

Design and Fabrication of Receptionist Robot

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ABSTRACT – One of the areas that is still relatively unknown is the social interaction between humans and robots, which is being studied by many scientists. As a component of the Social Robots Project, the Receptionist Robot project investigates how a social robot can continue to be engaging or engaged for an extended amount of time. Despite the majority of us believing that computers are not user-friendly enough, they are becoming an increasingly important component of today's environment. This barrier of unfriendliness between computers will be filled by intelligent robots. We can install a robot for computerized guidance at a business reception desk. The function of service robots in society is becoming more and more significant. Numerous people's everyday requirements could be met by humanoid robots, particularly ones with social abilities. It is becoming increasingly important to understand how typical users view and perhaps accept these robots when they utilize them for routine jobs, as well as the advantages they bring in terms of task effectiveness, for example.

I. INTRODUCTION

Many individuals envision a robot as a machine resembling a human when they hear the term, similar to the androids seen in popular works of science fiction such as Star Wars, Terminator, and Star Trek. Despite the fact that these robots captivate our imaginations, they are mostly found in science fiction. Today, robots are prevalent in our society and have become essential in making our lives easier. As a result, we have proposed the concept of a robotic

receptionist to effectively carry out the duties of a receptionist in an office or company. We are unveiling a robot that is designed to be easy for users to operate. Due to advancements in technology and the widespread adoption of artificial intelligence, the ROBO-R is capable of performing all of the tasks typically handled by a receptionist. It is the concept of a robotic receptionist capable of performing the duties of a receptionist in an office or company. Due to advancements in technology and the widespread use of artificial intelligence, the ROBO-R is capable of performing all the tasks typically carried out by a receptionist. The utilization of image processing and converting text to speech. The ROBO-R will have a Raspberry Pi and Pi camera installed in order to detect and recognize faces. Thanks to face recognition technology, the ROBO-R will search its database to determine if the visitor is new or if any previous information about the visitor exists. Hence, the automated receptionist sends a request to the relevant individual and schedules an appointment. The person being requested by the visitor receives a notification sent by the robot. The requested person must respond to the robot's notification to confirm if they are available to meet with the visitor. If the visitor is available, the robot can lead them to the specified person's office. The automated receptionist takes a picture of every visitor to maintain a record of their visit and the person they were looking to meet.

II. METHODOLOGY

There are numerous essential phases in building a robot receptionist powered by a Raspberry Pi. The

hardware, which consists of a Raspberry Pi board, a camera module, motors, wheels, and navigational sensors, must first be assembled. The Raspberry Pi must next be programmed in Python or another appropriate language so that it can detect faces, respond to voice instructions, and control the robot's motions. Creating a user interface is also necessary if you want to engage with visitors via speech recognition or a touchscreen display. Ultimately, extensive testing and iteration will be required to guarantee that the robot performs dependably in a receptionist capacity, managing responsibilities like welcoming guests, giving them information, and pointing them in the right direction.

III. COMPONENTS USED

RASPBERRY PI 3B(+) WITH SD CARD: The Raspberry Pi is an affordable, small computer that can be connected to a computer monitor or TV, and can be operated with a regular keyboard and mouse. This device can perform all the typical tasks you would anticipate from a desktop computer, such as internet browsing, playing HD video, creating spreadsheets, word processing, and gaming. SD card is for external storage.

POWER SUPPLY: Pi is powered using a USB Micro or USB Type-C connection. Similar to Model 4B and 2A at 5V for 3B and 3B+, or 700mA at 5V for older, lower-powered Pi versions, we need a reliable power source that can deliver a genuine 3A at 5V.

ULTRASONIC SENSORS: The primary components are the transmitter and receiver. The transmitter creates sound using piezoelectric crystals, which then travels to the target and returns to the receiver component. In order to determine the distance between the target and the sensor, the sensor measures the time it takes for sound to travel from the transmitter to the receiver.

PI CAMERA: The Pi camera module is compact, lightweight camera that is compatible with the

IV. BLOCK DIAGRAM

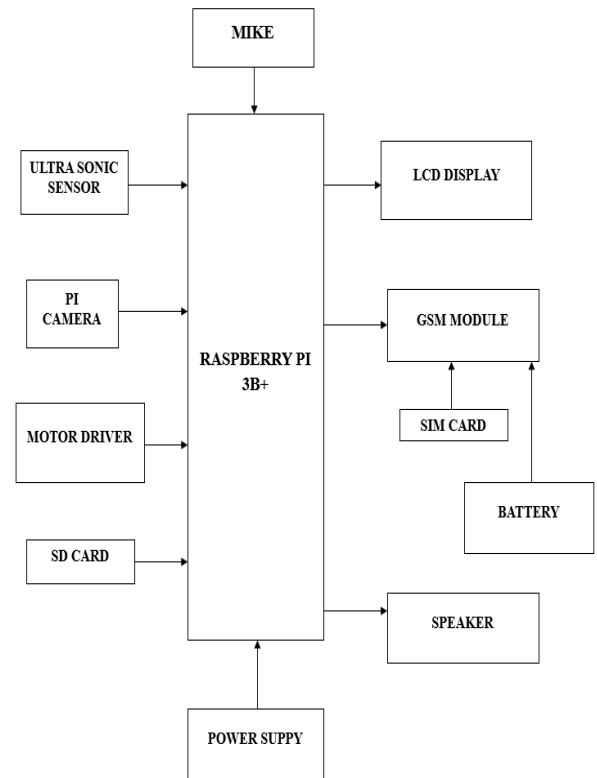


Fig 1:Block diagram

Raspberry Pi. It communicates with the Raspberry Pi using the MIPI camera serial interface protocol. It is typically utilized in tasks related to image processing, machine learning, or surveillance projects.

MOTOR DRIVER: The L298N is a motor driver that controls the speed and direction of two DC motors simultaneously using dual H-Bridge technology. The module is capable of powering DC motors that range in voltage from 5 to 35V, and can handle a peak current of up to 2A.

MIKE: A microphone is a device that records sound waves on a recording media or through a loudspeaker by converting air vibrations into electrical impulses. Microphones allow for a wide variety of audio recording devices to be used for voice, music, sound, and recording of various forms of communication.

LCD DISPLAY: One kind of flat panel display called an LCD (Liquid Crystal Display) operates primarily through the usage of liquid crystals. It is used to display the output text by the R-ROBO.

SPEAKER: Transducers, such as speakers, change electromagnetic waves into sound waves. It is used to get the output response from the R-ROBO.

GSM MODULE: GSM is a standard for digital cellular communications, meaning it offers a channel for wireless communication between mobile devices. A specialized gadget called a GSM module makes it possible for a device to send and receive data via the GSM network.

KEYPAD: A keypad is a block or pad of buttons that include alphabetical letters, symbols, or numbers arranged in a certain way. Numerical keypads are keyboards that are used with computers and typically contain numbers. It is used to provide the phone number to the R-ROBO to get location details through SMS.

DC MOTOR: A DC motor is a type of electrical motor that generates mechanical force by means of direct current (DC). It is employed to create the robot's locomotion.

BATTERY: An Electric Battery is a power source that can be used to power electrical equipment. It provides power to electrical devices such as microphones, LCDs, Motor drives, and GSM modules.

V. FUNCTIONING

The robot is stationed at the front desk. The detector picks up on any client entering the reception area and alerts the Raspberry Pi when it does. Subsequently, the Raspberry Pi interprets the signal, causes the wheels to spin, and advances to greet the customer. Raspberry Pi serves as the microcontroller in this project. Every part interface with the raspberry pi. Robotic motors are connected to a motor driver. At that moment, an ultrasonic sensor detects the person entering the reception area, and a pi camera takes a

VI. DESIGN

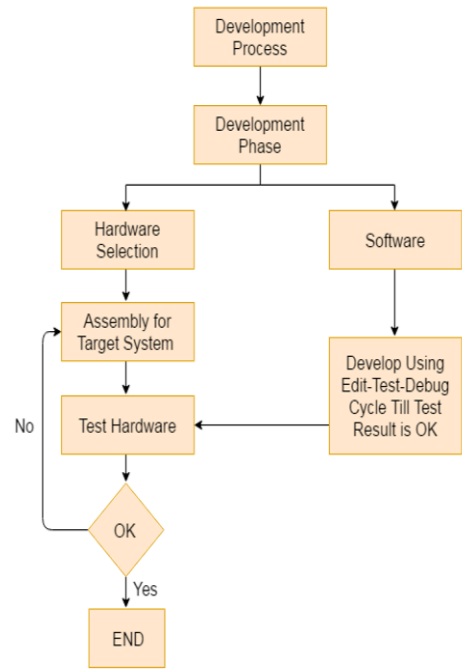


Fig 2: Design Diagram

picture of the person. In the event that the consumer is unknown, the robot will converse with them using a voice playback module that speaks both Kannada and English. The ROBO-R interacts with the user by calling their name if their data is stored in a database. Initially, every background playback voice was captured using a microphone and is kept in a database.

If the robot is unable to respond to the person's inquiry, it will inform them to "consult with high authority people" so that the robot can communicate with them.

In essence, a voice command system is a device that receives speech input, interprets it, decodes it, processes it, and outputs the proper voice command. The speech to text converter, query processor, and text to speech converter are the three fundamental parts of any voice command system. These days, voice plays a crucial role in communication. Voice

command systems are widely used in computer equipment because it is quicker to comprehend sounds and voices than written text.

VII. SOFTWARES AND ALGORITHMS

SOFTWARES

1. Python IDE
2. Scikit Libraries
3. Tensorflow
4. Open CV
5. Dlib
6. Numpy

ALGORITHMS

1. CSV MODULE
2. CV2 MODULE
3. OS MODULE
4. CHECK CAMERA MODULE
5. CAPTURE IMAGE MODULE
6. TRAIN IMAGE MODULE
7. RECOGNIZE MODULE
8. gTTS MODULE
9. PLAYSOUND MODULE
10. PYTTTSX3 MODULE
11. PANDAS MODULE
12. RPI.GPIO MODULE
13. MIXER MODULE
14. RPI_I2C_DRIVER MODULE
15. IMAGE MODULE
16. SERIAL MODULE

VIII. COCLUSION

Building a receptionist robot out of a Raspberry Pi provides an affordable and adaptable way to automate a variety of duties. The Raspberry Pi's adaptability and accessibility make it possible to integrate software and hardware elements to create an interactive and useful receptionist system. The receptionist robot can effectively greet guests, offer information, and improve user experience in a range of contexts by utilizing technologies including speech recognition, facial recognition, and database management. The autonomous robot for this project was successfully implemented, meeting all stated specifications. The software and hardware architectures of the system were conceptualized, developed, and pursued. The Human-Robot interaction capabilities and coordination solution of the Receptionist were achieved through the adaptation and utilization of multiple software packages within the Robot's design. Although it was successfully used, the Speech Recognition module did not prove to be totally dependable. With the exception of certain circumstances when usability difficulties are evident and need to be addressed, the On-screen Interface and Speech Synthesis module demonstrated that it could function as intended.

Through the implementation of the Coordination module, all modules have been effectively integrated, yielding an overall functional system that nevertheless exhibits instances of periodic instability that need to be fixed going forward.

IX. REFERENCES

[1] Nourbakhsh et al. (Naurbakhsh, Bobenage, et al. 1999): Nourbakhsh et al. design and locate, SAGE mobile robot at Carnegie museum of natural history]. Interaction with visitors through audio and LCD screen and uses a frame of mind to seize visitor. SAGE is completely self-govern and when resist trouble and ask for help. SAGE implement Social

capability, reliability, and safety to be an effective member of the museum. SAGE not only have the communication capability but also non-verbal communication is an important part of communication.

[2] Cooperative robot Assistance (Iossifidis Theis et al. 2003): An assistance should manifest a high degree of liberty to acquire information about their surroundings. Iossifidis et al. developed CORA that is accommodated on the senses, anatomy of humans, and behavior. CORA is assembling on the table and communicate through hand gesture, speech, mechanical interaction and gaze permit it to obtain the required information about their partner and their environment. CORA's job includes comprising of visual identification of entity presented by its instructor. Recognition of item amongst many, grabbing and hand over the item and execute and convention tasks.

[3] CERO (Huttenrauch, Green, et al. 2004): CERO is an assistance robot construct to assist those who have a physical disability in an environment. During the sequential expansion of CERO analysis interaction through speech alone was not practical enough. After observation communication wasn't productive. To conquer this trouble, the humanoid body assembles in front of CERO that it can move harm and head.

[4] Sidner and Lee (Sidner and Lee 2005): Sidner and Lee show that interacting with the robot not only through gesture but also communicate through the behavior of their human partner for better communication. Their robot MEL, is a structure like a penguin as below in fig [4] interact with the visitor through vision and speech recognition for better communication. MEL points the item in the experiment, scans the direction of the instructor to establish instruction given by them, and looks at instructor to acknowledge their presence. MEL is a good example of the channel of communication, with clear gestures and speech, which is used for duplex communication.

[5] Voice based home automation system using Raspberry Pi (2018): From this paper we learnt that Python is the main programming language which is also default programming language provided by Raspberry Pi. Also we were enlightened how to interface Microphone and speaker as voice command and recognition will also be a crucial part of this paper.

[6] Human robot interface for interactive receptionist system and way finding applications (2018): The Robot's virtual embodiment used in this work consists of an open source 3D model of a Physical Robot display on a 27 inch monitor.

[7] The influence of voice pitch on evaluation of social robot receptionist (2011): All the software of this robot runs on two pc boards: one Intel core i7 (2.8GHz) and one atom processor (1.2GHz). Average pitch value for male voices are 120 Hz and 210 for female voices.

[8] Implementation of image processing on Raspberry Pi (2007): We learnt how to interface camera for face recognition on Raspberry Pi. Raspberry pi consist of camera slot interface (CSI) to interface the raspberry pi camera.

[9] Pyke & Butterill, 2001: Medical receptionists and patient coordinators are often the frontline individuals who provide direct clinical services for patients (Pyke & Butterill, 2001). The front desk person is busy aiding in general practical duties of a medical office and is essential to the overall flow of a medical clinic.

