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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.**

1. Introduction

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. Hardly any gatherings of individuals need more assistance and backing than others like the old or incapacitate individuals. For them, innovation implies a mode to carry on with a practically ordinary human existence. The proposed planned robot is fundamentally intended for the gathering of individuals those necessary assistantships in their everyday life to finish everyday 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.

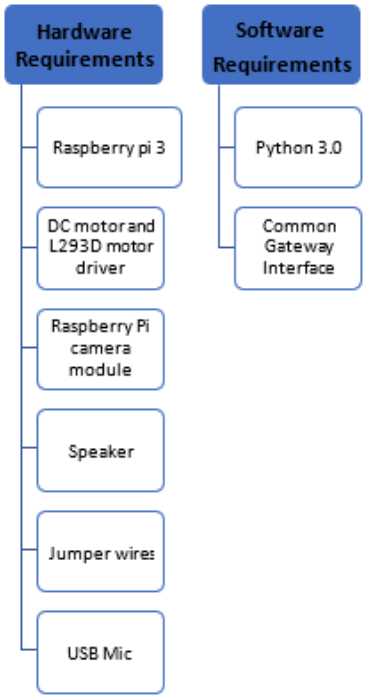

Fig. 1. Different hardware's and software's are available for developing the intelligent assistant

2. 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 allude paper [1], centers around tracking down a novel innovation that helps the visually impaired individuals by permitting them to hear what is addressed as text, and this is accomplished through the innovation of catching the picture through the camera and changing over the introduced text into sound signs. On the other hand, survey paper [2], has discussed the plan and execution of secure lock robotization utilizing 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

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paper [3], has presented an individual right hand with wonderful allowance appropriateness and the capacity to collaborate with environmental elements just through one of the actual types of human cooperation like Human Voice.

This paper [4], has clarify discourse acknowledgment framework that has been created in the arrangement of work area application elders 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], address the coordinate odometry and visual street acknowledgment framework into a nearby organization-based guide that gauges the robot's situation just as its environmental elements to make a way of movement.

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 uses one RNN which encodes a progression of images into a decent length vector representor, while the other unravels the portrayal into another example of images. The encoder and decoder of the recommended model are together prepared to boost the contingent likelihood of the objective grouping given the source succession.

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 fostered a voice-controlled individual collaborator robot which the assistance of human voice, orders to the far off computerized associate by utilizing a brilliant cell phone. The robot can perform different orders, headings, developments, start or stop activities, and move an article starting with one spot then onto the nex

3. Components Used for Implementation

The proposed system will be planned with the assistance of few programming and equipment segments.

1) 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.

2) 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 gathering of link, with a connector or pin at separately end which is typically used to interconnect the parts of a breadboard or other model 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 utilized to accept top quality video just as stills photos moreover. It is appended to the CSI (Camera Sequential Interface)

port on the Raspberry Pi by means of a 15cm lace link. It tends to be gotten to through the MMAL((Multimedia Reflection 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 solitary L293D IC comprising of 16-pins is equipped for running two DC engines at the same time and furthermore the heading of these two engines can be controlled freely.

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 receiver is related to a mouthpiece input which has an inherent amplifier pre speaker. It assists with conveying a similarity message to a blender or a speaker, or to a PC.

Fig. 9. USB Microphone

The disc shaped mechanical devices are referred as wheel. Wheel grant things to roll or when the wheel wind objects on the wheel moves all the more effectively in the ground. Most land vehicles roll on wheel. Wheel are for the most part utilized two by two, associated by a bar of wood or metal known as a pivot. Many machines have wheel with choppers, known as pinion wheels.

Fig. 10. Wheel

4. System Description

This chapter give a complete system description, while maintaining a high-level view of the system. This section characterizes the equipment and programming interfaces, conduct investigation utilizing arrangement graph of the framework and a proper depiction and portrayal of a framework. This framework coordinated such that supports thinking about the working of the framework. A framework portrayal contains distinctive framework parts, those are remotely helpful to imagine various properties of segments, and connections (for example the conduct) between them. It gives an arrangement from which items can be plan and created, that will cooperate to carry out the general functionalities. This section is used to show the decomposition of the main design description into sub part.

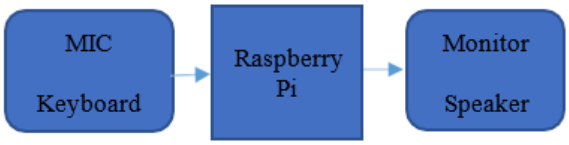


Fig. 11. Hardware Interfaces

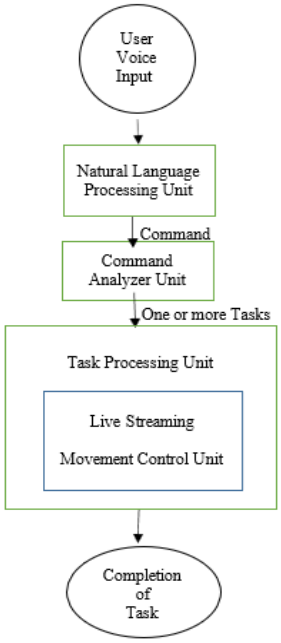


Fig. 12. The workings of the sub-modules of I Robot

1) 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.

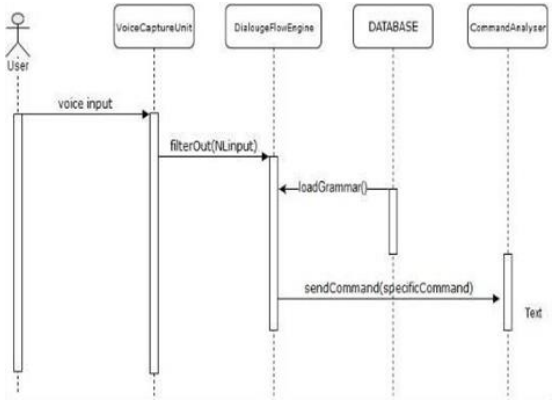


Fig.13. Sequence Diagram of Natural Language Processing Unit

2) 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.

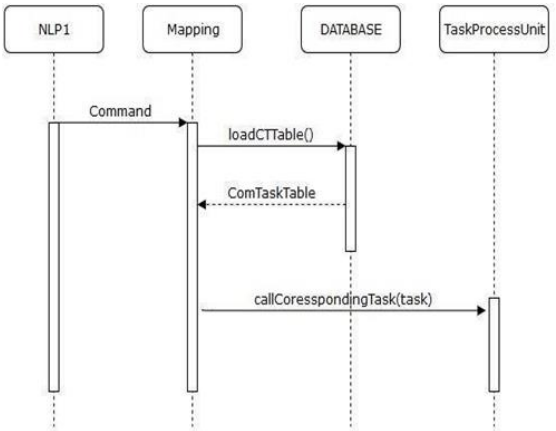


Fig. 14 Sequence Diagram of Command Analyzer Unit

3) Task Processing Unit

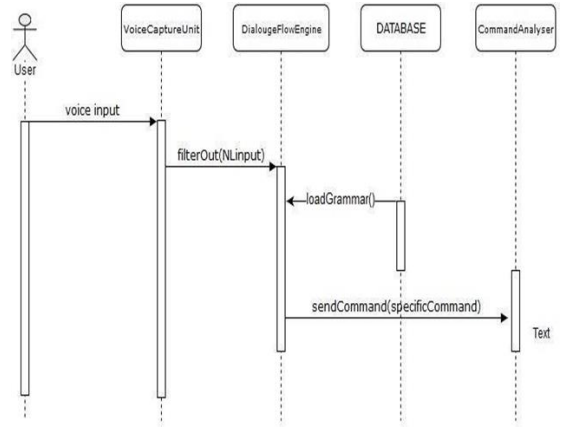
The task processing unit perform required task based on each command. This system has presented two major tasks. Live Streaming and Movement Control Unit. The Live streaming, unit is used to capture video and telecast it into web page. It compresses video frame by using h264 and send frame to RTMP server. 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.

5. Detail Design and Results

1) 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.
10.



2) 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.

3) 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.

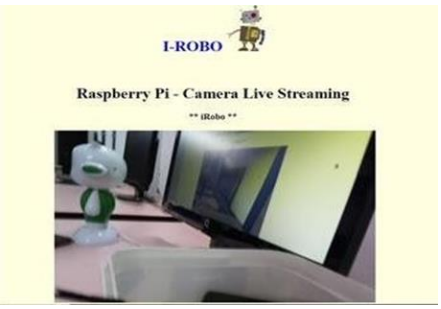


Fig. 15. Live Streaming

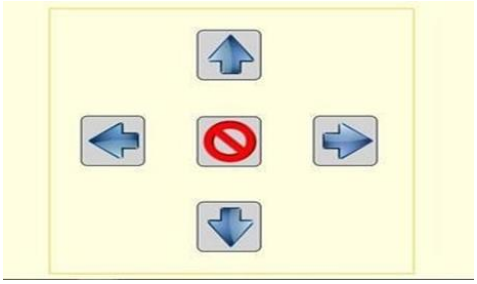


Fig. 16. Movement Control

Fig. 17. Model Robot

6. 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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