VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"Jnana Sangama", Belagavi -590018.

Mini Project ON

"VOICE CONTROLLED VEHICLE USING ARDUINO"

Submitted in partial fulfillment of the requirements for the degree of

BACHELOR OF ENGINEERING IN

ELECTRONICS AND COMMUNICTION ENGINEERING

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CERTIFICATE

This is to certify that the mini project report (18ECMP68) work entitled "**VOICE CONTROLLED VEHICLE USING ARDUINO**" is a bonafide work carried out by Kadambari K K (4AI18EC043), Manasa S (4AI18EC051) Kiran Kumar S K (4AI18EC046), Lavanya K J (4AI18EC049) students of 6th Semester B.E., in partial fulfillment for the **MINI PROJECT** of 6th semester Bachelor of Engineering in Electronics and Communication Engineering of the Visvesvaraya Technological University, Belgaumduring the academic year **2020-2021**. It is certified that all corrections and suggestions indicated for Internal Assessment have been incorporated in the report deposited in the department library. The projectreport has been approved, as it satisfies the academic requirements in respect of Project Work prescribed for the said degree.

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ABSTRACT

Voice Controlled Vehicle is a mobile robot whose motions can be controlled by the user by giving specific voice commands. The speech is received by a microphone and processed by the voice module. When a command for the robot is recognized, then voice module sends a command message to the robot's microcontroller. The microcontroller analyzes the message and takes appropriate actions. The Android Application is connected to the Bluetooth module (HC-05) present on the Robot via Bluetooth. The commands are sent to the robot using voice commands present on the android application.

At the receiving end four DC motors are interfaced to the microcontroller where they are used for the movement of the vehicle. The RF transmitter of the Bluetooth can take either switch press or voice commands which are converted to encoded digital data for the advantage of adequate range (up to 100 meters) from the robot. The receiver decodes the data before feeding it to another microcontroller to drive DC motors via motor driver IC for necessary work. This technology has an advantage over long communication range as compared to RF technology. Further the project can be developed using IoT technology where a user can control the robot from any corner of the world.

DECLARATION

We**,** Kadambari K K (4AI18EC043), Manasa S (4AI18EC051), Kiran Kumar S K (4AI18EC046), Lavanya K J (4AI18EC049) students of Sixth semester B.E., Electronics and Communication Engineering, Adichunchanagiri Institute of Technology, Chikkamagaluru, hereby declare that Mini Project work entitled **" VOICE CONTROLLED VEHICLE USING ARDUINO"** has been carried out by us under the guidance of **Guide Name, Assistant Professor, Dept. of Electronics and Communication Engineering , AIT, Chikkamagaluru**, in the partial fulfilment for the **MINI PROJECT** of 6th semester Bachelor of Engineering in Electronicsand Communication Engineering of the Visvesvaraya Technological University, Belgaumduring the academic year **2020-2021**. We also declare that, to the best of our knowledge and belief, the matter embodiedin this Project Report has not been submitted previously by us for the award of any Degree or Diploma to any other university.

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CHAPTER 1:
INTRODUCTION

Speech signals are the most important means of communication in human beings. Almost every conversation to interact is done by means of voice signals. Sounds and various speech signals can be converted into electrical form using a microphone. Voice recognition is a technology which is used to convert the speech signals into a computer text format. This voice recognition technology can be used to control and generate speech acknowledgement using some external server.

In proposed design, we wish to control the movements of the vehicle using voice commands from the user. These commands will be issued at the Android Application on the user's phone which is connected to the robot using a Bluetooth Module. The commands issued will then be relayed over an RF channel and will be received by the Module. The goal of Voice Controlled Robotic Vehicle is to listen and act on the commands received from the user. Here, the system will require the training from the user (for the accent) after which the device will start understanding the commands issued. This is done by adding commands to the controller through a code

About Voice Recognition:

The process of enabling a computer to identify and respond to sound produced in human speech. Voice recognition is the process of taking spoken word as an input to the program. Voice recognition is the ability of the machine to receive and interpret dictation, or to understand and carry out spoken commands.

Why Voice Recognition?

Both speech and voice recognition use recordings of human voice, but they do different things with it. Voice recognition stripes out personal differences to detect the words. Speech recognition typically disregards the language and meaning to detect the physical person behind the speech. For our project, if we want to make it user friendly than Voice Recognition is the best methodology to control this robot. The proposed topic involves voice recognizing. Voice recognition is the process of capturing spoken words and commands using a microphone or telephone and converting them into a digitally stored set of words. Two factors decide the accuracy of the proposed voice recognition system. Accuracy in detecting the human words and processing those words at the desired speed so that the commands are executed with the least delay.

1.1 Literature Survey:

1. Robot Control Design Using Android Smartphone :

Authors:- Mrumal.K.Pathak, Javed Khan, Aarushi Koul, Reshma Kalane,Raunak Varshney The purpose of this paper is to provide powerful computational android platforms with simpler robots hardware architecture. This paper describes how to control a robot using mobile through Bluetooth communication, some features about Bluetooth technology, components of the mobile and robot. It present a review of robots controlled by mobile phone via moving the robot upward, backward, left and right side by the android application such as Arduino, Bluetooth.

2. Smart Phone Controlled Robot Using ATMEGA328 Microcontroller:

Authors : Aniket R. Yeole, Sapana M. Bramhankar, Monali D. Wani, Mukesh P. Mahajan In this paper have designed a robot that can be controlled using an application running on an android phone. It sends control command via Bluetooth which has certain features like controlling the speed of the motor, sensing and sharing the information with phone about the direction and distance of the robot from the nearest obstacle.

3. Android Mobile Phone Controlled Bluetooth Robot Using 8051 Microcontroller :

Authors : Ritika Pahuja, Narender Kumar A robot is usually an electro-mechanics machine that is guided by computer and electronic programming. Many robots have been built for manufacturing purpose and can be found in factories around the world. This paper develop the remote buttons in the android app which control the robot motion with them. And in which Bluetooth communication is use to interface controller and android. Controller is interfaced to the Bluetooth module though UART protocol.

4. **Robot Controlled Car Using Wi-Fi Module** :

Authors : S R Madkar, Vipul Mehta, Nitin Bhuwania, Maitri Parida This paper,deliberate how to control robot controlled car using Wi-Fi module through android application of an android mobile phone. It is also show that the appliances can be controlled even in the absence of an android phone by sending a normal SMS. This project can be modified quite easily to include a spy camera as well that can stream the videos to the user over Wi-Fi. Solar cells are instead of the regular lithium-ion battery for the project.

1.2 Problem Statement:

The main objective of the project is to control the robotic vehicle in a desired position. Also, the main objective of the project is to control the robot by the voice or push buttons. Human Robotic Interaction is achieved.

The goal of voice-controlled Robot is to listen and act on the commands received from the user. The proposed system consists of two blocks: transmitter and receiver block both use the microcontroller of the AVR family and a battery for the power source. Using this application, we can control the robotic vehicle by using personal computer. The project is designed to control a robotic vehicle by voice commands and manual control for remote operation.

1.3 Existing System:

The current systems are robots like line follower robot, edge averting robot, DTMF robot, gesture-controlled robot. These types of robots are not efficient since they require more power to run, cost is also very high. In the existing system they don’t use voice commands, making it not possible for physically handicapped people to drive. The voice commands are interpreted via an offline server in real time.

The commands are at once transmitted to the server directly by the means of a wired network. The car is built primarily on a platform based on a microcontroller. Some of the fields that can likewise be equally enhanced are the effect of the mouth-microphone range on the robotic, the overall performance (scope) of the robot and the effect of noise on the translation of speech to textual content. In the existing system Bit Voicer Server is used, it's a database for speech processing and automation synthesis. It was designed to make voice operation possible with simple gadgets having low processing power.

Microcontrollers usually do not have enough storage and computing ability to perform sophisticated speech treatment and synthesis. By doing the tough work Bit Voicer Server removes the consequences of these limitations so that the microcontroller can assign its key functionality to most of its origin sources.

1.4 Proposed System:

The reason of this lookup is to provide simple robotic hardware architecture so that this shape can focal point on Bluetooth connection infrastructure. It is also beneficial for academic robotics due to the fact human beings can construct their personal robots with low cost. When the app is operating in the system, a microphone on the mobile is used to identify user voice commands. Commands are interpreted and the program utilizes Google's speech-recognition software to translate voice to text within the app. The text will then be sent with the aid of Bluetooth to the receiver part. The microcontroller Arduino UNO R3 has 32kB of ISP flash memory, 2kB of RAM and 1kB of EEPROM.

The digital Arduino I / O pins 3, 4, 5 and 6 are programmed as output pins in this design. For serial communication with the Bluetooth unit, pins 0 and 1 of Arduino are used. Text obtained with the aid of Bluetooth is forwarded to Arduino UNO microcontroller panel by the usage of UART serial conversation protocol. The voice commands to the robotic device are dispatched via Bluetooth with the aid of an Android device. These commands are received on the robotic device by using Bluetooth module set up on it. The motor driver circuit is used to manipulate the velocity of the car. The complete circuitry is powered by the usage of a 12V rechargeable battery hooked up on the system.

1.5 Tools Required:

1.5.1 **Hardware Specifications**:

1. Arduino Uno
2. Motors x4
3. Wheels x4
4. Chassis (of appropriate size)
5. L293D Motor Driver
6. 12V battery (power source)
7. Jumper wires
8. Bluetooth Module HC-05
9. Ultrasonic Sensor HC-SR04

1.5.2 **Software Specifications**:

1. Arduino IDE.
2. Android Application operated Bluetooth connectivity.

CHAPTER 2:

SYSTEM DESIGN:

This Chapter describes the block diagram and methodology and working principle behind the project .This section gives the detailed explanation about all the hardware components required for the development of the system.

2.1 Block Diagram:

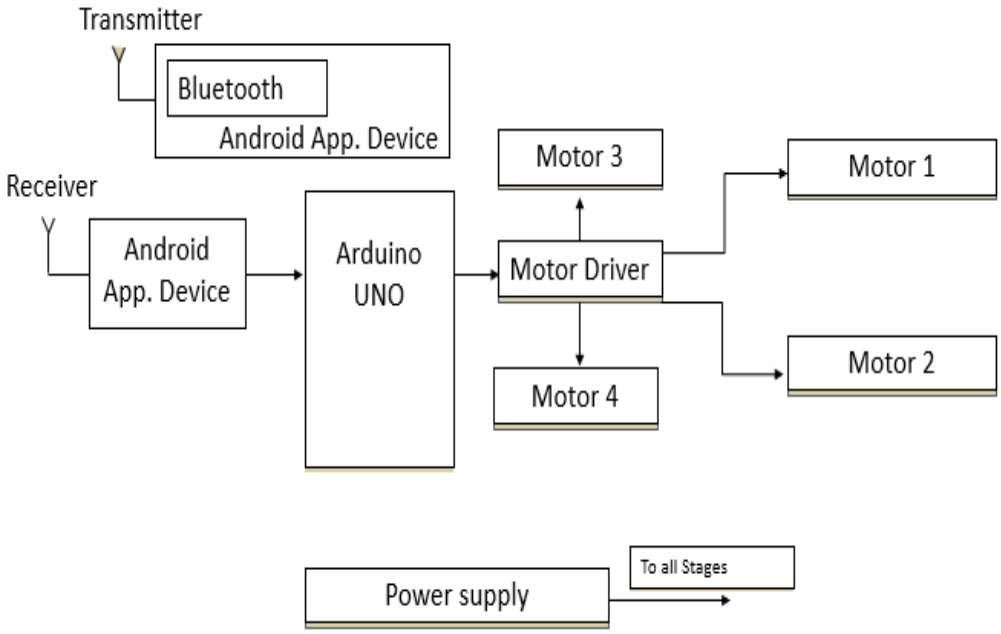


Fig 2.1: - Block Diagram

The block diagram of this project is given in Fig.1. The basic block diagram of Voice control robot using Arduino is given below which consists of an android phone that recognize the command and transmit to the Bluetooth module via Bluetooth link. The user gives the command via AMR voice and this command is transferred to the Bluetooth Device. According to the given command Arduino UNO R3 receive the command and operates on it. To perform all operation, it required 12 volt power supply. First the given command or data is converted into text form in AMR voice control. When it received at the Bluetooth module, the data or command is converted into digital form. Hence the Arduino perform the operation according to the received command or data.

2.2 Hardware Components:

The following components are used to implement the design of the system. Each of these is described in the following sections.

- Arduino Uno R3-(ATMEGA328).
- L293d Motor Driver Shield.
- DC Motors.
- HC-05 Bluetooth Module.
- Ultrasonic Sensor (HC-SR04)
- Servo Motor

Arduino Uno R3-(ATMEGA328):

The Arduino Uno is an open-source microcontroller board based on the Microchip ATMEGA328P microcontroller and developed by Arduino. The board is equipped with sets of digital and analog input/output pins that may be interfaced to various expansion boards (shields) and other circuits.

The board has 14 digital I/O pins (six capable of PW output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery Arduino Uno microcontroller is full set containing the memory and the I/O serial ports which are used in interfacing it with other devices like LCD, LEDs, Buzzer and many others. Once the program is made in the computer, it is transferred to the Arduino chip using the USB cable.

Fig 2.2.1: Arduino Uno R3 Board

Arduino is an open-source hardware and software company, project and user

community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices. Arduino board designs use a variety of microprocessors and controllers. The microcontrollers can be programmed using C and C++ programming languages. In addition to using traditional compiler toolchains, the Arduino project provides an integrated development environment (IDE) based on the Processing language project. The Arduino project started in 2005 as a program for students at the Interaction Design Institute Ivrea in Ivrea, Italy, aiming to provide a low-cost and easy way for novices and professionals to create devices that interact with their environment using sensors and actuators. Common examples of such devices intended for beginner hobbyists include simple robots, thermostats and motion detectors.

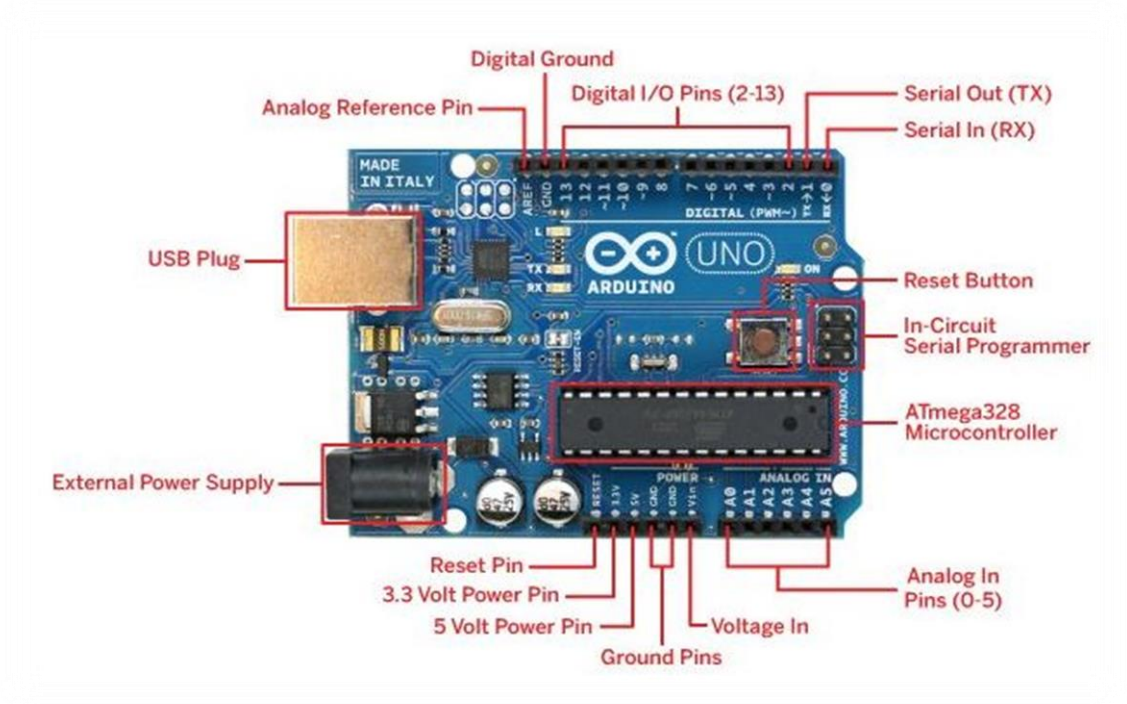


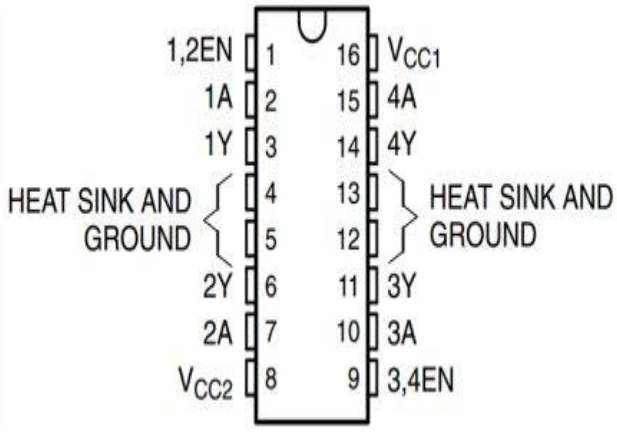
Fig 2.2.2 Pin Description of Arduino UNO

L293D Motor Driver Shield:

L293D is a monolithic integrated, high voltage, high current, 4-channel driver. Basically this means using this chip you can use DC motors and power supplies of up to 16 volts, that is some pretty big motors and the chip can supply a maximum current of 600mA per channel, the L293D chip is also what's known as a type of H-Bridge. The H-Bridge is typically an electrical circuit that enables a voltage to be applied across a load in either direction to an output, e.g. motor.

Fig 2.2.3: - L293d Motor shield

The L293D is quadruple high-current half-H drivers. It is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. Both devices are designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high-current/high-voltage loads in positive-supply applications. All inputs are TTL compatible. Each output is a complete totem-pole drive circuit, with a Darlington transistor sink and a pseudo- Darlington source. Drivers are enabled in pairs, with drivers 1 and 2 enabled by 1,2EN and drivers 3 and 4 enabled by 3,4EN. When an enable input is high, the associated drivers are enabled, and their outputs are active and in phase with their inputs. When the enable input is low, those drivers are disabled, and their outputs are off and in the high-impedance state. With the proper data inputs, each pair of drivers forms a full-H (or bridge) reversible drive suitable for solenoid or motor applications.



Pin	Name	Function
1	Enable1,2	Enable pin to control 1,2 driver
2	Input 1A	Input to control 1Y
3	Output 1Y	Output,connect to motor
4	GND	Ground and heat sink
5	GND	Ground and heat sink
6	Output 2Y	Output,connect to motor
7	Input 2A	Input to control 2Y
8	Vcc2	Output supply voltage
9	Enable3,4	Enable pin to control 3,4 driver
10	Input 3A	Input to control 3Y
11	Output 3Y	Output,connect to motor
12	GND	Ground and heat sink
13	GND	Ground and heat sink
14	Output 4Y	Output,connect to motor
15	Input 4A	Input to control 4Y
16	Vcc1	Supply voltage(7 max)

Fig 2.2.4:- Pin description of L293D

DC Motors:

A DC motor is an electric motor that runs on direct current (DC) electricity. DC motors were used to run machinery, often eliminating the need for a local steam engine or internal combustion engine. DC motors can operate directly from rechargeable batteries, providing the motive power for the first electric vehicles. Today DC motors are still found in applications as small as toys and disk drives, or in large sizes to operate steel rolling mills and paper machines. Modern DC motors are nearly always operated in conjunction with power electronic devices.

Fig 2.2.5: - DC Motors.

300 RPM Side Shaft Heavy Duty DC Gear Motor is suitable for large robots / automation systems. It has sturdy construction with gear box built to handle stall torque produced by the motor. Drive shaft is supported from both sides with metal bushes. Motor runs smoothly from 4V to 12V and gives 300 RPM at 12V. Motor has 8mm diameter, 17.5mm length drive shaft with D shape for excellent coupling.

HC-05 Bluetooth Module:

HC-05 module is an easy-to-use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. It uses CSR Bluecore 04-External single chip Bluetooth system with CMOS technology and with AFH (Adaptive Frequency Hopping Feature). It has the footprint as small as 12.7mmx27mm. Hope it will simplify your overall design/development cycle.

Fig 2.2.6:- HC-05 Bluetooth Module

Hardware Features :

- Typical -80dBm sensitivity.
- Up to +4dBm RF transmit power.
- Low Power 1.8V Operation ,1.8 to 3.6V I/O.
- PIO control.
- UART interface with programmable baud rate.
- With integrated antenna.
- With edge connector.

Software Features :

- Default Baud rate: 38400, Data bits:8, Stop bit:1, Parity: No parity, Data control: has supported baud rate: 9600,19200,38400,57600,115200,230400,460800.
- Given a rising pulse in PIO0, device will be disconnected.
- Status instruction port PIO1: low-disconnected, high-connected;
- PIO10 and PIO11 can be connected to red and blue led separately. When master and slave are paired, red and blue led blinks 1time/2s in interval, while disconnected only blue led blinks 2times/s.

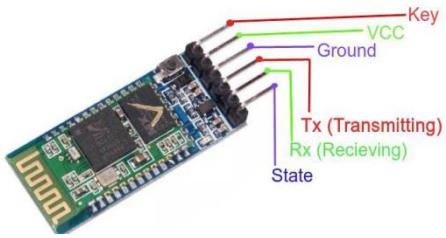


Fig 2.2.7. Pin description of HC-05 Bluetooth Module

ULTRASONIC SENSOR (HC-SR04):

The HC-SR04 ultrasonic sensor uses sonar to determine distance to an object like bats do. It offers excellent non-contact range detection with high accuracy and stable readings in an easy-to-use package. It comes complete with ultrasonic transmitter and receiver modules. There are many applications use ultrasonic sensors like instruction alarm systems, automatic door openers etc. The ultrasonic sensor is very compact and has a very high performance.

Vcc- Connects to 5V of positive voltage for power
Trig- A pulse is sent here for the sensor to go into ranging mode for object detection
Echo- The echo sends a signal back if an object has been detected or not. If a signal is returned, an object has been detected. If not, no object has been detected.
GND- Completes electrical pathway of the power.

Fig:-2.2.8 HC-SR04

Features

Here's a list of some of the HC-SR04 ultrasonic sensor features and specs:

- Power Supply :+5V DC
- Quiescent Current : <2mA
- Working Current: 15mA
- Effectual Angle: <15°
- Ranging Distance : 2cm – 400 cm/1″ – 13ft
- Resolution : 0.3 cm
- Measuring Angle: 30 degree
- Trigger Input Pulse width: 10uS
- Dimension: 45mm x 20mm x 15mm

How Does it Work?

The ultrasonic sensor uses sonar to determine the distance to an object. Here's what happens:

1. The transmitter (trig pin) sends a signal: a high-frequency sound.
2. When the signal finds an object, it is reflected and…
3. The transmitter (echo pin) receives it.

The time between the transmission and reception of the signal allows us to calculate the distance to an object. This is possible because we know the sound's velocity in the air.

Pins

- VCC: +5VDC
- Trig : Trigger (INPUT)
- Echo: Echo (OUTPUT)
- GND: GND

Servo Motor:

A **servo motor** is an electrical device which can push or rotate an object with great precision. If you want to rotate and object at some specific angles or distance, then you use servo motor. It is just made up of simple motor which run through **servo mechanism**. If motor is used is DC powered then it is called DC servo motor, and if it is AC powered motor then it is called AC servo motor. We can get a very high torque servo motor in a small and light weight packages. Doe to these features they are being used in many applications like toy car, RC helicopters and planes, Robotics, Machine etc.

Servo motors are rated in kg/cm (kilogram per centimeter) most hobby servo motors are rated at 3kg/cm or 6kg/cm or 12kg/cm. This kg/cm tells you how much weight your servo motor can lift at a particular distance. For example: A 6kg/cm Servo motor should be able to lift 6kg if the load is suspended 1cm away from the motors shaft, the greater the distance the lesser the weight carrying capacity.

Fig 2.2.9:- Servo motor

The position of a servo motor is decided by electrical pulse and its circuitry is placed beside the motor.

It consists of three parts:

1. Controlled device
2. Output sensor
3. Feedback system

It is a closed loop system where it uses positive feedback system to control motion and final position of the shaft. Here the device is controlled by a feedback signal generated by comparing output signal and reference input signal.

2.3 Circuit Diagram and Methodology:

Circuit Diagram:

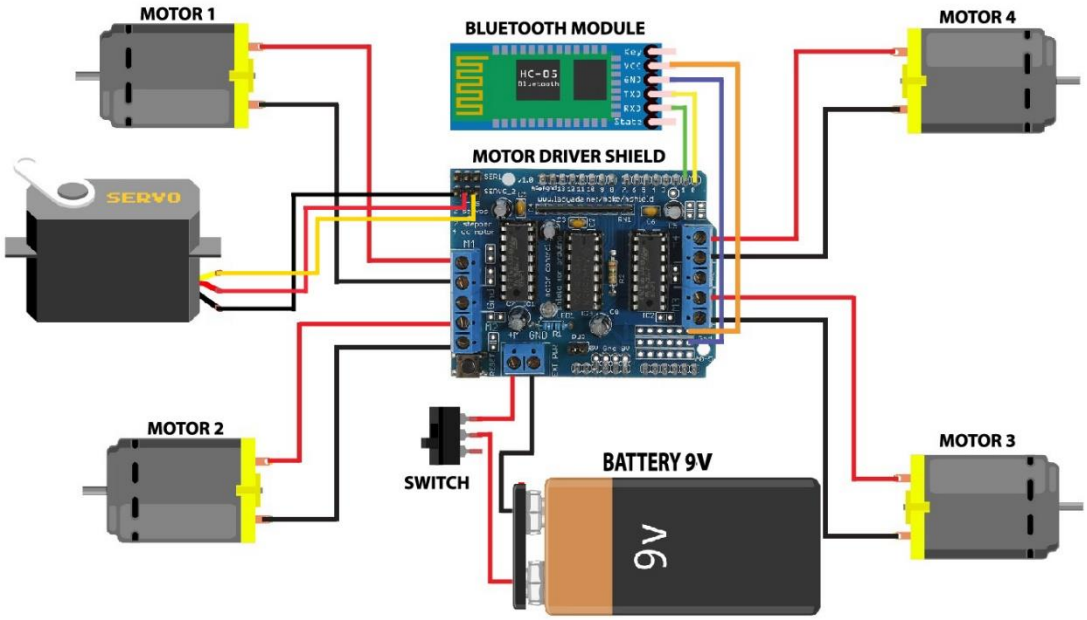


Fig:- 2.3.1:- Circuit Diagram

Methodology:

- **Transmitter :**

On the Transmitter section, commands are given to the Mobile Application through the micro-phone of the mobile handset. This mobile handset is connected to the moving vehicle via Bluetooth module. The mobile application used, is programmed in such a way that the voice commands given to the handset are received by the micro-phone and these analog voice commands are converted to digital word sequences (A to D conversion). These stored sequences are than transmitted to the robot via Bluetooth.

- **Receiver:**

The signal is received and decoded signal for communication with the Bluetooth module. The controller compares these digital signals with the stored program commands in it and convert them into voice strings. The voice strings are then used to run the DC motors for the desired interval of time.

CHAPTER 3:

SOFTWARE DESIGN

3.1 Software Details :

ARDUINO IDE:

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

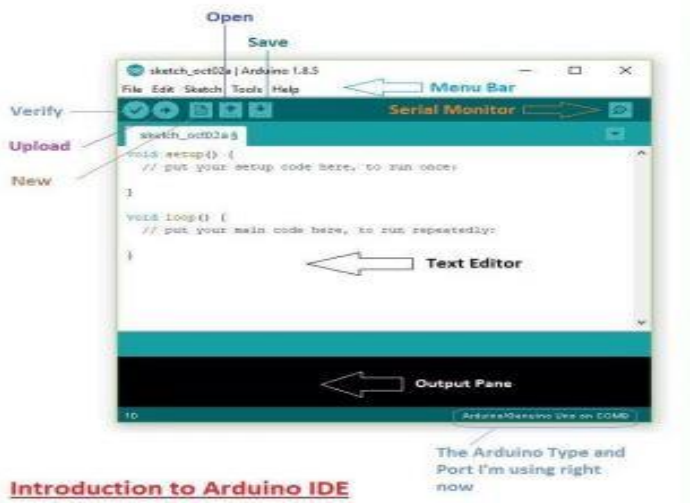


Fig 3.1.1. Arduino IDE

Programs written using Arduino Software (IDE) are called **sketches**. These sketches are written in the text editor and are saved with the file extension .ino. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom right hand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor. The Arduino Software (IDE) uses the concept of a sketchbook a standard place to store your programs (or sketches). The

sketches in your sketchbook can be opened from the File then Sketchbook menu or from the Open button on the toolbar. The first time you run the Arduino software, it will automatically create a directory for your sketchbook. You can view or change the location of the sketchbook location from with the Preferences dialog.

Beginning with version 1.0, files are saved with a .ino file extension. Previous versions use the .pde extension.

Software Language:

Embedded C

Embedded C is most popular programming language in software field for developing electronic gadgets. Each processor used in electronic system is associated with embedded software. Embedded C programming plays a key role in performing specific function by the processor**.**

In day-to-day life we used many electronic devices such as mobile phone, washing machine, digital camera, etc. These all-device working is based on microcontroller that are programmed by embedded C.

Embedded C is perhaps the most popular languages among Embedded Programmers for programming Embedded Systems. There are many popular programming languages like Assembly, BASIC, C++, Python etc.

In embedded system programming C code is preferred over other language. Due to the following reasons:

- Easy to understand
- High Reliability
- Portability

Embedded Systems consists of both Hardware and Software. If we consider a simple Embedded System, the main Hardware Module is the Processor. The Processor is the heart of the Embedded System and it can be anything like a Microprocessor, Microcontroller, DSP, CPLD (Complex Programmable Logic Device) or an FPGA (Field Programmable Gated Array). All these devices have one thing in common: they are programmable i.e., we can write a program (which is the software part of the Embedded System) to define how the device actually works. Embedded Software or Program allow Hardware to monitor external events (Inputs / Sensors) and control external devices (Outputs) accordingly. During this process, the program for an Embedded System may have to directly manipulate the internal architecture of the Embedded Hardware (usually the processor) such as Timers, Serial Communications Interface, Interrupt Handling, and I/O Ports etc.

- Scalability

From the above statement, it is clear that the Software part of an Embedded System is equally important as the Hardware part. There is no point in having advanced Hardware Components with poorly written programs (Software). There are many programming languages that are used for Embedded Systems like Assembly (low-level Programming Language), C, C++, JAVA (high-level programming languages), Visual Basic, JAVA Script (Application-level Programming Languages), etc.

Android Application Operated Bluetooth Control (Amr Voice) :

- Android is an open-source operating system which means that any manufacturer can use it in their phones free of charge.

- It was built to be truly open.

- Android is built on the open Linux Kernel. Furthermore, it utilizes a custom JAVA virtual machine.

- An android app is meant for phones with an android based operating systems. They can be downloaded from the android app Market which is pre-loaded on every android phone.

- Blue control APP and Bluetooth Spp APP are some examples. Android Application Operated Bluetooth.

- The Android platform includes support for the Bluetooth network stack, which allows a device to wirelessly exchange data with other Bluetooth devices.

- The application framework provides access to the Bluetooth functionality through the Android Bluetooth APIs.

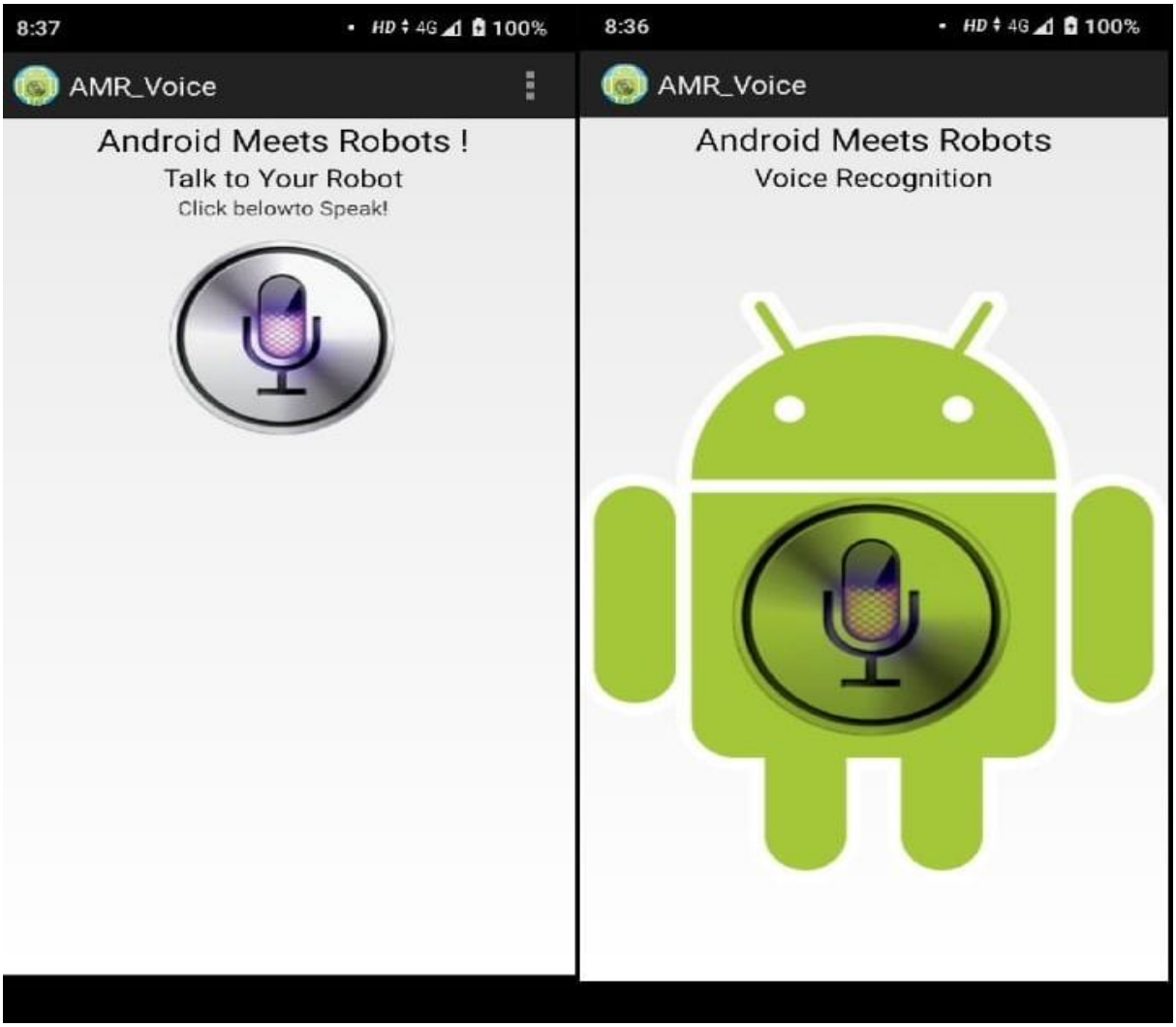


Fig 3.1.2 Android Application operated Bluetooth control

3.2 Flow Chart:

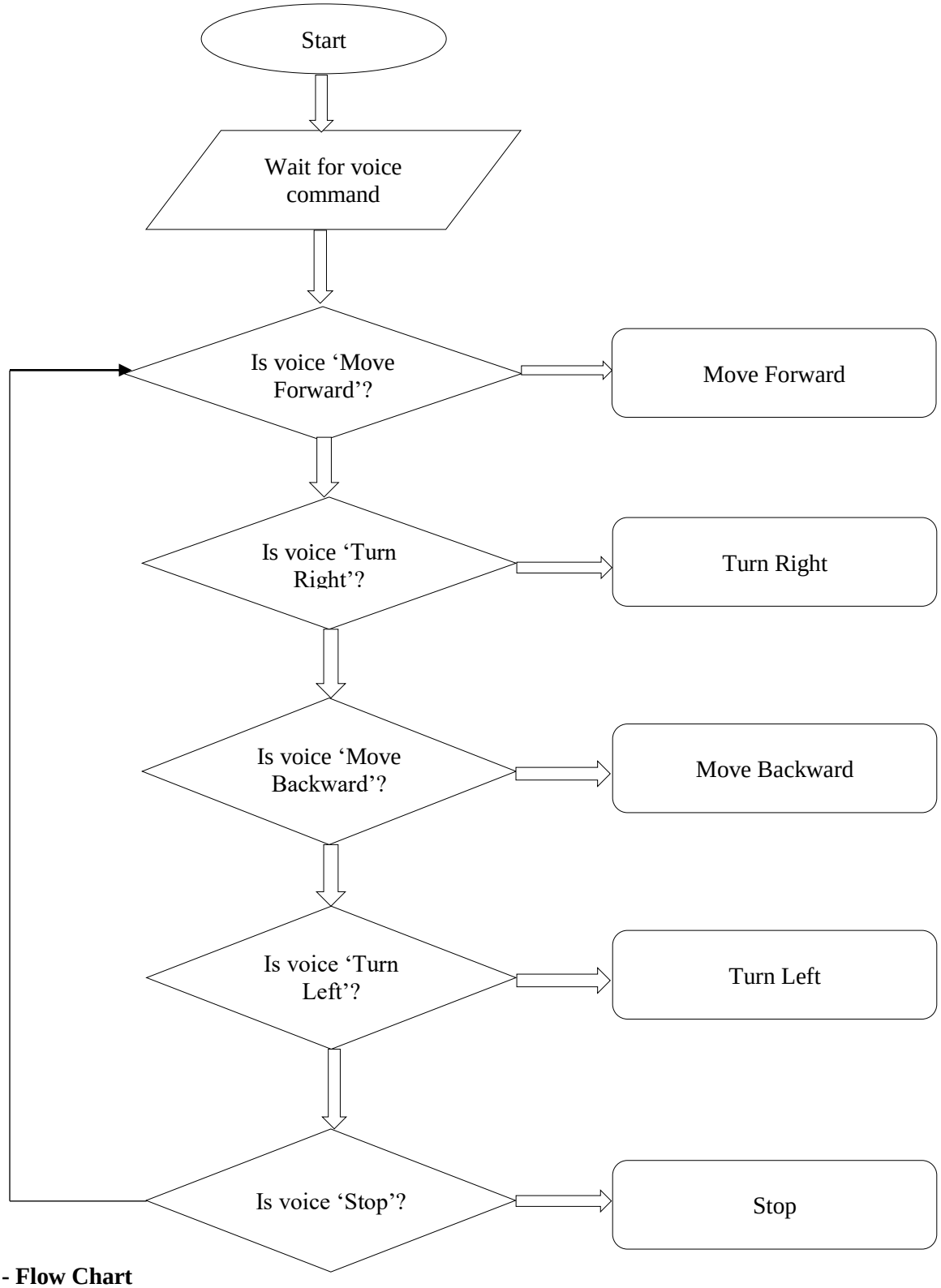


Fig 3.2.1:- Flow Chart

3.3 Working of the Proposed System:

In this system the robot is controlled by Arduino board containing the ATmega328 microcontroller. The text sent to microcontroller from mobile phone and it will be compared with pre-programmed command such as left, right, forward, back and stop.

The microcontroller gives the commanding signal to all the wheels through motor driver when user gives various commands.

1.'Forward' Command: The Bluetooth device at the receiver end uptakes the 'forward' command and passes it on to the Arduino board which inturn tells the motor driver to control the 4 connected motors(wheels) as follows:

Motor 1- Clockwise direction
Motor 2- Clockwise direction
Motor 3- Clockwise direction
Motor 4- Clockwise direction

2.'Back' Command: The Bluetooth device at the receiver end uptakes the 'back' command and passes it on to the Arduino board which inturn tells the motor driver to control the 4 connected motors(wheels) as follows:

Motor 1- Anti-Clockwise direction
Motor 2- Anti-Clockwise direction
Motor 3- Anti-Clockwise direction
Motor 4- Anti-Clockwise direction

3.'Right' Command: The Bluetooth device at the receiver end uptakes the 'right' command and passes it on to the Arduino board which inturn tells the motor driver to control the 4 connected motors(wheels) as follows:

Motor 1- Clockwise direction
Motor 2- Clockwise direction
Motor 3- Anti-Clockwise direction
Motor 4- Anti-Clockwise direction

4.'Left' Command: The Bluetooth device at the receiver end uptakes the 'left' command and passes it on to the Arduino board which inturn tells the motor driver to control the 4 connected motors(wheels) as follows:

Motor 1- Anti-Clockwise direction
Motor 2- Anti-Clockwise direction
Motor 3- Clockwise direction
Motor 4- Clockwise direction

5.'Stop' Command: The Bluetooth device at the receiver end uptakes the 'left' command and passes it on to the Arduino board which inturn tells the motor driver to control the 4 connected motors(wheels) to stop.

CHAPTER 4:

4.1 Results and Discussion:

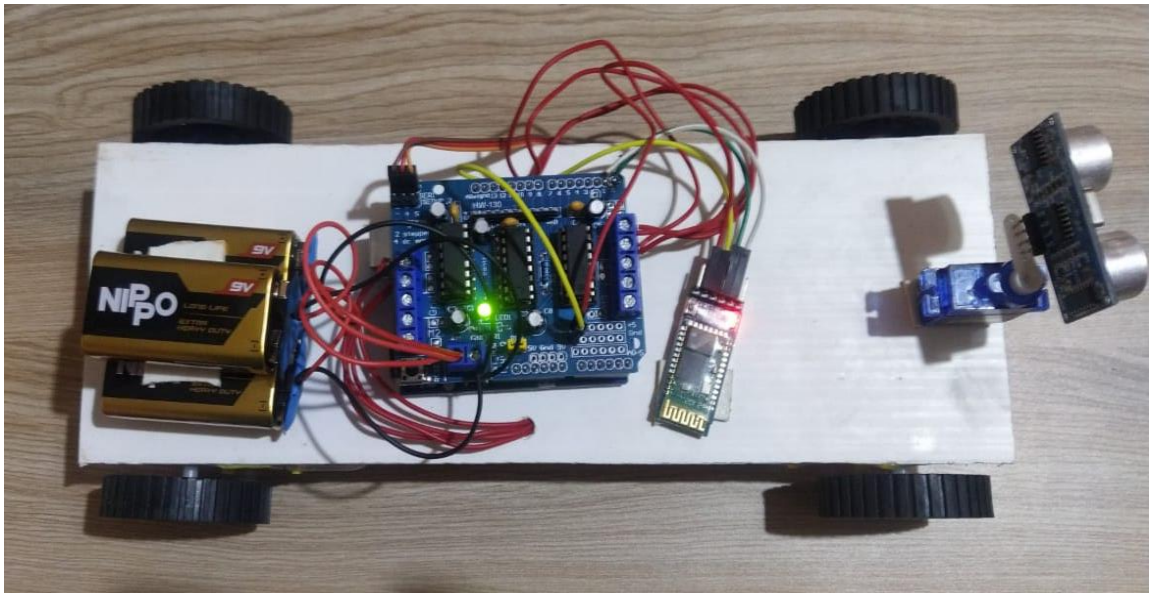


Fig 4.1.1: Snapshot of the Voice Controlled Robot Using Arduino Uno

The following are the pictures taken while the robot is inaction. The robot has two sections for the voice recognitionand synthesis. The upper part as you can see consists of a L293D motor drive sheild,HC-05,Ultrasonic Sensor (HC-SR04). The lower deck consists of Arduino Uno, motor drivers, dc motors.

4.2 Advantages and Disadvantages:

Advantages:

- Voice commands are transmitted and received through wireless serial communication with the help of Bluetooth technology.
- Live streaming of the operation is possible due to wireless camera.
- Changes in the environment are done using robotic arm.
- System is protected against any hindrances by an obstacle detector using ultrasonic sensor. The system has very less power consumption (upto 30W).
- The robotic vehicle can be used where humans find difficult to reach but human voice reaches like in a small pipeline, in fire situations, in highly toxic areas Etc.
- It can be integrated with wheelchairs for assisting disabled persons.

Disadvantages:

- Range of Bluetooth technology is upto 10 meters only.

- Delay in transmission and reception of commands is high.
- The Bluetooth connection gets dropped frequently.
- Noise signals are added during reception of video signals which give rise to flicker.
- Maintenance of the system is difficult. There is need for more number of obstacle detector sensors. Location of the system can be tracked using GPS/GSM modules.

4.3 Applications:

The assistant robot can be used for various purposes as listed below:

1. **In chemical industries:**

In chemical industry, people cannot handle the chemicals which might be having high temperature. Thus, industrial robot is a vital development towards improving the safety standards in industries. In such hazardous situations, the assistant robots can be used to hold the chemicals and carry them from one place to another without human interference. Also, there might be places in the industries where humans cannot go and work, in all such cases this robot can be controlled by the voice commands and can be directed to go and work in that place. It can also be used to carry small objects in the industry within a certain distance to reduce the time and the manual labor. Robotic assistant can also be used in manufacturing sector for different re-positioning operations.

2. **In homes and for daily needs:**

People may need assistance to reduce their manual effort, which may be mostly needed in the case of physically handicapped people or the old-aged people. Robotic assistant can be used by physically challenged people or the old-aged people as it helps them to place an object from one place to another which would be difficult for them in general. These assistant robots can move around quickly and also can be controlled easily by voice commands and can be used to obtain the desired result in a quicker span of time and much easily.

3. **In hospitals:**

This assistant can be used extensively in the hospitals where it can be used in surgical operations. Robotic arm has been used in various surgeries across hospitals [8]. Furthermore, if it can be guided by the voice commands and carry out the specified task, efficiency can be increased thus also causing the human labor to reduce.

i The robot is useful in places where humans find difficult to reach but human voice reaches. E.g., in a small pipeline, in a fire-situations, in highly toxic areas.
ii It is the one of the important stage of Humanoid robots.
iii Command and control of appliances and equipment .

Conclusion:

Robot controlled by voice using mobile phone is a very effective project especially for physically challenged people. It is also Very useful in industries and at those places where human life is endangered. The idea of using voice commands to manipulate a device is not new to us. With the advent of technology this idea became a reality now. Improvements in the areas of speech recognition and synthesis, language understanding, and voice processing have already been realized in many real-world applications.

The Technology advancement in the speech recognition over the past few year's results in research-oriented activities based operating the equipment based on user voice commands. Some design implementation results in operating the home appliances based on voice command, some design implementation results in navigation of physically challenged to their destination based on their voice commands, design implementation of robots and forklift navigation based on voice command, endanger. It gives exact concept of controlling a robot by voice. Robot is capable of understanding and synthesizing human's speech for communication. A voice recognition unit built around a high-speed processor that ensures various function of the system to be performed by voice command

The robotic assistant developed has potential applications ranging from chemical industries to comfortable scenario inside homes. This should be helpful in showcasing a Arduino based application in developing a voice-controlled robotic assistant.

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Appendics:

```
#include <AFMotor.h>
#include <Servo.h>

String command;

AF_DCMotor motor1(1, MOTOR12_1KHZ);
AF_DCMotor motor2(2, MOTOR12_1KHZ);
AF_DCMotor motor3(3, MOTOR34_1KHZ);
AF_DCMotor motor4(4, MOTOR34_1KHZ);

Servo myservo;

void setup() {

Serial.begin(9600);
myservo.attach(10);
myservo.write(90);

}

void loop() {

 delay(10);
 while(Serial.available()) {
  command = "";
  command = Serial.readString();

    Serial.print(command);
}
  if(command == "*move forward#"){
    forward();
  }else if(command == "*move backward#"){
    backward();
  }else if(command == "*turn left#"){
    left();
  }else if(command == "*turn right#"){
    right();
  }else if(command == "*stop#") {
```

```
    Stop();
  }
  command = "";
}

void forward() {
  motor1.setSpeed(255);
  motor1.run(FORWARD);
  motor2.setSpeed(255);
  motor2.run(FORWARD);
  motor3.setSpeed(255);
  motor3.run(FORWARD);
  motor4.setSpeed(255);
  motor4.run(FORWARD);
  delay(1500);
  motor1.run(RELEASE);
  motor2.run(RELEASE);
  motor3.run(RELEASE);
  motor4.run(RELEASE);

}

void backward() {
  motor1.setSpeed(255);
  motor1.run(BACKWARD);
  motor2.setSpeed(255);
  motor2.run(BACKWARD);
  motor3.setSpeed(255);
  motor3.run(BACKWARD);
  motor4.setSpeed(255);
  motor4.run(BACKWARD);
  delay(1500);
  motor1.run(RELEASE);
  motor2.run(RELEASE);
  motor3.run(RELEASE);
  motor4.run(RELEASE);
}

void left() {
  myservo.write(180);
  delay(500);
  myservo.write(90);
  delay(500);
  motor1.setSpeed(255);
```

```
  motor1.run(FORWARD);
  motor2.setSpeed(255);
  motor2.run(BACKWARD);
  motor3.setSpeed(255);
  motor3.run(FORWARD);
  motor4.setSpeed(255);
  motor4.run(BACKWARD);
  delay(500);
  motor1.run(RELEASE);
  motor2.run(RELEASE);
  motor3.run(RELEASE);
  motor4.run(RELEASE);
}

void right() {
  myservo.write(0);
  delay(500);
  myservo.write(90);
  delay(500);
  motor1.setSpeed(255);
  motor1.run(BACKWARD);
  motor2.setSpeed(255);
  motor2.run(FORWARD);
  motor3.setSpeed(255);
  motor3.run(BACKWARD);
  motor4.setSpeed(255);
  motor4.run(FORWARD);
  delay(500);
  motor1.run(RELEASE);
  motor2.run(RELEASE);
  motor3.run(RELEASE);
  motor4.run(RELEASE);
}

void Stop() {
  motor1.run(RELEASE);
  motor2.run(RELEASE);
  motor3.run(RELEASE);
  motor4.run(RELEASE);
}
```