School of Engineering and Applied Science,

Ahmedabad University

ANDROID PHONE CONTROLLED ROBOT

TEAM MEMBERS :	ROLL NO:
Yesha Shastri	1741035
Devshree Patel	1741075
Muskan Matwani	1741027
Naishi Shah	1741033

Motivation:

Robots are gadgets which can be programmed by the humans in order to give them human-like abilities. Since humans cannot always be accurate in performing certain tasks, robots can be useful to provide us with unbiased and accurate results. In the areas where human intervention is not possible like, in military surveillance, use of robots becomes a necessity. Robots in the agricultural sector will be of great help to the nation. Looking at the magnificence of the applications of the robot and the ease of availability of the Android technology motivated us to think of developing a robot which will be useful in the real-life scenario.
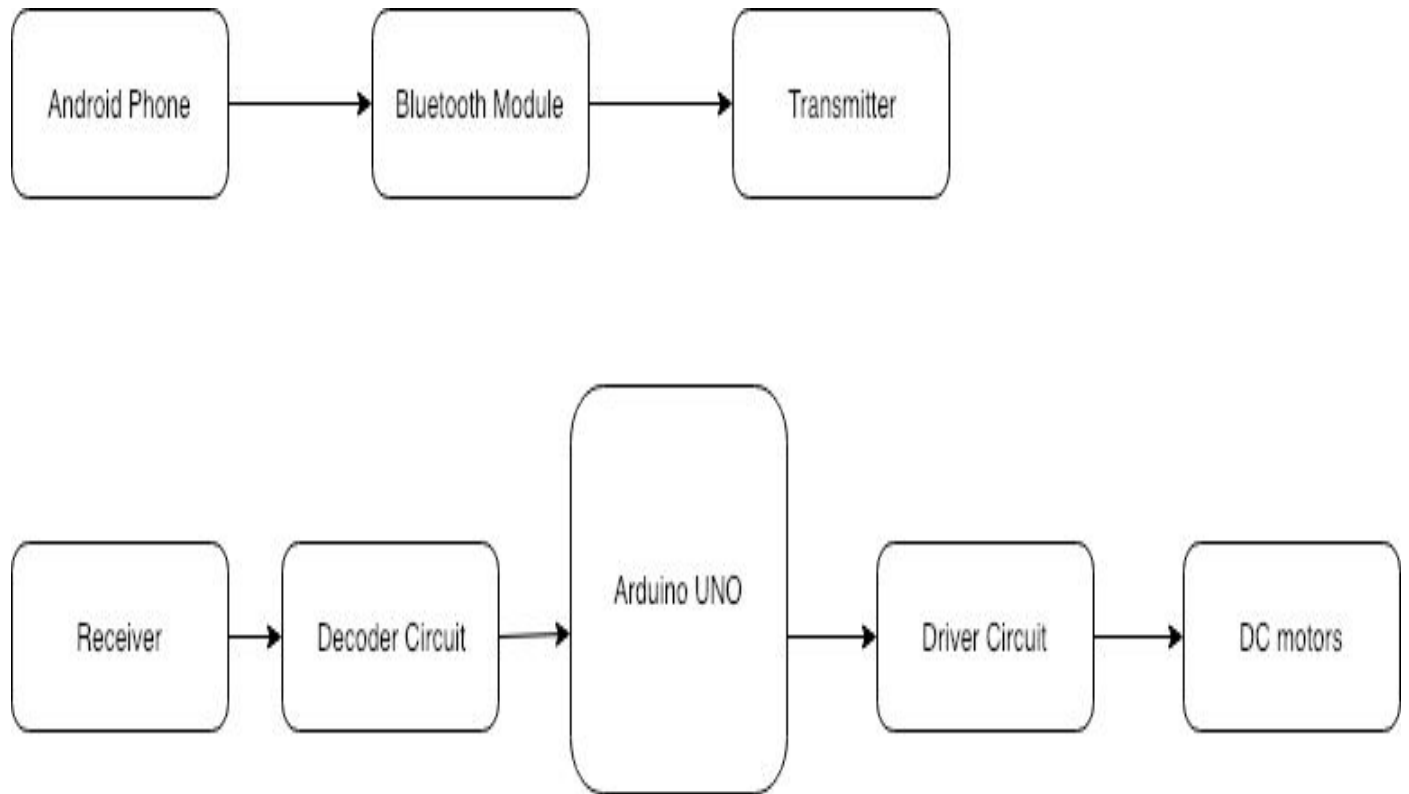
Description:

The system will work on the control commands sent by the app. The commands could either be in the form of touch on the app screen or by the speech. These commands will be received by the Bluetooth module attached to the robot. The received data would then be passed on to Arduino which will further send instructions to the motor driver. The motor driver will amplify the low-current control signal to high-current control signal for the purpose of driving the motors. Ultimately, the motors will make the robot move in desired directions. In return, the robot also sends back information regarding the distance from the closest obstacle to the phone and if it reaches very close to a certain obstacle it will automatically stop.

Final Outcome:

The robot will be able to move in forward, backward, left and right directions. The user will also be able to control the speed of the robot through the app interface. Speech commands could be from (forward, backward, left, right and stop). The spoken commands will be visible on the app screen. Hence, it will result in a full-fledged Android phone controlled robot ready for the addition of features in future to work for real-life applications.
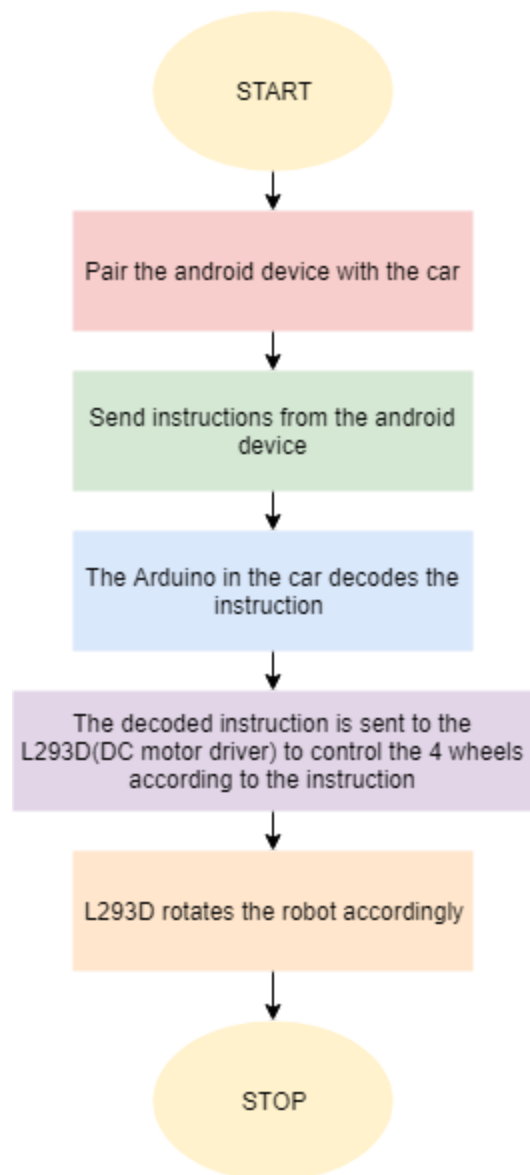
BLOCK DIAGRAM :

Android Phone → Bluetooth Module → Transmitter

Receiver → Decoder Circuit → Arduino UNO → Driver Circuit → DC motors

Block diagram of Proposed System

COMPONENTS REQUIRED :

1. 1 X Arduino Uno R3 Board
2. 4 X Geared motor with wheels
3. 2 X Motor Driver L293D
4. 1 X Bluetooth module HC-06
5. 2 X Li-ion battery 18650
6. 4 X LEDs + resistors 220 Ohm
7. 1 X Buzzer
8. Connecting wires

FLOWCHART :

START

↓

Pair the android device with the car

↓

Send instructions from the android device

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The Arduino in the car decodes the instruction

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The decoded instruction is sent to the L293D(DC motor driver) to control the 4 wheels according to the instruction

↓

L293D rotates the robot accordingly

↓

STOP

SELECTION CRITERIA OF COMPONENTS:

Arduino Uno:

It is an open-source electronics prototyping platform based on flexible, easy-to-use hardware and software. It is intended for artists, designers, hobbyists and anyone interested in creating interactive objects or environments.

The board is very easy to use as the user simply needs to connect it to a computer with a USB cable, or power it with an AC-to-DC adaptor or battery to get started. The microcontroller on the board is programmed using Arduino programming language using the Arduino development environment.

DC motor:

A DC motor is a type of motor with a magnetic coil inside. When an electric current passes through the coil, the magnetic force generated proceeds to turn the motor. The current is passed through a commutator before entering the coil, which switches the direction of the current at the apex point, so the spinning continues. The speed of the motor can be controlled by limiting the current, and the direction is affected by the direction of the current.
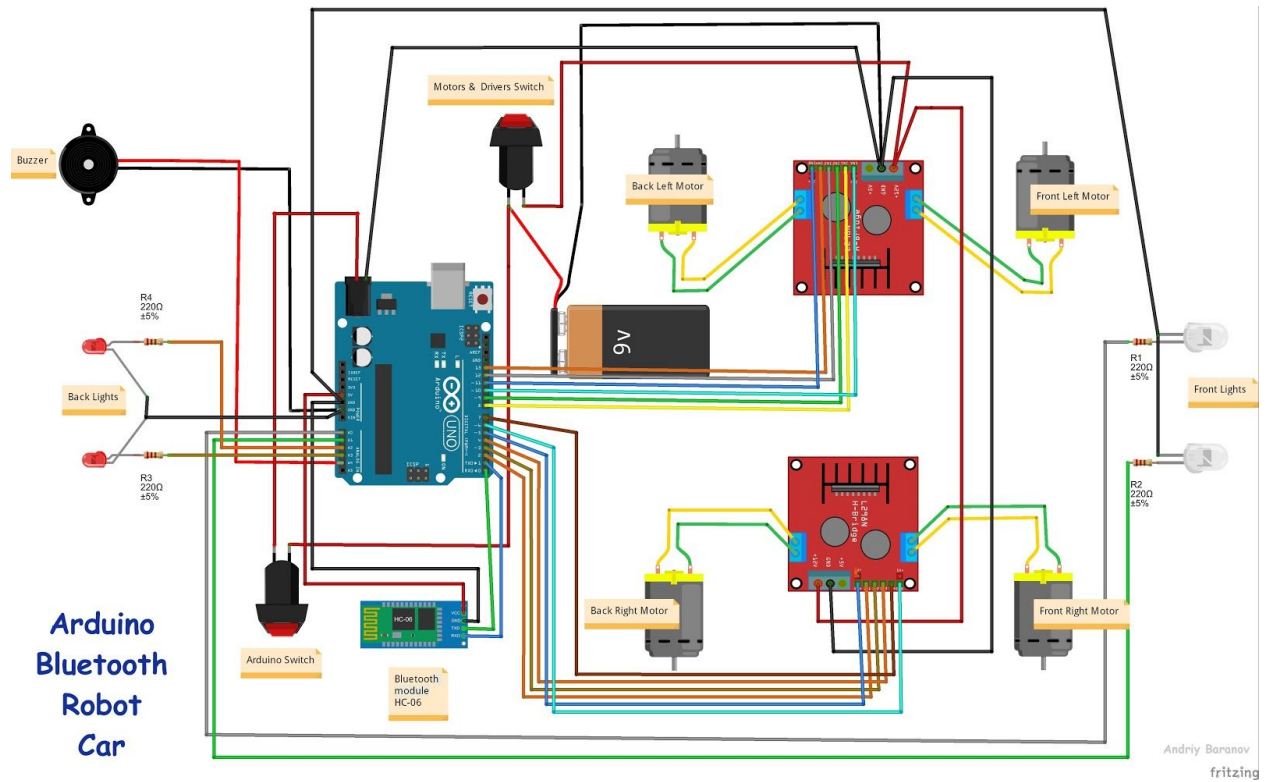
HC 06 Bluetooth Module:

The HC-06 is a class 2 slave Bluetooth module designed for transparent wireless serial communication. Once it is paired to a master Bluetooth device such as PC, and tablet, its operation becomes transparent to the user. All data received through the serial input is immediately transmitted over the air. When the module receives wireless data, it is sent out through the serial interface exactly at it is received. No user code specific to the Bluetooth module is needed at all in the user microcontroller program. The HC-06 will work with a supply voltage of 3.6VDC to 6VDC, however, the logic level of RXD pin is 3.3V and is not 5V tolerant. It is

responsible for enabling Bluetooth Communication between Arduino and Android Phone.

L293D:-

L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC. Here, 2 L293D drivers control 4 DC Motors which are connected to wheels of the robot. Also, it is one of the most popular drivers in the market. There are several reasons which make L293D the preferred driver to the users, such as, cheap price (compared to other drivers), proper shape and size, easy control, no need for protective circuit and diodes, no need for heat sinks and good resistance to temperature and high-speed variations. This IC can set up motors with a voltage between 5V to 36V and a current of up to 600 mA. However, it can withstand a current up to 1200 mA in 100 microsecond and non-repetitive. The frequency of this IC is 5 kHz.

CIRCUIT DIAGRAM:-

Buzzer

Motors & Drivers Switch

Back Left Motor

Front Left Motor

R4
220Ω
±5%

Back Lights

R3
220Ω
±5%

Arduino
Bluetooth
Robot
Car

Arduino Switch

Bluetooth
module
HC-06

HC-06

9v

Back Right Motor

Front Right Motor

R1
220Ω
±5%

Front Lights

R2
220Ω
±5%

Andriy Baranov

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DATASHEET OF MAJOR COMPONENTS:

1. Arduino Uno R3 board:

Microcontroller	ATmega328P
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limit)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
PWM Digital I/O Pins	6
Analog Input Pins	6
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328P) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328P)
EEPROM	1 KB (ATmega328P)
Clock Speed	16 MHz
LED_BUILTIN	13
Length	68.6 mm
Width	53.4 mm
Weight	25 g

2. DC Motor:

DC motor 6/9V

Item	Specification	Reference
Rated Voltage	6V DC	
No load speed	12000±15%rpm	
No load current	≤280mA	
Operating voltage	1.5-6.5V DC	
Starting Torque	≥250g.cm(according to ourself developed blade)	
starting current	≤5A	
Insulation Resistance	above 10Ω between the case and the terminal	DV 100V
Rotation Direction	CW:[+]terminal connected to the positive power supply,[-]terminal connected to nagative power,clockwise is deemed by the direction of the output shaft	
shaft gap	0.05-0.35mm	

3. HC 06 Bluetooth Module:

Pin	Name	Function
1	Key	The pin state determines whether the module works in AT command mode or normal mode [High=AT commands receiving mode(Commands response mode), Low or NC= Bluetooth module normally working]
2	Vcc	+5V Positive supply needs to be given to this pin for powering the module
3	Gnd	Connect to ground
4	TXD	Serial data is transmitted by module through this pin (at 9600bps by default), 3.3V logic
5	RXD	Serial data is received by module through this pin (at 9600bps by default),3.3V logic
6	State	The pin is connected to the LED on the board to represent the state of the module

4. L293D:

Pin No	Function	Name
1	Enable pin for Motor 1; active high	Enable 1,2
2	Input 1 for Motor 1	Input 1
3	Output 1 for Motor 1	Output 1
4	Ground (0V)	Ground
5	Ground (0V)	Ground
6	Output 2 for Motor 1	Output 2
7	Input 2 for Motor 1	Input 2
8	Supply voltage for Motors; 9-12V (up to 36V)	Vcc_2
9	Enable pin for Motor 2; active high	Enable 3,4
10	Input 1 for Motor 1	Input 3
11	Output 1 for Motor 1	Output 3
12	Ground (0V)	Ground
13	Ground (0V)	Ground
14	Output 2 for Motor 1	Output 4
15	Input2 for Motor 1	Input 4
16	Supply voltage; 5V (up to 36V)	Vcc_1

TIMELINE OF THE PROJECT :

TASK	FINISH DATE
Selection of project topic and preparing list for components required	07/02/19
Understanding the working of components	13/02/19
Integrating all components and finalizing the circuit design	25/02/19
Updating report 1 to submit report 2	5/03/19
Writing a primary code to dump on the system	10/03/19
Debugging the code	15/03/19
Submission of report 3	19/03/19
Making android application and integrating the app with Bluetooth module	25/03/19
Integrating the final project and prepare the presentation	30/03/19
Final presentation	06/04/19