Creating Neobot: A Raspberry Pi-Based Voice-Operated Personal Assistant

Mr.G.Biju George bijugeorge@stellamaryscoe.edu.in
Mrs.P.Baby Shola babyshola@stellamaryscoe.edu.in
Mr.G.Pratheep pratheep@stellamaryscoe.edu.in
Mrs.E.Ramola ramolae@stellamaryscoe.edu.in
Department Of Electronics and Communication Engineering
Stella Mary's College Of Engineering, Tamilnadu, India

Abstract—This research work aims to build up a personal assistant by using Raspberry Pi as a processing chip and underlying architecture. It emphasizes the substitution of screen-based interaction by utilizing ambient technologies, Robotics and IoT, means the user interface is integrated with the physical gadget. It comprises of components, for example, IR sensors, Pi camera [6], Mic and Motor driver. It is a voice controlled personal assistant whose movements will be controlled through voice directions and it has the capacity to peruse the content from pictures and then articulate the equivalent to the client by utilizing the inbuilt speaker. It can help the outwardly disabled to connect with the world by giving them the access to informative sources like Wikipedia, Calculator, and so on by using their voice as the command.

Keywords—IoT, Raspberry Pi, Virtual Assistant, OCR (Optical Character Recognition), Voice Controlled

INTRODUCTION

Today, it has become very rare to find a human being without interacting with a screen, regardless of whether it is a PC or mobile. A screen which is a postcard-sized surface has somehow become a barrier and escapes the route in social situations, absorbing our gaze and taking us somewhere else. Soon, with the increasing proliferation of the Internet of Things (IoT), we will enter the period of screen-less cooperation or Zero UI[7][11] where we will wind up with more screens, everything will be a screen. Zero-UI [7][11] is a technology that utilizes our movements, voice and even musings to make system react to us through our conditions. Instead of depending on clicking, composing, and tapping, clients will currently enter data by means of voice. Interactions will be moved far from telephones and PCs into physical gadgets which we'll speak with. This all eventual conceivable by utilizing Robotics or IoT. Robotics is the branch of technology which manages the development, design, operation, and application of robots.

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

LITERATURE SURVEY

The current system experiences the downside that just predefined voices directions are conceivable and it can store just constrained commands. Subsequently, the client can't get full data lucidly. These systems

are playing out the restricted assignment either just voice controlled or OCR.

PROPOSED SYSTEM

The proposed system is with the end goal that it can defeat from the disadvantages of the current system by making it a standalone personal assistant that can be associated exclusively through the client's voice. Furthermore, which perform different errands like perusing content from a picture, controlling movement through voice based indicated directions, and so forth. This system is a model for an assortment of employment

List of hardware

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 aluminium strip to support Pi camera

Raspberry Pi:-

The Raspberry Pi [2][4] 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 the top-notch video to spreadsheets, word processing, and playback.

Fig 1: Raspberry Pi

Motor Driver IC (L298N) [8]:-

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.
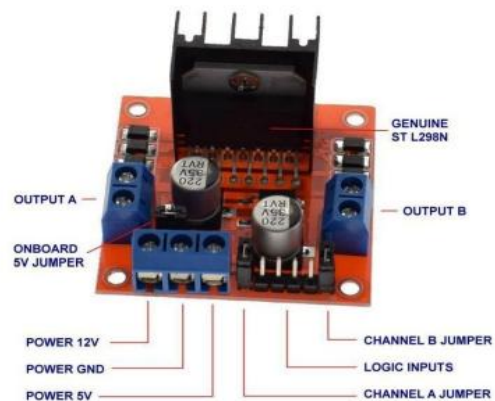
Fig 2: Motor driver IC(L298N)

Pi Camera [6]:-

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

Fig 3: Pi Camera

IR Sensor:-

This module has a few infrared transmitters and 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

Fig4:IR sensors

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 that means that the package includes some common or static libraries. It currently supports a wide range of programming dialects such as C++, Python, and 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 message 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 hotword 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 to 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 which specifically manipulates the sound bytes of an Assistant ask for and reaction.

WORKING

The raspberry pi based personal assistant comprises of three fundamental modules: Voice Control, Character recognition, and Virtual Assistant. Voice Control [5]:- 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[12]. What we are doing is controlling the assistant with the following voice instructions:

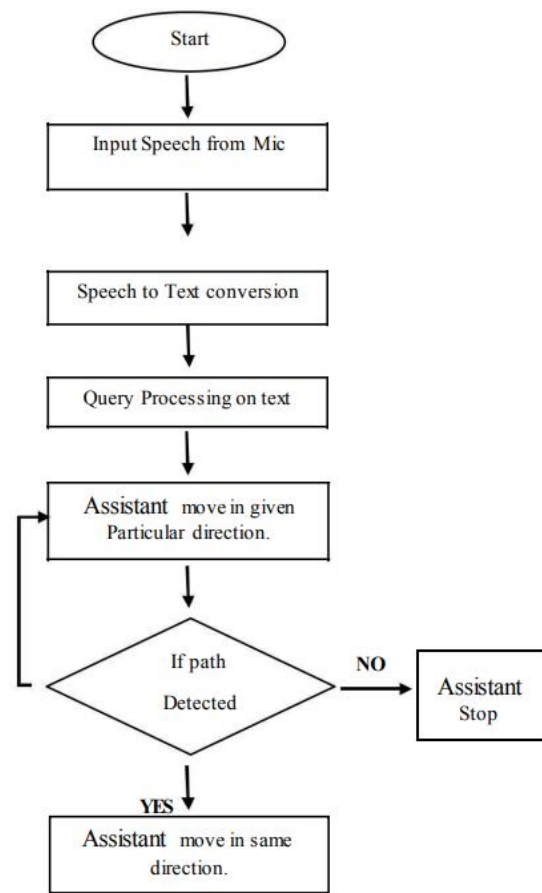| INPUT (User Speak)	OUTPUT (Assistant does)
Forward	moves forward
Back	moves back
Right	turns right
Left	turns left
Stop	stops doing current task

TABLE 1: Movements done by Assistant

Fig 5:Flow diagram of Voice Control

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. 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 contribution for interpretation.

is truly adept at understanding the natural language.

Procedures:

1) Assistant first records your discourse and send 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 Assistant notice words like "weather", it would tell the weather forecasts without lifting a finger.

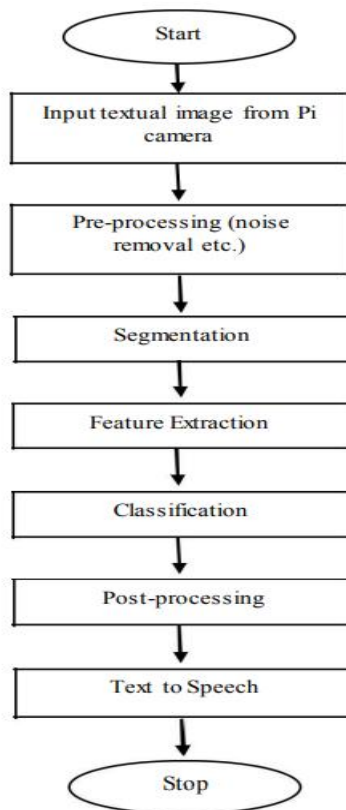4) The Server sends the data back to our device and assistant may speak.

Fig6: 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, 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 so as to conjure the required reaction however in correlation; it
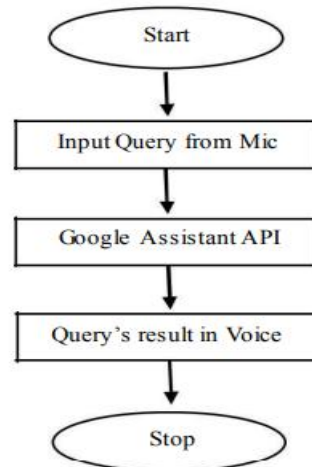
Fig7:Flow diagram of Virtual Assistant

RESULT

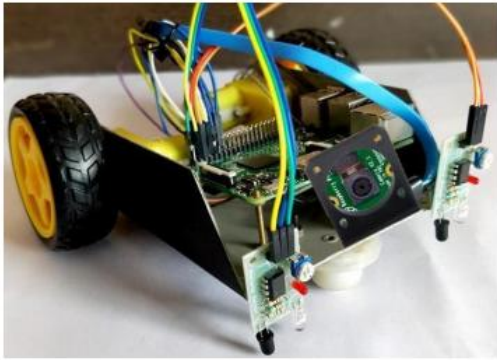The designed hardware prototype model is as appeared in fig. underneath:

Fig8: 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 with. As the assistant utilizes Google Assistant API so it gives answered accurately with the 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 second the movement direction is trailed by the assistant and the assistant moves in RIGHT, LEFT, FORWARD, 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 new modules without disturbing the working of current modules.

CONCLUSION

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 contributes 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 for the debilitated individuals.

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