



Design and Development of an Interactive Robot: I Robot

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Abstract— *In the field of research and development Artificial Intelligence (AI) and Robotics are the key technologies that could change the world for better. Artificial Intelligence focuses on creating intelligent machines that responds, works and reacts like humans. Robotics is a enhances branch of engineering that includes the conception, design, creation, and operation of robots. The proposed system is to make a personal interactive robot that can interfere with certain aspects of life. It will be a good companion to senior citizen, children and those who suffer from loneliness. The Robot facilitate functions such as interaction through natural language, live streaming and movement based on the voice commands. Here the personal assistant robot that will sincerely listens to solve clear-cut loads which are designed for making clients life easier. The proposed system will have significant applications in a wide range of areas.*

Keywords—*Artificial General Intelligence, Movement Control Unit, Natural Language Translation Processing, Online Character Reorganization, Task Processing Unit.*

I. INTRODUCTION (HEADING 1)

In the today's world the technology embraces and makes life much easier and more enjoyable for us. This emerging technologies benefits, support and help to certain groups of people like, the elderly or people with disabilities. For them, innovation and technology area way to lead a practically normal life. This designed robot is specifically useful for the group of people those required assistance in their day-to-day life. In this COVID-19 era the elderly or the handicapped people can use interactive robot to fulfil their daily needs. In the present world, technology embraces and makes life easier and more enjoyable. All of this takes advantage of evolving technology. Few groups of people need more help and support than others like the elderly or disable people. For them, technology means a mode to live an almost normal human life. The proposed designed robot is primarily designed for the group of people those required assistantship in their daily life to complete day to day work. All technologies that exist in today's world focuses on to reduce human effort and increase the ease of daily activities. The following minimum hardware and software requires for implementing the interactive personal assistant are given below.

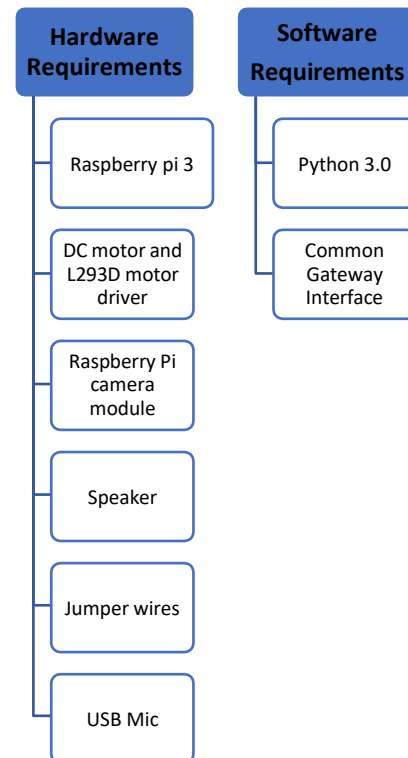


Fig. 1 Different hardware's and software's are available for developing the intelligent assistant

II. LITERATURE REVIEW

Now a days many current researchers focus on conveying the various issues of a single aiding system for people with visual, hearing and vocal impairment, not everything is being addressed since it is a tough job to do so. This refer paper [1], focuses on finding a unique technology that helps the blind people by allowing them to hear what is represented in the form of text, and this is achieved through the technology of capturing the image through the camera and converting the presented text into audio signals. On the other hand, survey paper [2], has discussed the design and implementation of secure lock automation using Raspberry Pi. The Raspberry Pi works work and controls the camera to capture it to turn 'ON' sequences to unlock the door. The unit has a locked secure face recognition tool to automatically open the door. This studied paper [3], has introduced a personal assistant with remarkable deduction suitability and the ability to interact with surroundings only through one of the physical forms of human interaction like Human Voice.

This paper [4], has explain speech recognition system that has been developed in the setup of desktop application program

that helps its users, like elderly and disabled, to attain different tasks such as opening computer applications, checking the time and date, opening and browsing websites for different types of information on the internet simply by using a voice command. This paper [5], has done study that the Internet connections can be exploited and used for achieving greater productivity from machines with local intelligence. This paper [6], represent the integrate odometry and visual road recognition system into a local network-based map that estimates the robot's position as well as its surroundings to create a path of motion.

This paper [7] has presented, a design to implement a robot that can detect motion and track an object simultaneously. It has a prototype for developing advanced models based on automated home security systems. This work is implemented with the help of an integrated Arduino Nano Board with Bluetooth support and also with DC motors for guiding and movement of the robot. This paper [8], concludes the study of a programming framework for the interaction between general intelligence-oriented software systems and complex mobile robots, including humanoid robots.

This paper [9], provides a practical roadmap for AI at the human level, starting with the current situation in which the AGI cognitive structures remain partially implemented and sufficiently tested, to a future in which AGI systems are deployed to carry out a variety of practical tasks that can only be accomplished by humans today. This paper [10], has utilizes one RNN which encodes a series of symbols into a fixed length vector representor, while the other decodes the representation into another pattern of symbols. The encoder and decoder of the suggested model are together trained to maximize the conditional probability of the target sequence given the source sequence.

This paper [11], has explain the design and implementation of the personal robotic assistants which help to reduce the manual task that is being put by the humans in their day-to-day work. In this paper, has developed a voice-controlled personal assistant robot which the help of human voice, commands to the remote automated assistant by using a smart mobile phone. The robot can perform various commands, directions, movements, start or stop operations, and move an object from one place to another.

A. *Selecting a Template (Heading 2)*

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B. *Maintaining the Integrity of the Specifications*

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III. COMPONENTS USED FOR IMPLEMENTATION

The proposed system will be designed with the help of few software and hardware components.

A. *Software Components*

Python comes with a huge library of functions which allows us the freedom to implement the various features of the project easily.

Common Gateway Interface is known as CGI. It is an interface specification for web servers to execute programs running on a server that creates web pages energetically, customization done based on the request received from the client or user.

B. *Hardware Components*

- DC motors are one of the simplest and easiest motors to use. They can attain a high rotational speed that is dependent on the input voltage. However, it cannot hold the point as one would with a servo motor or a stepper motor. Finally, to alternate the torque of a DC motor, it is necessary to use a gearbox.

Fig 2. DC Motor



- A jumper wires is a group of cable, with a connector or pin at respectively end which is normally used to interconnect the components of a breadboard or other prototype for testing.



Fig 3. Jump Wire

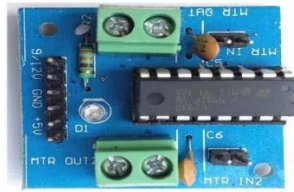
- A power bank is a transportable charger devised to recharge electronic devices while travelling. The size of power banks ranges from slim, pocket-sized up to larger, higher-capacity devices. They can be used to charge almost every electronic device, like the cell phones, tablets, portable speakers, cameras and laptops.



Fig 4. Power Bank

- Raspberry pi is considered as the heart of the system design as it is include in almost every step of processing data when components are connected with each other. The Raspbian OS is attached onto the SD card which is then mounted in the card slot to provide functionality of operating system.

Fig 5. Raspberry pi



- The Raspberry Pi camera module is used to take high-definition video as well as stills photographs also. It is attached to the CSI (Camera Serial Interface) port on the Raspberry Pi via a 15cm ribbon cable. It can be accessed through the MMAL((Multimedia Abstraction Layer) and V4L APIs. It can also be accessed through various third-party libraries such as the Picampere Python library.



Fig 6. Raspberry Pi camera module

- L293D is an regular Motor Driver IC which makes it possible for the DC motors to drive in any direction. A single L293D IC consisting of 16-pins is capable of running two DC motors simultaneously and also the direction of these two motors can be controlled independently.

Fig.7 L293D Motor Driver IC



- The speaker is a device which is used by use to converts command to speech using online text converter to speech converter. Now this speech which is in audio output configuration is sent to the user using the speakers.



Fig. 8 speaker

- A microphone is associated to a microphone input which has a built in microphone pre amplifier . It helps to send an analogy signal to a mixer or an amplifier, or to a computer.



Fig. 9 USB Microphone

- The disc shaped mechanical devices are referred as wheel. Wheel permit things to roll or when the wheel twist objects on the wheel moves more easily in the ground. Most land vehicles roll on wheel. Wheel are generally used in pairs, connected by a rod of wood or metal known as an axle. Many machines have wheel with choppers, known as gears.



Fig. 10 Wheel

IV. SYSTEM DESCRIPTION

This chapter give a complete system description, while maintaining a high-level view of the system. This chapter defines the hardware and software interfaces, behaviour analysis using sequence diagram of the system and a formal description and representation of a system. This system organized in a way that supports reasoning about the working of the system. A system description contains different system components, those are externally useful to visualize different properties of components, and relationships (e.g. the behaviour) between them. It provides a plan from which products can be design and developed, that will work together to implement the overall functionalities. This section is used to show the decomposition of the main design description into sub part.

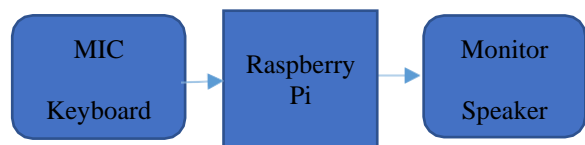


Fig. 11 Hardware Interfaces

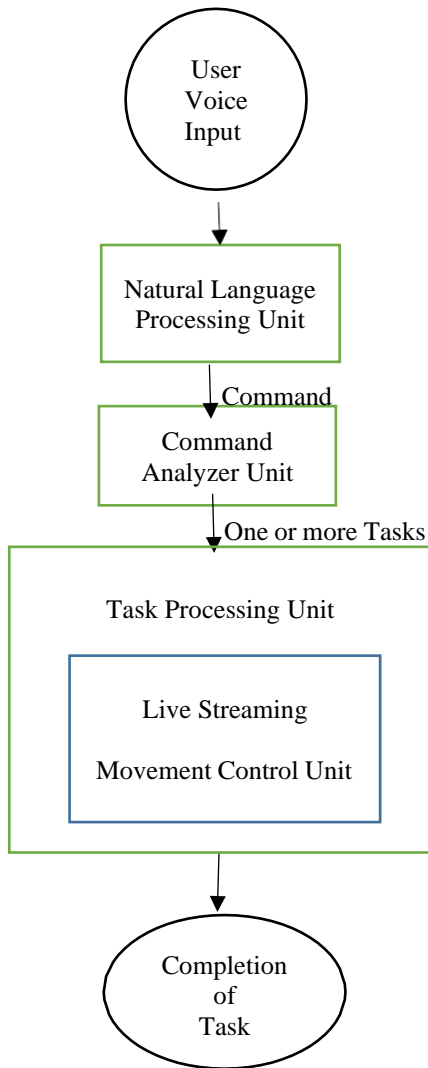


Fig. 12 The workings of the sub-modules of I Robot

A. Natural Language Processing

Natural Language Processing (NLP) assigns to AI method of connecting with a creative arrangement of using a natural language like English, Hindi, Malayalam, etc. The languages used by humans for their daily communications are used in the field of NLP which helps computer to perform appropriate duty. Speech can be the input and output of an NLP system. It converts speech into useful command.

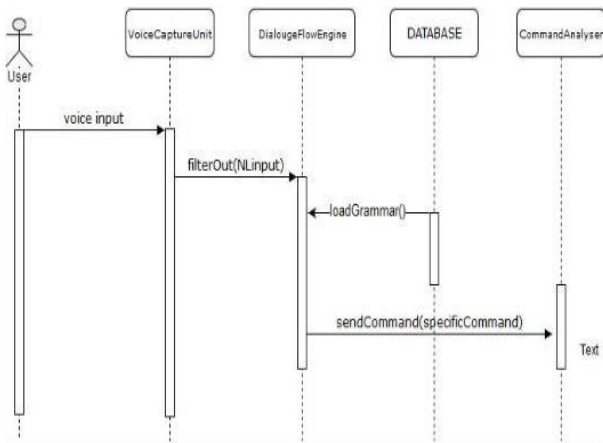


Fig.13 Sequence Diagram of Natural Language Processing Unit

B. Command Analyzer Unit

The below unit is used to identify task related to each command. It done its task by loading command table from database which map command for appropriate task.

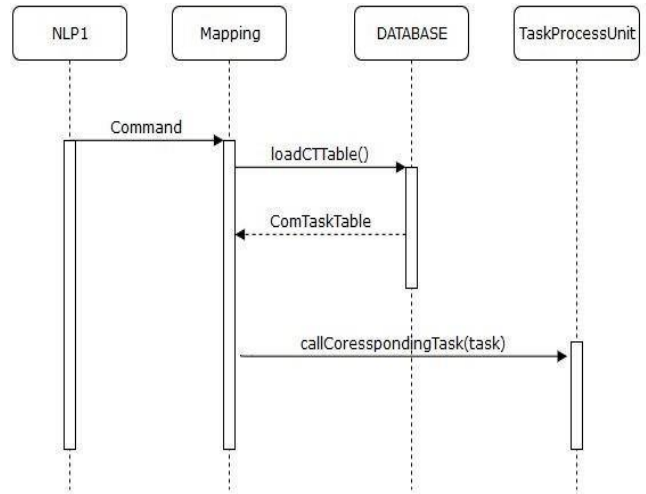


Fig. 14 Sequence Diagram of Command Analyzer Unit

C. Task Processing Unit

The task processing unit perform required task based on each command. This system has presented two major tasks. Live Streaming and Movement Control Unit. The Live Streaming, unit is used to capture video and telecast it into web page. It compresses video frame by using h264 and send frame to RTMP server. The Movement Control Unit is used to accept voice command and web page instruction for moving forward, back- ward, rotating and stop. Then corresponding signals are passed to motor.

V. DETAIL DESIGN AND RESULTS

A. Algorithm of Natural Language Processing Unit

Input: Voice Input

Output: Command

Algorithm

- 1: Start.
- 2: Read the input.
- 3: Do STEP 4 to STEP 8.
- 4: Arranging the given input in natural language.
- 5: Evaluate different aspects of the language.
- 6: Text planning.
- 7: Sentence planning.
- 8: Text Realization.
- 9: Stop.

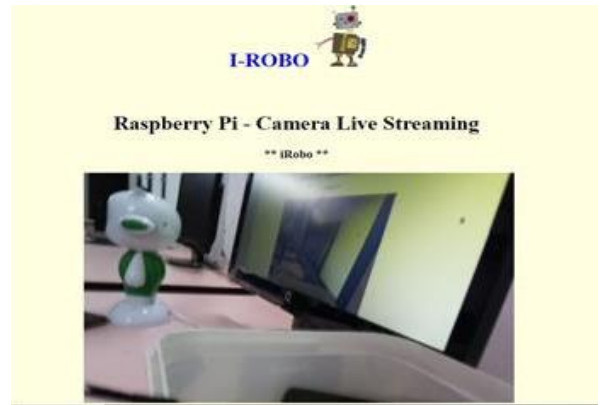
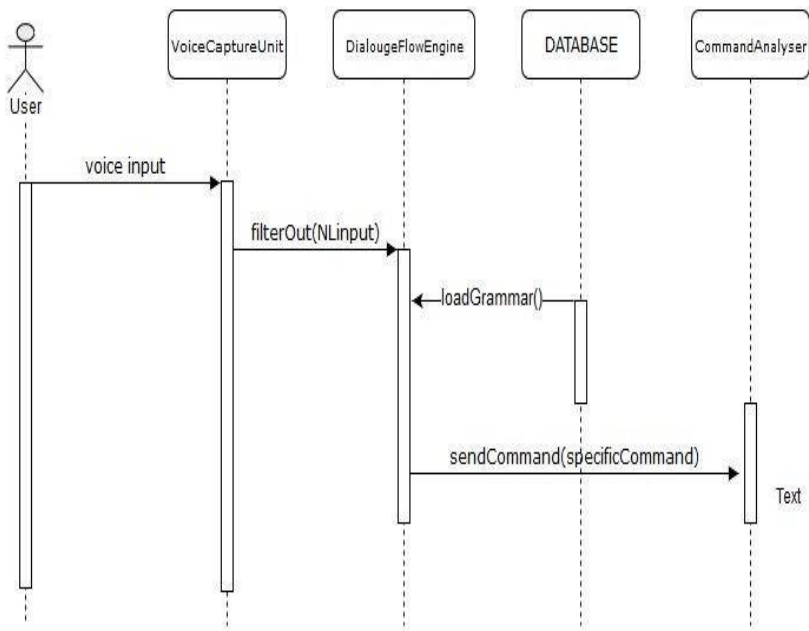


Fig. 15 Live Streaming

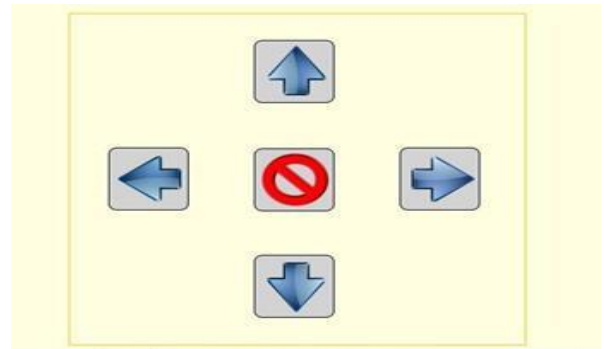


Fig. 16 Movement Control

B. Algorithm for Command Analyzer Unit

Input: Commands

Output: One or more tasks

Algorithm

- 1: Start.
- 2: Read the input command.
- 3: Load command table.
- 4: Map command for appropriate task.
- 5: Return task
- 6: Stop.

C. Algorithm for Task Processing Unit

Livestreaming

Input: One or More Task.

Output: Completion of Task.

Algorithm

- 1: Start.
- 2: Turn on camera.
- 3: For each frame repeat step 3 to 6.
- 4: Compress frame using h264.
- 5: Send frame to RTMP server.
- 6: Send to Webpage.
- 7: Stop.



Fig. 17 Model Robot

VI. CONCLUSION

Interactive Robot is very useful for each and every human being. It will be a good companion to senior citizen, children and those who suffer from loneliness. It performs many functions such as take voice command as input and get result as voice, move based on user command, live streaming to get status of place at which robot stand.

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