters the room, the motion is detected through motion sensor and automatically Buzzer will be on. With the help of Temperature Sensor room temperature and Humidity wil be displayed on LCD display.

Keywords:- *Raspberry pi, Python language; PIR sensor; Temperature Sensor.*

I. INTRODUCTION

Nowadays, people want to carry out tasks as quickly, efficiently and simply as it can be with the least amount of effort. This need can be easily met by converting 'normal' homes into 'smart' ones by implementing a home automation system. Smart home is not a new term for science society, it has been used from decades. As electronic technologies are advancing, the field of home automation is increasing rapidly. There were various smart systems have been proposed where the control is via Bluetooth, internet etc. Design of Controlling Home Appliances through voice recognition using Raspberry pi as well as providing security is an attractive option to homeowners. Automation have a continuously increasing and very important role in the industrial and economic world as well as in the daily experience. However, cost and ease of installation and use are still barriers to widespread adoption. The goal of this paper is to design a low cost, open source, and flexible system with increasing variety of devices to be controlled. The voice recognition based home automation systems for paralyzed and old people can make the system more user friendly and easy to operate. Home automation system for old or disabled people will offer raised quality of life for them. In this system, we use Raspberry pi which is a high performance, low cost computer. Raspberry Pi have several generations of computer systems which have different configuration. The latest version of Pi 'Raspberry Pi 3' have on-board Wi-Fi and Bluetooth. Based on Raspberry Pi, this project will implement several common home security peripherals. A thermostat will be available to monitor temperature. Google API's are used to recognize the voice commands. It receives the commands and tells the system to perform desired function with the desired appliance. The system also tracks the current state of the appliances and other functionalities can be added to the system with simple codes and devices. Python is used as the main programming language. Along with home automation, security is also provided in this system. We use motion sensor to detect human motion and a camera module which captures the image of the unauthorized person and sends it to the owner's phone via internet and also sends an offline message using GSM module. By the rapid developments of new technologies, monitoring, controlling services have been started to be served along with internet as an instrument providing interaction with machinery and devices. The system can be used in several places like banks, labs, hospital and other sophisticated automated system, which reduces the hazards of unauthorized entry. The main reason to develop this system is to save time and man power along with security and convenience. Controlling home appliances through voice along with security makes this system

II. LITERATURE SURVEY

In this section, we briefly survey the existing works for intelligent home network systems and, based on their main contributions, try to classify them into three types: Decision Support oriented, Service Provision oriented and Real Implementation oriented. First, some work has focused on how to make the decisions for the home networks more efficiently.

For example, intelligent home control [1] project focused on designing home control system's that provides intelligent services for users based on active sensor network. Secondly, Home automation using raspberry pi [2] project deals with controlling home appliances remotely through any Wi-Fi capable mobile device. Smart home system [3] project based on aurdino proposed a system which controls home appliances along with security. Smart home project[4] based on sensing mechanism provides home automation with increased functionalities such as alarm based smart lock, smart water tank, mosquito sensing.

Lastly, more practical research to emphasize a real implementation has been done as well. H Bharathi[5] suggested home automation using Raspberry Pi and android mobile phone to control electronic appliances anywhere

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throughout the world. Compared to existing work, this paper focuses on home automation through voice recognition using raspberry pi along with security. It makes the users more convenient and comfortable. Our system provides home automation with additional functionalities such as gas detection, locking gas valves etc.

III. PROPOSED SYSTEM

Fig (1) shows the block diagram Voice Recognition based home automation and Security using Raspberry Pi. The project deals with both Software and Hardware components. The hardware part consists of input command is voice, it means controlling home appliances by voice. The block diagram consists of a Raspberry Pi , Bluetooth module , temperature sensor ,motion sensor, Gas sensor, Ethernet cable, Wi-Fi router, Relay circuit board, 5v power supply and android mobile .Python is used as a main programming language provided by Raspberry pi.

IV. SALIENT FEATURES OF RASPBERRY PI

Raspberry Pi is an ARM based computer credit card in size. It is single "on chip" computing hardware. Here the raspberry pi3 model B is used. Raspberry pi 3board has 802.11 n wireless LAN and Bluetooth 4.1.and WIFI in built. We installed raspbian stretch in to the memory card used for the board. Raspberry Pi 3 has a LINUX based operating system call Raspbian. The R-pi board contains 40 general purpose input output pins (GPIO) which can be used for digital input

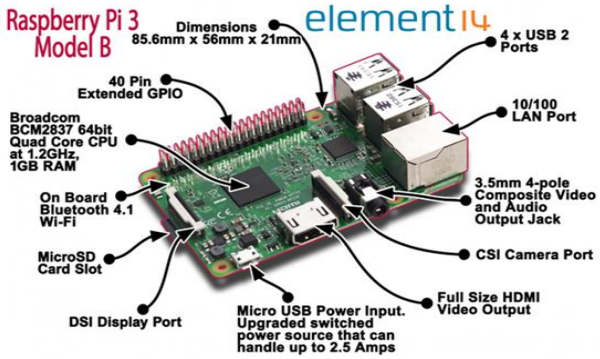

Fig 1:- Diagram of Raspberry Pi 3B

and digital output, it contains 4 USB ports, 1 HDMI port, 3.5mm Audio jack, micro USB power supply. This board also has serial connections for connecting camera and a display.

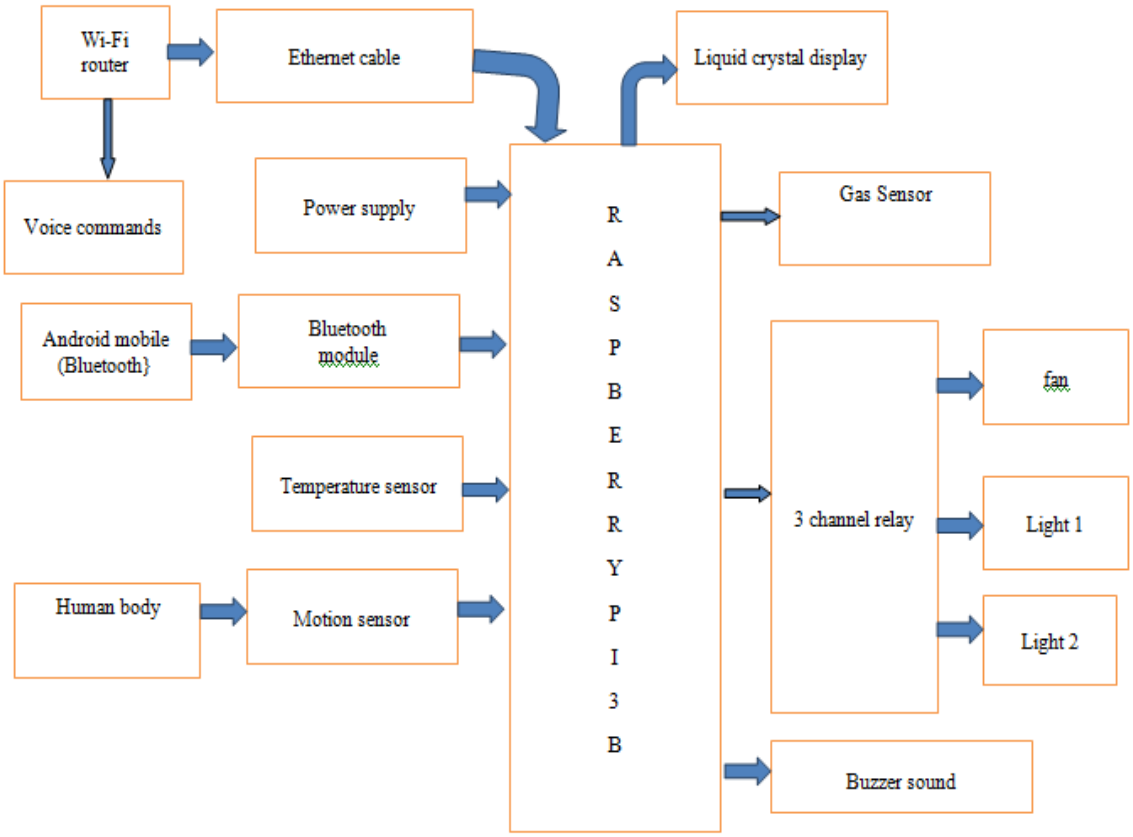

Fig 2:- Block Diagram

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A. Motion Sensor

A passive infrared sensor (PIR sensor) is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view.PIR sensor has two slots made of special material sensitive to IR. When the sensor is inactive, then the two slots sense the same amount of IR. The ambient amount radiates from the outdoors, walls, room, etc. It is used for security purpose.

Fig 3:- Motion Sensor

B. Bluetooth module

It is a wireless data exchanging between two Bluetooth modules within the range of 10 meters. Here we are using HC-05 Bluetooth module. [6].

V. WIFI AND ETHERNET CABLE

By connecting Wi-Fi router to the R-pi with the help of Ethernet cable we can identify the IP address of the Raspberry pi by downloading network IP application scanner'

A. Relay circuit board

Relays are simple switches which are operated both electrically and mechanically. A relay is an electrically controllable switch widely used in industrial controls, automobiles, and appliances .It allows the isolation of two separate sections of a system with two different voltage sources. The relay circuit board consumes 12V.

B. Temperature Sensor

Here we are using DHT11 Humidity and Temperature Sensor. The DHT11 is a basic, ultra low-cost digital temperature and humidity sensor which generates calibrated digital output. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed).

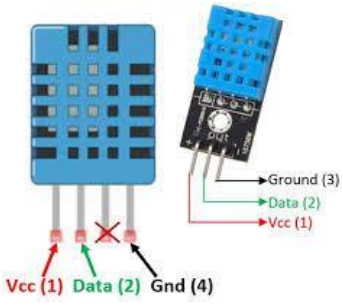

Fig 4:- Temperature *Sensor*

The DHT sensors are made of two parts, a capacitive humidity sensor and a thermistor. There is also a very basic chip inside that which does some analog to digital conversion and spits out a digital signal with the temperature and humidity. The data pin of this sensor is connected to the GPIO pin of Raspberry pi.

C. Gas Sensor

A gas sensor is deployed near the gas valve to prevent a gas explosion. It periodically checks the gas in the atmosphere and reports the values to the home control system to prevent gas explosion.

D. *Buzzer*

Buzzer is a transducer which produces sound signal to the corresponding electrical signal. A buzzer is a mechanical, electromechanical, magnetic, electromagnetic, electro-acoustic or piezoelectric audio signalling device.

Fig 5:- Diagram of Buzzer

A piezoelectric buzzer can be driven by an oscillating electronic circuit or other audio signal source.

VI. SOFTWARE DESIGN

➢ *Installation*

Download the Raspbian stretch zip file from the raspberry. Org [7] and extract the zip file. Then download the win disk 32 manager [8]. Now connect SD card (format the sd card after connecting to pc) open the win32 disk application write the image file into that memory card after write successful eject your memory card and load it into raspberry pi. Now connect raspberry pi to your laptop and give LAN connection in order to know the IP address of the raspberry pi by installing IP scanner. Then download putty enter the IP address of the pi .By the application of the VNC viewer we can install in the laptop we can operate through laptop.

VII. PROGRAMMING LANGUAGE

Python is the programming language. Python language is used to develop the code for the speech based Home automation system. It is a high level programming language widely used for raspberry pi.

VIII. METHODOLOGY

Voice commands are given through AMR (android meets robot) voice app which connects to the nearby Bluetooth device and sends it to the r-pi and the corresponding action is performed. For Security purpose we are using

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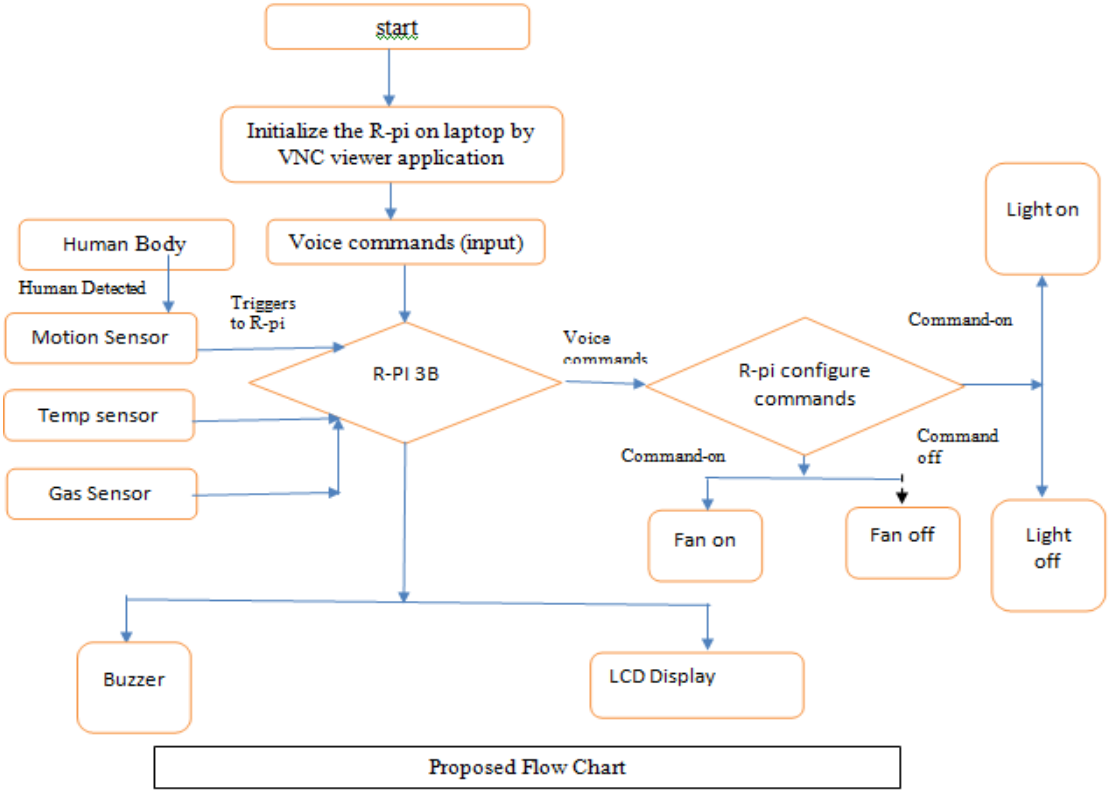
Motion sensor, and Temperature sensor and Gas Leakage sensor. In order to know the temperature and Humidity value we are using temperature sensor (dht-11) and its value is displayed on LCD screen. When PIR sensors detects any motion it triggers to raspberry pi and raspberry pi sends signals to the Buzzer automatically buzzer will be on. When any Gas leakage occurs automatically it will detects and it will sends signal to Buzzer on. We can do watering of plants in the home garden time to time by interfacing the water motor to the Raspberry Pi and giving the time delay to the Raspberry Pi automatically it turns ON/OFF the motor which reduces the human effort.



Proposed Flow Chart

IX. RESULTS

Controlling home appliances through voice and providing security to the home when the owner is absent.

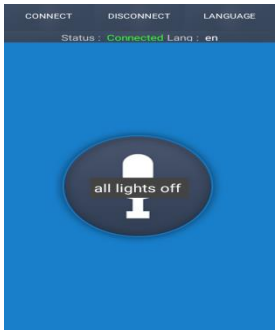


Fig 6:- screenshot of android mobile phone when Bluetooth module is connected to Bluetooth of mobile phone. When the Person says “ALL LIGHTS ON ” or “ALL LIGHTS ON”

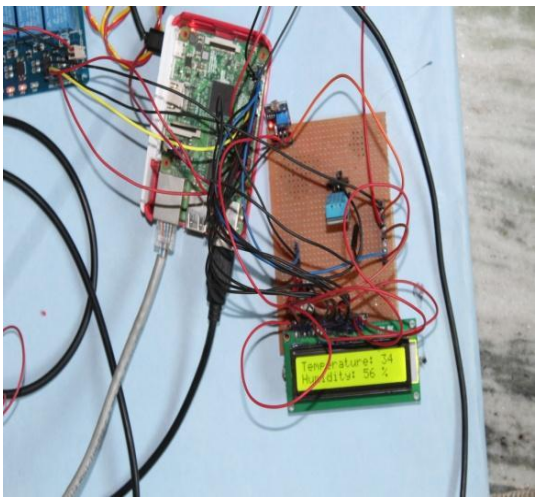


Fig 7:- To display room temperature

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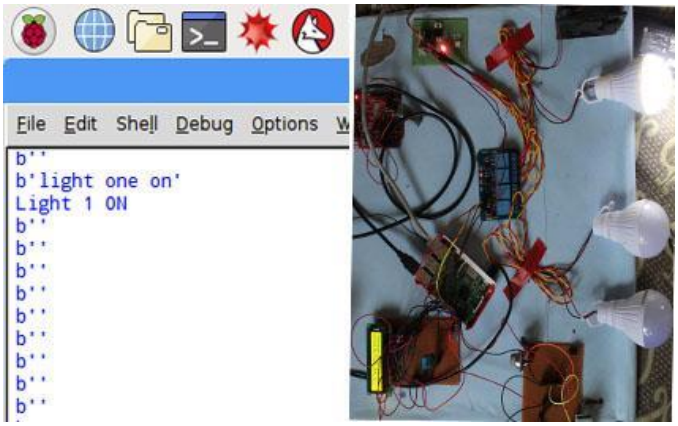

Fig 8:- When light 1 ON humidity

Fig 9:- To display "ALL LIGHTS OFF

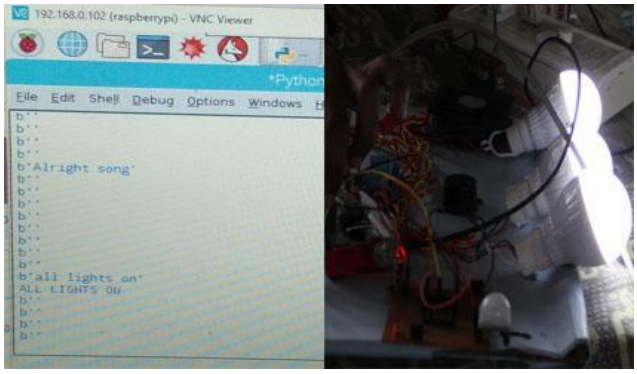

Fig 10:- To display "ALL LIGHTS ON"

X. CONCLUSION

The main aim of the project was to design a system in such a way that to produce maximum output with minimum complexity. Voice controlled home appliances is to reduce the human efforts. It is mainly helpful for old and paralyzed people. By temperature sensor room temperature and Humidity will displayed on LCD display. If any unknown persons enters into room or any gas leakages occurs automatically Buzzer will be on. It's security features can be extended for future scope by interfacing camera to Raspberry Pi.

XI. ACKNOWLEDGEMENT

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