

GUIDING MECHANISM WITH ALEXA VOICE SERVICE AND LINE FOLLOWER

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Abstract— The guiding mechanism is the main part of the our Project since it replaces the job of the guides by taking guided steps that are fed to the robot guide in the form of data into the program. It guides us to the required destination by moving with the help of wheels. The Robot Guide is a very friendly guide that helps the students to find a particular subject book in the library since it's a robot at the end of the day. The processor in which we dump the program is also known as the "brain" which is run by a computer program. The program is very detailed as it gives commands for the moving parts of the robot to follow. There are many mechanical parts that are used in this part such as motors, wheels, and gears that make the robot move and turn. We also have a use of sensors to tell the robot about its surroundings. Sensors such as IR sensor which detects the black line and further guides the student to the shelves of the library. Alexa is a virtual assistant that was programmed and developed by Amazon and is available on almost all the wide range of products that are manufactured by Amazon, right from Amazon echo dot to Amazon FIRE TV. Alexa can be used for various tasks from a basic interaction with an AI, listening Music, listening to audiobooks, playing podcasts, for knowing weather forecast etc. It was first released in the year 2014. it has a wide variety of languages available namely English, French, Japanese, Italian, Spanish, Marathi, Japanese, Punjabi, Hindi, Portuguese. Since it is a cloud based assistant there is a requirement of active network connection for the purpose of accessing its services.

I. INTRODUCTION

The word "Robot" was created in 1920 in connection with a play that featured human-like machines that took over the society they had been serving. In 1932, the first simple robot was born in Japan. Isaac Asimov wrote a short story in 1941 that included "Three Laws of Robotics." The laws stipulate that a robot cannot harm a human or allow a human to come to harm, a robot has to obey all humans, and a robot has to protect its existence. The first robotic arm came to be in 1954, and General Motors began using this technology for dangerous assembly line work in 1962. The 1969 moon landing utilized robotic technology also, to assist the astronauts with their mission. In our project we make the use of a Robot and using voice recognition along with guiding mechanism we give the robot autonomy without manual controlling a way to guide the visitors and tourists to the

places that are predefined or feed into the data memory of the bot. We find this will be an efficient way of guiding people in a way such that the user can avail information about new places at any given period of time with exhausting the guide in our case a bot. Guiding industry has over a billion dollar turnover and especially in countries like India it can expand to such great heights with a high number of tourists visiting India each year.

The two main components or key focus areas of our project goes into voice recognition and guiding mechanisms. Our first Component being the voice recognition which can be defined as the computer analysis of the human voice especially for the purposes of interpreting words and phrases of identifying an individual voice. And we use this as a way to analyse the user given speech. We make the use of predefined database and matching user requested information with our predefined database after speech to text conversion of the user given speech. The second component namely being the guiding mechanism which makes a use of mapping the area and feeding map of the place to the bot along with making use of various different sensors for precision and for precaution.

II. LITERATURE SURVEY

We came up with this project title realizing real life difficulties and then as a group discussed what could be an efficient way to resolve this problem. The main problems observed were such that in places like shopping malls or all purpose malls, people generally are confused regarding the where about the shops etcetera. Mostly these questions are redundant, which lead to the thought of having the answers for these questions saved, resulting in an electronic device direction. Another major issue is faced in medical stores, where the crowd is huge and by the time we reach the counter, often the particular medicine might not be available. Hence, this "electronic device" can be of immense help in such a way that the questions can be asked to it using voice commands and it could reciprocate according to its database.

III. THEME OF THE PROJECT

Guiding industry has over a billion dollar turnover and especially in countries like India it can expand to such great heights with a high number of tourists visiting India each year. The two main components or key focus areas of our project goes into voice recognition and guiding mechanisms. Our first Component being the voice recognition which can be defined as the computer analysis of the human voice especially for the purposes of interpreting words and phrases of identifying an individual voice. And we use this as a way to analyze the user given speech. We make the use of predefined database and matching user requested information with our predefined database after speech to text conversion of the user given speech. The second component namely being the guiding mechanism which makes a use of mapping the area and feeding map of the place to the bot along with making use of various different sensors for precision and for precaution.

With a backbone of a guiding mechanism, we have designed this project in such a way that it consists of an Alexa which is used as a voice recognition device and a line follower which is a hardware module which is used as a guide, Alexa will take the command from the user and then that command will be further processed and is given to a line follower so that it can guide you towards that specific location.

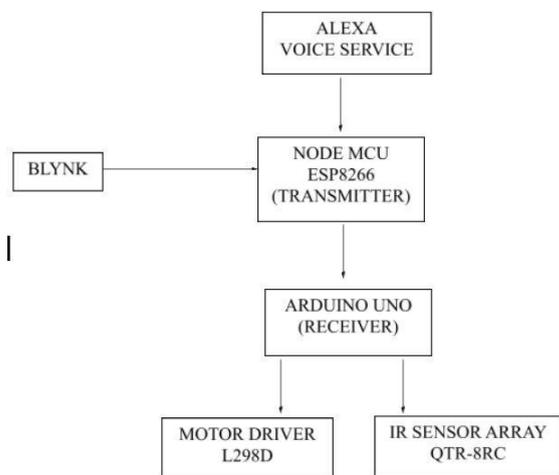


Fig: Theme of the project explained in a flowchart

IV. IMPLEMENTATION

This project is divided into two modules i.e, module 1 consists of Alexa (Echo dot 3rd generation) for voice recognition and module 2 consists of a basic black line follower.

Module 1: Alexa and its skills

Alexa is a virtual assistant that was programmed and developed by Amazon and is available on almost all the wide range of products that are manufactured by Amazon, right from Amazon echo dot to Amazon FIRE TV. Alexa can be used for various tasks from a basic interaction with an AI, listening Music, listening to audiobooks, playing podcasts, for

knowing weather forecasts etc. It was first released in the year 2014. It has a wide variety of languages available namely English, French, Japanese, Italian, Spanish, Marathi, Japanese, Punjabi, Hindi, Portuguese. Since it is a cloud based assistant there is a requirement of active network connection for the purpose of accessing its services.

In our project we have used the device Amazon echo dot for the purpose of interacting with people. Since echo dot is a device that is manufactured by Amazon and it has the virtual assistant Alexa inbuilt to its processor it was a perfect choice. We have used services of Amazon namely AWS i.e. Amazon Web Services and ADS i.e. Amazon Developer services. We made an account on AWS for accessing the web services provided by Amazon. On Amazon Developer Console we created an account, after the account was created we followed a step wise procedure.

Procedure:

The code for the e-guide was written in python and for the database we used JSON. The database is the excel file that is the raw file that will be provided by the library in case of implementation in real time, for now we made the use of a dummy excel file created by us. The excel file is then converted into JSON format by the usage of a python script for reading the data then converting it to JSON. The JSON file so created resembles the data type Dictionary of Python. Hence, Alexa makes the use of this data while interacting with people. When a person asks e-guide for a particular subject book it recognizes the command and then if that particular subject book is present it responds with the shelf number and if it is not present it apologizes for not finding it. We have made use of node MCU for integration of Alexa with the Module 2 part of e-guide. For this we have made use of an android application named Blynk which creates a token id, this token id is an IP address for the node MCU that is connected to the internet. Via this IP address we have initiated a connection between the Echo dot and the moving part of the bot. This token id or IP address is added on the python code written on Amazon Developer Console. On Amazon Developer Console since we have selected the python script, the code is written in python. We then write the code for taking the input from the database, for establishing a connection with the node MCU, for it to reply with the book shelf number and some exception handling. For making a request to Alexa, specific phrases can be used as utterances. Variable in utterances are slots. They are empty by default but can also have predefined values.

First create a custom intent in Alexa skills to define a slot as this can't be used in built-in Intents, where intents are the representation that the user's spoken request has been fulfilled.

Module 2: Line follower

A line follower is being made by using electronic components such as Arduino, LN928D motor driver, power supply-12V, DC motor, IR sensor array.

Using these components a line follower is made where the motor driver is connected to two DC motors. The motor driver is connected to the 5V pin, Vin pin and ground pin of Arduino. The IR sensor array is connected with the four tilted pins of Arduino. We have chosen tilted pins of Arduino because using these pins we can easily control the speed of the motors using Pulse Width modulation (PWM).

On the other hand, for the integration of Alexa with line followers, we have used node MCU which will transmit the data from Alexa to the Arduino and further it will instruct the E-Guide bot to move. So to make this interfacing between Arduino and node MCU we have connected the TX (Transmitter) pin of node MCU with the TX pin of Arduino and similarly RX (Receiver) pin of node MCU is connected with RX pin of Arduino. The instruction will be given to Alexa and then the instruction will be decoded and will be given to Arduino through node MCU which will lead to the movement of the line follower towards the desired location according to the instructions.

The circuit diagram is as shown below.

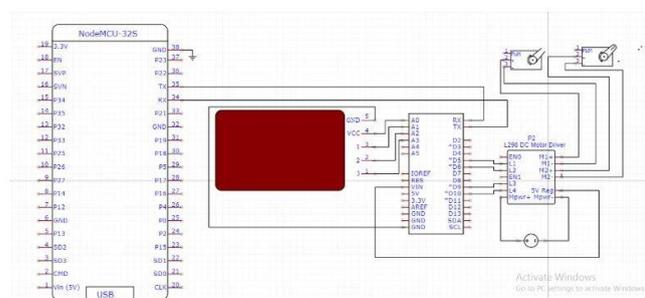


Fig: Circuit diagram

Components Used:

1. Arduino

In our project we have used Arduino as a multitasking device. Arduino is an open source hardware and very useful for project developments. There are many types of Arduino available in the market. We have used Arduino uno in our project. Arduino will manage the rotation of wheels according to the program and instructions and simultaneously it will control the motor driver for proper rotation of the wheels.

2. L298N Motor Driver

L298N is a motor driver IC which has two channels for motors. It requires 12V supply to work and it also manages the power minimization for the DC motors.

If the DC motors require 9V to work then the Motor driver will convert the 12V into 9V for proper functioning.

3. IR Module:

IR Module is a sensor circuit which consists of an IR LED/photodiode pair. We have used an IR sensor array in which there are 4 pairs of IR sensors attached in an array.

4. Power Supply

I have added a voltage regulator to get 5 volt for Arduino, comparator and motor driver. A 12 volt battery is used to power the circuit and Alexa.

5. DC Motor

Motor is a device that converts any form of energy into mechanical energy or imparts motion. In constructing a robot, a motor usually plays an important role by giving movement to the robot. In general, motors operate with the effect of a conductor with current and the permanent magnetic field. The conductor with current usually produces a magnetic field that will react with the magnetic field produced by the permanent magnet to make the motor rotate. There are generally three basic types of motor, DC motor, even servo motor and stepper motor, which are always being used in building a robot. DC motors are most easy for controlling. One DC motor has two signals for its operation. Reversing the polarity of the power supply across it can change the direction required. Speed can be varied by varying the voltage across the motor.

6. Amazon Echo Dot

Amazon Echo Dot is a voice-controlled speaker with Alexa. It is developed for any room or space. We can just ask any kind of question and Alexa will respond and will do the desired work. We can play music, ask about information, news, controlled compatible smart home devices and many more things.

7. Software Required

For the simulation of the circuit, Proteus® software is used. For coding and uploading the sketch, the Arduino 1.65 ® is used. For developing Alexa skills we have used the Alexa console.

8. Programming and simulation

The program code acts as the decision-maker embedded in the microcontroller deciding about the outputs for a particular set of inputs. The program is coded using Arduino® 1.65 and is also checked in simulation using Proteus.

v. INTERFACING OF NODE MCU WITH ARDUINO

The project "Guiding mechanism with Alexa voice services and line follower" consist of two parts i.e. one deals with Alexa skills and another looks after line follower bot (EGuide). Alexa skills are developed using the customize intent skill template of Amazon developer console .Once the skills build up, Alexa starts to respond accordingly. For further processing the data delivered by Alexa needs to be sent to Node MCU , the firmware which works on ESP8266 Wi-Fi module. This module can give any microcontroller access to your Wi-Fi network. To transfer the data from Alexa console to Node MCU, Blynk application creates a platform for easy access of data from one module to another. It provides a unique identity called authentication token to connect hardware to our mobile phones. URL point = "https://188.166.206.43/BlynkAuthToken/update/v1" Here 188.166.206.43 is Blynk server IP address followed by blynk authentication Token . It updates the Blynk whenever a web request is triggered. Further it sends the command to our Node MCU. Node MCU is given required Wi-Fi credentials of the users. V1 is a virtual pin created in Blynk that can transmit data from 0 to 1023. The data has to be transmitted by adding the data with V1 in URL. For example : URL+?shelf{ }

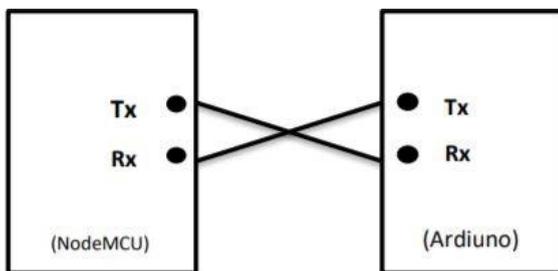


Fig: Interfacing of node MCU with Arduino

Transmitted data is received by Arduino .These data contain a shelf number of required book or room number of different location fetch from json file in Alexa console Once the data is received Arduino follows the path given for the particular data number in Arduino code. IR Sensor array senses the black line from the arena. Whole path has been instructed by increasing count in the Arduino code. Sensed information is sent back to Arduino and motor moves accordingly by considering nodes in the designed arena.

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