

VOICE CONTROL PERSONAL ASSISTANT USING RASPBERRY PI (NEOBOT)**B.L.Malleswari**

Principal & Professor, Department of Electronics and Communication Engineering,
Sridevi Women's Engineering College, Hyderabad, India, blmalleswari@gmail.com

E.Krishnaveni

U.G Student, Department of Electronics and Communication Engineering, Sridevi Women's
Engineering College, Hyderabad, India

D.Rajasree

U.G Student, Department of Electronics and Communication Engineering, Sridevi Women's
Engineering College, Hyderabad, India

K.Vasavi

U.G Student, Department of Electronics and Communication Engineering, Sridevi Women's
Engineering College, Hyderabad, India

Abstract

This project paintings goal to accumulate a Personal Assistant via way of means of the usage of Raspberry Pi as a processing chip and underlying architecture. It 6emphasizes the substitution of screen-primarily based totally interplay via way of means of utilizing ambient technologies, Robotics and IoT, the way the consumer interface is incorporated with the bodily gadget. It accommodates of components, for example, IR sensors, Pi camera, Mic and Motor Driver. Furthermore, it is a voice managed Personal Assistant whose actions can be managed through voice instructions, and it has the potential to peruse the content material from snapshots after which articulate the equal to the patron via way of means of utilizing the built-in speaker. Furthermore, it can assist the outwardly disabled to connect to the arena via way of means of giving them to get admission to informative reassess like Wikipedia, Calculator, and so forth via way of means of the usage of their voice because the command.

Keywords: IoT, Raspberry pi, virtual Assistant, OCR (Optical Character Recognition), Voice controlled.

1. Introduction

Now-a-days, it has become very rare to find a human being without interacting with a screen, regardless of whether it is a PC or mobile phone. A screen that is a postcard-sized surface has somehow become a barrier and escapes the route in social situations, absorbing our look and taking us somewhere else. Soon, with the increasing proliferation of the Internet of Things (IOT), we will enter into the period of screen-less cooperation or Zero UI where we will wind up with more screens, everything will be a screen. Zero-UI is a technology that utilizes our actions, voice, and even musings to make the system react to us through our conditions. Instead

of depending on clicking, composing, and tapping, clients will currently enter data through voice. Communications will be moved far from telephones and PCs into physical gadgets which we will speak with. This is all eventual believable by utilizing Robotics or IOT. Robotics is the branch of technology that manages the development, design, operation, and application of robots.

Our assistant is artificially intelligent and controlled from end to end predetermined voice directions. It gets a consistent signal from the IR sensor to locate the constant way for a run. It makes the utilization of the Pi camera module for unique handwritten or printed content from the picture and articulates it to the client by utilizing a built-in speaker. It can perform Arithmetic computation dependent on voice commands and give back the processed solution through a voice and look web-dependent on the client's query and give back the answer through a voice with further spontaneous questions by the assistant.

Existing System

The present day machine reports the disadvantage that simply predefined voices instructions are doable, and it could save simply restrained commands. Subsequently, the purchaser cannot get complete facts lucidly. These structures are gambling out the limited venture, both simply voice managed or OCR.

Proposed System

The proposed device is with the conclude intention that it is able to defeat from the risks of the modern-day device with the aid of using making it a standalone non-public assistant that may be related completely through the client's voice. Furthermore, which carry out unique errands like perusing content material from a picture, controlling motion through voice primarily based totally indicated directions, and so forth. This device is a version for a collection of employment

2. Literature Review

Artificial intelligence is a territory of software engineering that arrangements with enabling machines to appear like they have human intelligence. Extreme AI would be an entertainment of the human manner of thinking that is a manmade machine with our scholarly capacities.

Robotics is a branch of a building that includes the origination, plan, fabrication, and activity of robots, that can take every necessary step of a man and that work naturally or are controlled by a PC. RPI has been utilized for different applications, in the creators have proposed a framework that centers around cost sparing and improving the nature of administration in the field of innovation helped to instruct.

The greater part of the acknowledgment frameworks depends on a PC, the convenience of which is constrained by its weight, measure, and power utilization.

Our proposed system aim at a robotic vehicle operated by human speech commands. The system operates with the use of an android device that transmits voice commands to raspberry pi to achieve this functionality. The transmitter consists of the android phone Bluetooth device.

The voice commands recognized by the module are transmitted through the Bluetooth transmitter. These commands are detected by the robotic vehicle to move it in left, right, backward and front directions. The Bluetooth receiver mounted on the raspberry pi is used to recognize the transmitted commands and decode them. The controller then drives the vehicle motors to move them accordingly. This is done with the use of a driver IC used to control the motor movements. The Bluetooth technology used to transmit and receive data allows for remotely operating the system within a good range. A voice-operated robot is used for one moving object is developed such that it is moved as per commands given by the voice recognition module and that command is received by the robot and the robot is matched the given command with the stored program and then set the command as per voice using wireless communication.

The project aims to build an autonomous robot using raspberry pi as a processing chip. An HD camera is used to provide and detect the obstacle from the real world to the robot. The robot is capable of avoiding the obstacle occurring in its path using an obstacle detection algorithm and moving in an obstacle-free path. The pi camera module will detect the obstacle on a real-time basis and using an image processing algorithm it will detect the obstacle and feedback to the raspberry pi wherein it will change the path of the robot and divert it to the obstacle free path. The voice-controlled robotic framework is exceptionally helpful in territories where there is a high hazard for people to enter. A voice-controlled robotic framework is controlled through voice orders got using the android gadget. The reconciliation of the control unit with a Bluetooth gadget is accomplished by utilizing a Bluetooth module to catch and read the voice summons. The robotic vehicle works according to the summon got through the android gadget, for this Raspberry pi is incorporated in the framework. The controlling gadget might be any advanced mobile phone having an Android OS. The transmitter utilizes an android application required for transmitting the information. The beneficiary end peruses these summons and translates them into controlling the robotic vehicle. The android gadget sends orders to advance the vehicle in, reverse, right, and left bearings. After getting the charges, Raspberry pi works the engines keeping in mind the end goal to move the vehicle in four ways. The correspondence between the android gadget and recipient is sent as serial correspondence information. Raspberry pi program is intended to move the engine through an engine driver circuit according to the charges sent by an android gadget.

3. SYSTEM DESIGN

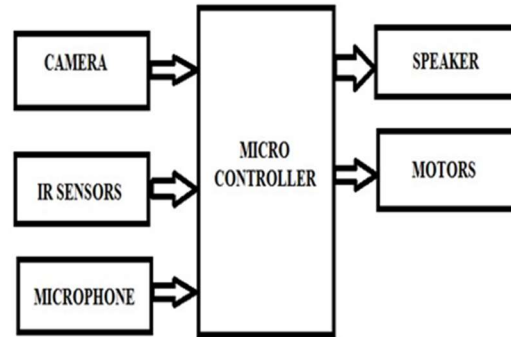


Fig 1. Block diagram

The system works on the principle of speech recognition. Firstly, the user starts the device (Raspberry Pi), and on startup, the Pi greets the user. The python script which consists of the program code is executed automatically (auto-start) on system startup. The input to the system is fed through the microphone in speech form, the system records this speech form until a pause is observed to know the user has finished the request, and then it is converted into text form for the machine to understand. The algorithm is built in such a way that the system processes the request and searches for the keyword and delivers appropriate output in textual form, which is later converted to speech using the speech recognition module. This speech is delivered via output speakers connected to the audio jack.

4. HARDWARE COMPONENTS

- 1) Raspberry Pi model B+
- 2) Motor driver(L298N)
- 3) DC motors
- 4) Pi Camera
- 5) IR Sensor
- 6) 4AAA battery
- 7) Speaker
- 8) Mic
- 9) L-shaped aluminum strip to support Pi camera.

Raspberry Pi:-

The Raspberry Pi is a minimal effort, Visa estimated computer that connects to a computer or TV. It is an able little device that provides power to individuals of any age to explore computing and to figure out how to program in dialects like Scratch and Python. It can do everything you would expect a personal computer to do, from browsing the web and playing top-notch videos to spreadsheets, word processing, and playback.

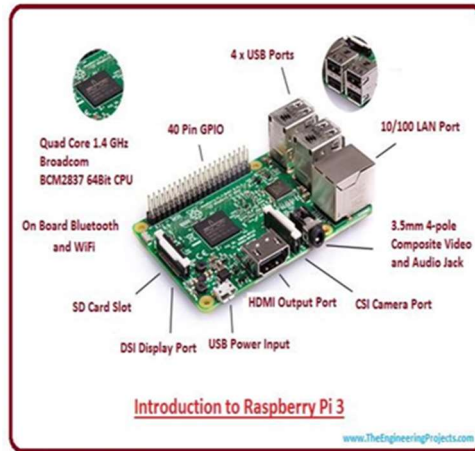


Fig 2. raspberry pi architecture

Motor Driver IC (L298N)

The L298N is a dual H-Bridge motor driver that in the meantime allows speed and control of two DC motors. The module can drive DC motors with voltages of 5 and 35V with a peak current of up to 2A. It uses the standard logic level control signal.

Pi Camera

It tends to be utilized to take top-quality video, and addition, still photos. It underpins 1080p30, 720p60, and VGA90 video modes, and still capture. It appends using a 15cm lace link to the CSI port on the Raspberry Pi.

IR Sensor:-

This module has a few infrared transmitters and Fig.1. Raspberry Pi the receiver tube, the infrared radiation tube that emits a Specific frequency, experiences a snag discovery course (reflecting surface), reflected infrared back to the receiver tube

Python:-

Python is a broadly utilized universally useful, high-level language. Its language syntax enables the developer to compose the code in fewer lines when contrasted with C, C++, or Java.

OpenCV:-

OpenCV (Open Source Computer Vision Library) is a BSD-licensed open-source library with several hundred computer view algorithms. It has a modular structure which means that the package includes some common or static libraries. It currently supports a wide range of programming dialects such as C++, Python, Java, and so on and is accessible on various platforms including, Windows, Linux, OS X, Android, iOS, and so forth.

OCR:-

OCR stands for "Optical Character Recognition." OCR is a technology that perceives messages inside a computerized picture. It is usually used to perceive the message in examined records. Its innovation can be utilized to change over a printed copy of a record into an electronic rendition.

Google Assistant SDK:-

It gives us a chance to include hot word detection, voice control, normal dialect comprehension, and Google's smarts to our gadget.

Our device catches an utterance, sends it to the Google Assistant, and gets spoken audio notwithstanding the crude content of the articulation.

Google Assistant Library:-

It gives us a turnkey solution for incorporating the voice assistant into our device. This library is written in python and is bolstered on devices with Linuxarmv7l and Linux-x86_64 structures.

Google Assistant Service:-

It is the best alternative for adaptability and wide stage bolster. It uncovered a low-level API that specifically manipulates the sound bytes of an Assistant ask for and reaction.

5. WORKING

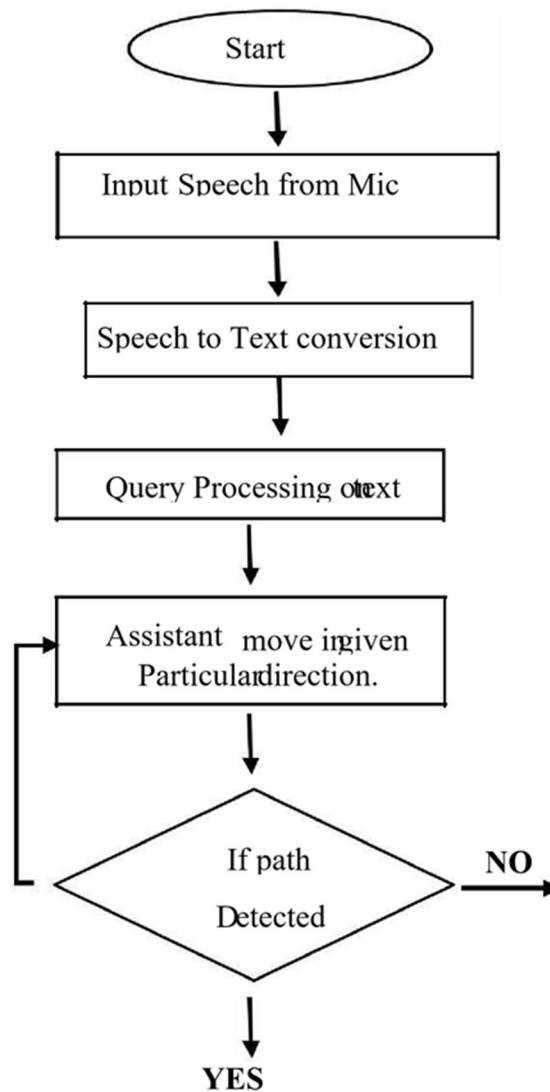
The raspberry pi based personal assistant comprises three fundamental modules: Voice Control, Character recognition, and Virtual Assistant.

This assistant can be controlled by the customer by giving explicit voice directions [1][7]. Right off the bat, the speech is transformed into text by a microphone. At that point, the content is processed and when the order given to the assistant is perceived, the assistant will react by moving in a provided specific guidance.

Our main idea is to create a type of menu control for our assistant, where the menu is driven by the voice. What we are doing is controlling the assistant with the following voice instructions:

INPUT (User Speak)	OUTPUT (Assistant does)
Forward	moves forward
Back	moves back
Right	turns right
Left	turns left
Stop	stops doing the current task

Table 1. Movements are done by the Assistant



Fig; Flow chart

The steps of Voice Control are as follows:

1. It will take the speech as an input through the Mic
2. Convert the speech into plain text.
3. Then the query is processed based on the plain text generated in step2.
4. The Assistant will try to move in the provided direction if the path is detected otherwise Assistant will stop.

Character Recognition [3]:-

This assistant will have the capacity to peruse manually written or printed content whether from a checked record, a photograph of an archive, or from caption content superimposed on a picture. The Pi camera module is utilized to capture the picture. The picture is caught by the camera module and put away in a .jpg document organize. The captured picture is changed over to a .txt record. The content record is then changed over to a .flac document which is given as a contribution for interpretation.

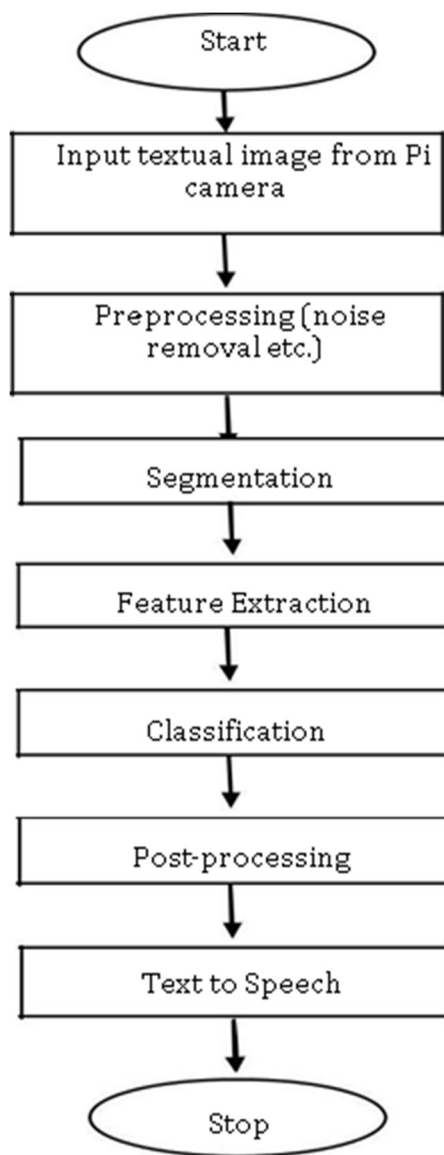


Fig.6. Flow Diagram of Character Recognition

Virtual Assistant:-

Virtual Assistant depends on natural language processing, a system of changing over discourse into text.

In this module, we utilized the Google Assistant API since Google Assistant is the best-adjusted remote helper[9]. It got a little-preferred standpoint over others for precedents Alexa, and Siri[10]. It answers the most inquiries effectively and furthermore increasingly conversational and setting mindful. With Alexa and Siri, it is critical to get the command without flaw to conjure the required reaction however in correlation; it is truly adept at understanding the natural language.

Procedures:

- 1) Assistant first records your discourse and sends it to the Google server to be analyzed more efficiently.

- 2) Server separates what you said into individual sounds. At that point, it counsels a database containing different words' elocutions to discover which words most intently compare to the mix of individual sounds.
- 3) It then recognizes keywords to understand the tasks and do relating functions. For instance, if the Assistant notice words like "weather", it would tell the weather forecasts without lifting a finger.
- 4) The Server sends the data back to our device and the assistant may speak.

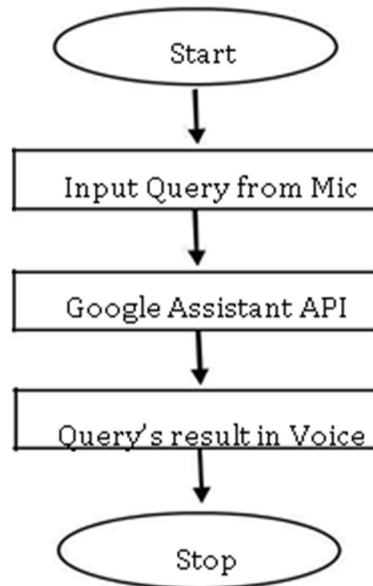


Fig.7. Flow Diagram of Virtual Assistant

VI. RESULT

The designed hardware prototype model is as appeared in fig. underneath:

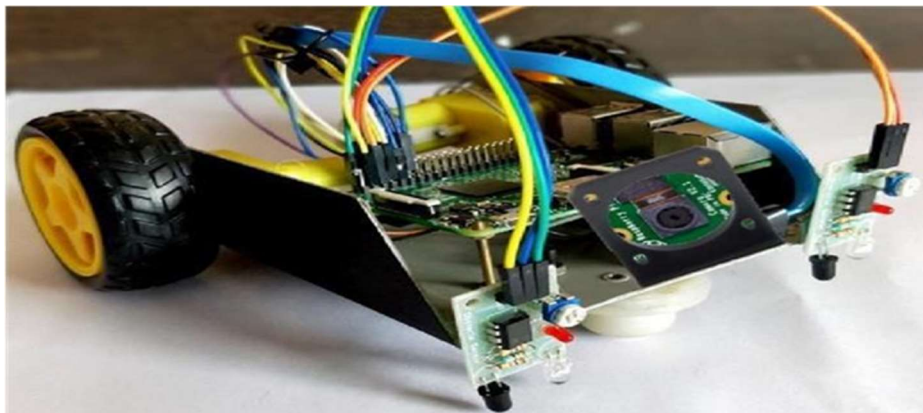


Fig.8. Hardware model

The Voice-controlled personal assistant is accomplished by the utilization of the Raspberry Pi board and takes a shot at the thought and rationale it was planned. As the assistant utilizes Google Assistant API so it gives answers accurately with a precision of 85.5%. Every one of the directions given to it is coordinated with the names of the modules written in the program

code. On the off chance that the name of the command matches with any arrangement of keywords, those set of actions are performed by the Voice-controlled assistant. For the movement order, the assistant has an exactness of about 95% that is following 1-2 seconds the movement direction is trailed by the assistant, and the assistant moves in RIGHT, LEFT, FORWARD, and BACK headings as indicated by the order and STOP.

All things considered, the assistant works on the expected lines with all features that were at first proposed.

Furthermore, the voice-controlled personal assistant likewise gives enough guarantees to the future as it is exceptionally adaptable and can be added to new modules without disturbing the working of current modules.

7. CONCLUSION

In this present work, the design, and implementation of the Voice controlled personal assistant has different working modules, for example, Voice Control, Character recognition, and Virtual Assistant. After several runs and tests, our features have worked proficiently with a worthy time postponement and then all the features are effectively integrated into this assistant and contribute towards the better working of the unit. Hence the project has been effectively structured and examined. Combined with AI and propelled data analytics utilizing Google Assistant API, the assistant develops the capability to shape a sympathetic and customized association with the clients. The proposed Raspberry Pi-based voice-operated personal assistant brings more comfort and simplicity to debilitated individuals.

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