GALGOTIAS UNIVERSITY

(Established under Galgotias University Uttar Pradesh Act No. 14 of 2011)

BLUETOOTH CONTROLLED ARDUINO ROBOT

A Report for the Evaluation 3 of Project 2

Submitted by

SAIF RAFI

(1613101610/16SCSE101760)

in partial fulfillment for the award of the degree of

BACHELOR OF TECNOLOGY

IN

COMPUTER SCIENCE

SCHOOL OF COMPUTING SCIENCE AND ENGINEERING

Under the Supervision of

Supervisor Name with Designation

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Professor

APRIL / MAY- 2020

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ABSTRACT

The project is designed to develop a robotic vehicle using Arduino for remote operation, monitoring purpose, surveillance purpose, industrial purpose. The robot can transmit real time information with the help of Arduino board connected to computer or any smart device. The **Arduino Uno** is a **microcontroller** board based on the ATmega328 (datasheet). These robots are reprogrammable and can be used in multiple applications. Robots can work 24 hours without any rest making it more productive and efficient. The whole system is controlled by microcontroller in the **Arduino Uno** in which the Arduino program is uploaded to control the motion of the robot.

INTRODUCTION

A robot is used in many Purpose like automating a task, Pick and Drop work, Surveillance, and many other purposes making the task easy and efficient. In this world of large demand and supply a robot is something on which we can rely for several works. This paper is also about a robot which is Arduino based and controlled by an android device.

The Arduino is a programmable device consisting of a microcontroller and various I/o pins. The Arduino robot is controlled by Bluetooth using android device. This robot consists of Arduino Uno board a Bluetooth Module (HC-05), L293d Motor Driver, Power Source, Motors, Wheels and a frame. The robot is controlled by android smartphone application. The Arduino program is uploaded to the Arduino board using a USB cable by pc making it functional. The Arduino program consists of various codes and commands for the movement of the robot and its control. The Arduino program is called sketch. The movement of the robot, like Forward, Backward, Right, left all are controlled by the Android remote control application, which is based on API. The combination of both android and Arduino leads to the functioning of the robot.

EXISTING SYSTEM

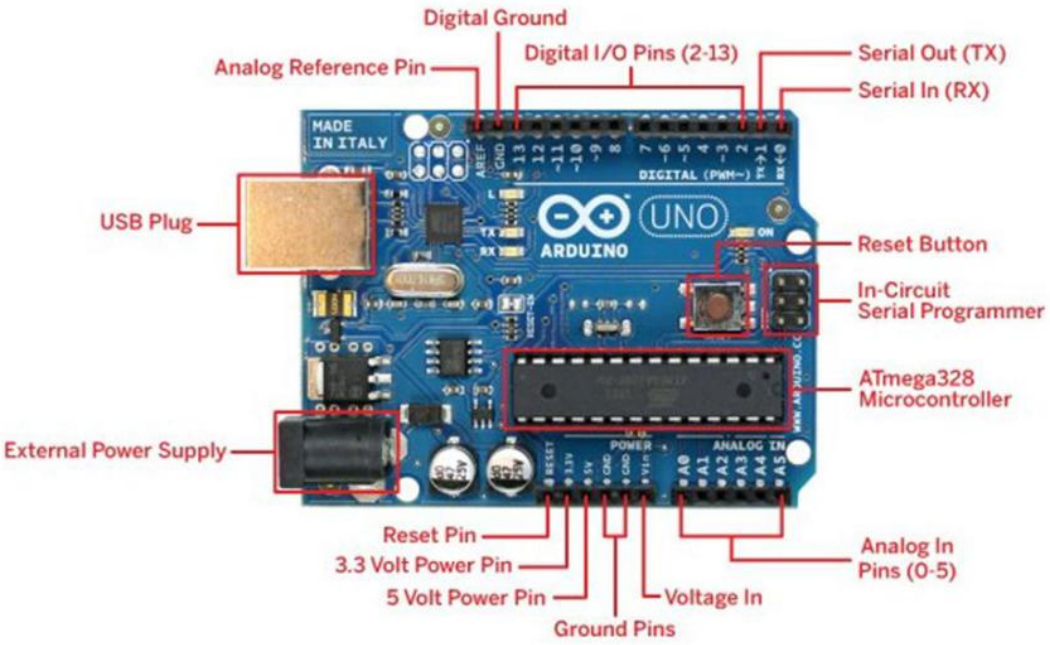
Arduino uno is an open source microcontroller board basec on microchip ATmega 328p microcontroller and developed bt Arduino.cc.This board is used in various projects and it has variuos applications.Many of the projects are developed using aurdino.Arduino is used in home automation systems,robot cars,remote controls,and various automated systems.It sis used invarious security systems and with iot.It is used for variuos surveillance systems. It is used in various security system like the laser security system a radar with arduino.It is used to make traffic light control system.It is used in temperature monitoring and controlling system.Arduino is usedto make quadcopters,RFID access control system,Arduino based robotic arm,arduino based obstacle avoiding robot,arduino based line following robot,arduino based distance sensor,and various other applications.It is mainly used in the robotics projects and development of various robots.

PROPOSED SYSTEM

In this project the focus is to make a bluetoooth controlled arduino robot controlled by the android smartphone using an application which can connect with the arduino attached to the car and give it commands or instructions to do a specific task like move forward ,move backward ,move right, move left which are transferred to the microcontroller through the program uploaded to the board using arduino ide.Arduino language is used to control the arduino board which.The board is controlled using the program uploadded to it.This is a robot which is used in various field like medical,defence for security purpose and spying,for pick and drop like work.The robots are robust and smart to do things which may not be possible and risky for the humans.

IMPLEMENTATION/ARCHITECTURE DESIGN

- **ARDUINO UNO:** The Arduino Uno is an open-source microcontroller based on the microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog I/O pins that may be interfaced to various Expansion boards (L293D Motor Driver Shield) and Circuits. The board has 14 digital I/O pins (6 capable of PWM Output),6 analog I/O pins, and is programmable with the Arduino IDE, via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7-20 volts. The Arduino project started at the Interaction Design Institute Ivrea (IDII) in Ivrea, Italy.



Technical Specifications of Arduino Uno Board:

- Microcontroller: Microchip ATmega328P
- Operating Volage:5 Volts
- Input Voltage:7 to 20 Volts
- Digital I/O pins:14(of which 6 can provide PWM output)
- UART:1
- 12C: 1

- SPPI: 1
- Analog Input Pins:6
- DC Current per I/O Pin:20mA
- DC Current for 3.3V Pin:50mA
- Flash Memory:32 KB of which 0.5 KB used by bootloader
- SRAM:2KB
- EEPROM:1 KB
- Clock Speed: 16MHz
- Lenght:68.6mm
- Width:53.4mm
- Weight:25g.

General Pin Functions:

- **LED:** There is a built-in LED driven by digital pin 13. When the pin is high value, the LED is On, when the pin is low, it is Off.
- **VIN:** The input voltage to the Arduino board when it is using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
- **5V:** This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 20V), the USB connector (5V), or the VIN pin of the board (7-20V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage the board.
- **3.3V:** A 3.3 Volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- **GND:** Ground Pins.
- **IOREF:** This pin on the Arduino board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source, or enable voltage translators on the outputs to work with the 5V or 3.3V.

- **RESET:** Typically used to add a reset button to shields that block the one on the board.

Special Pin Functions:

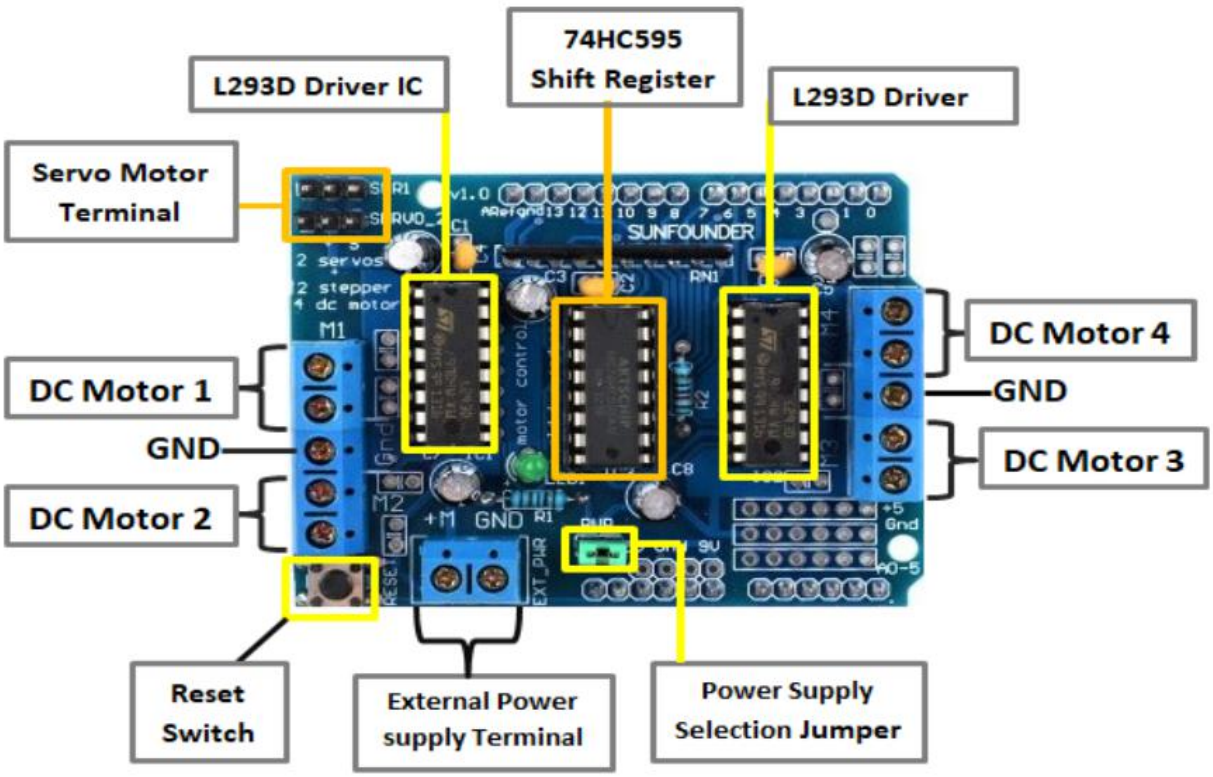
- **Serial/UART:** pins 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL serial chip.
- **External Interrupts:** pins 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value.
- **PWM (Pulse Width Modulation):** pins 3, 5, 6, 9, 10, and 11. Can provide 8-bit PWM output with the help of function (analogWrite()).
- **SPI (Serial Peripheral Interface):** pins 10 (SS), 11 (MOSI), 12 (MISO), and 13 (SCK). These pins support SPI communication using the SPI library.
- **TWI (Two Wire Interface):** pin SDA (A4) and pin SCL (A5). Support TWI communication using the Wire library.
- **AREF (Analog Reference):** Reference voltage for the analog inputs.

The Arduino Uno has a number of facilities for communicating with a computer, another Arduino board, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The 16U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, a .inf file is required. Arduino Software (IDE) includes a serial monitor which allows simple textual data to be sent to and from the board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (but not for serial communication on pins 0 and 1). A Software Serial library allows serial communication on any of the Uno's digital pins.

DC Motor: A DC Motor is controlled by dc Voltages applied and moves in left, right, forward, backward direction according to the polarity of applied voltage. Mostly all mechanical movements robot perform is controlled by the motor. Electric machines are Means of converting energy into mechanical energy. Motor found Application in many places like robots, Automobiles, and different Mechanical Devices.

L293D Motor Driver Shield: L293D shield is a driver board based on L293 IC, which can drive 4 DC motors and 2 stepper or Servo motors at the same time. Each channel of this module has the maximum current of 1.2A and doesn't work if the voltage is more than 25v or less than 4.5v.

The L293D is a dual-channel H-Bridge motor driver. The shield offers 4 H-Bridges and each H-bridge can deliver up to 0.6A to the motor. The shield also comes with a 74HC595 shift register that extends 4 digital pins of the Arduino to the 8 direction control pins of two L293D chips.



The output channels of both the L293D chips are broken out to the edge of the shield with two 5-pin screw terminals viz. M1, M2, M3 & M4. You can connect four DC motors having voltages between 4.5 to 25V to these terminals.

HC-05 BLUETOTH MODULE: It is a serial Bluetooth module for Arduino and other microcontrollers having an operating voltage of 4 to 6 V and an operating current of 30mA. It has a range of less than 100m.It works with serial communication (USART) and TTL compatible. Uses Frequency-Hopping Spread spectrum. It can operate in Slave, Master or Slave/Master mode. It can easily Interfaced with Laptop or Mobile phones with Bluetooth. It is interfaced with the microcontroller over the serial UART port of micro-controller.

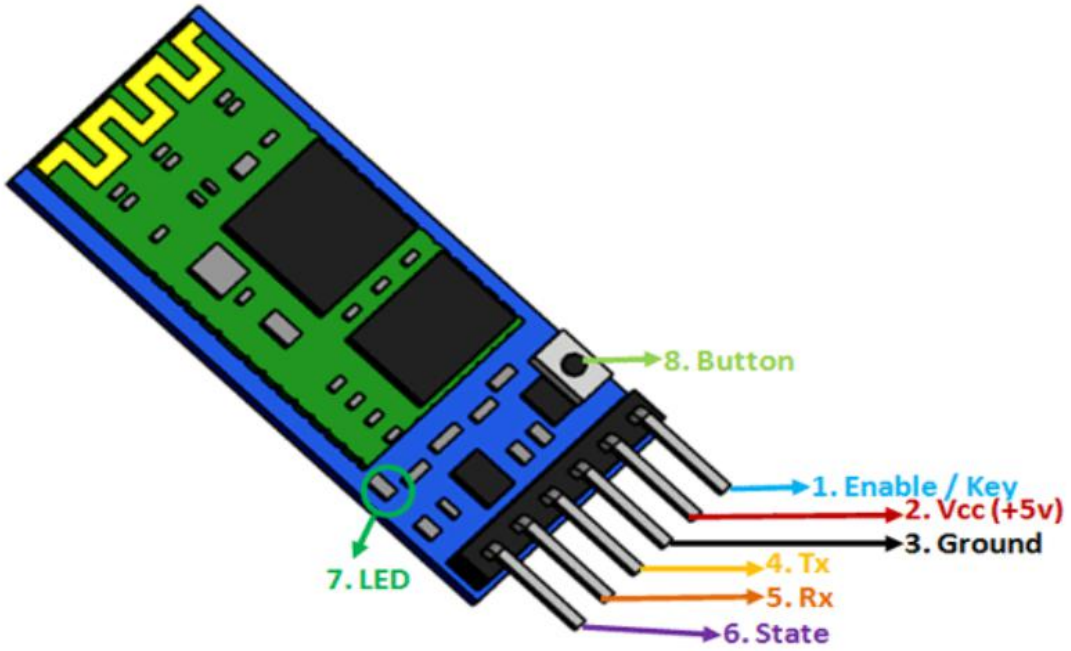
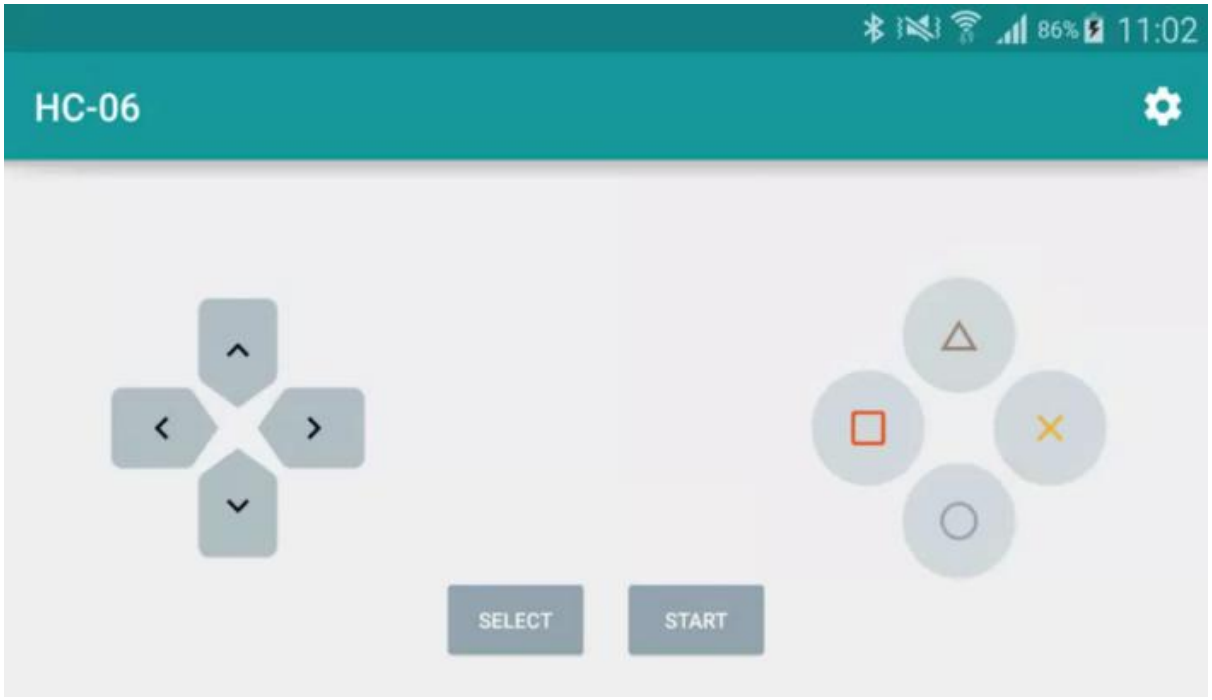
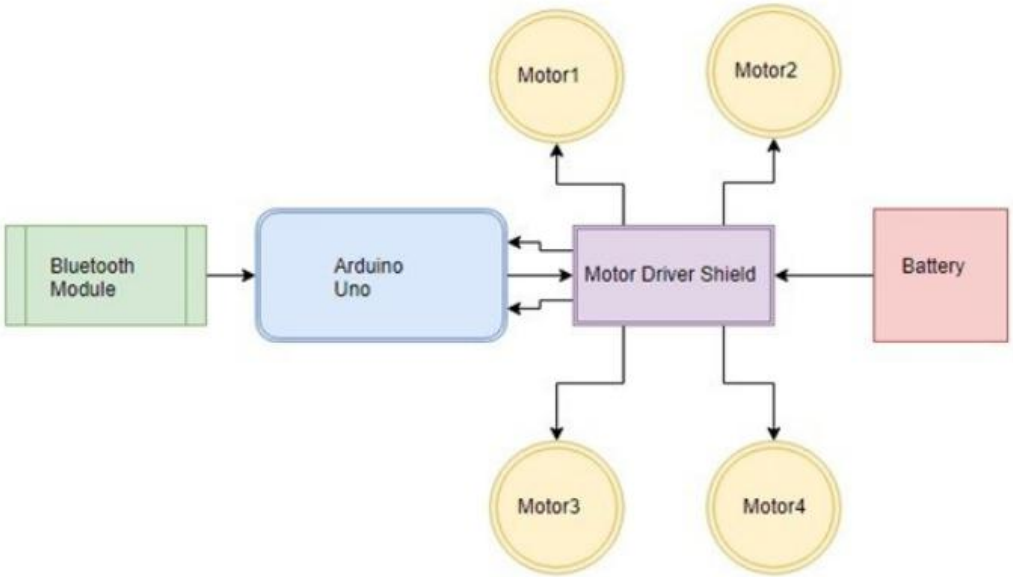


FIG3.HC-05 BLUETOOTH MODULE

ARDUINO CONTROLLER: Arduino Bluetooth controller is an application used to control the motion of the Arduino Robot.



SYSTEM ARCHITECTURE:



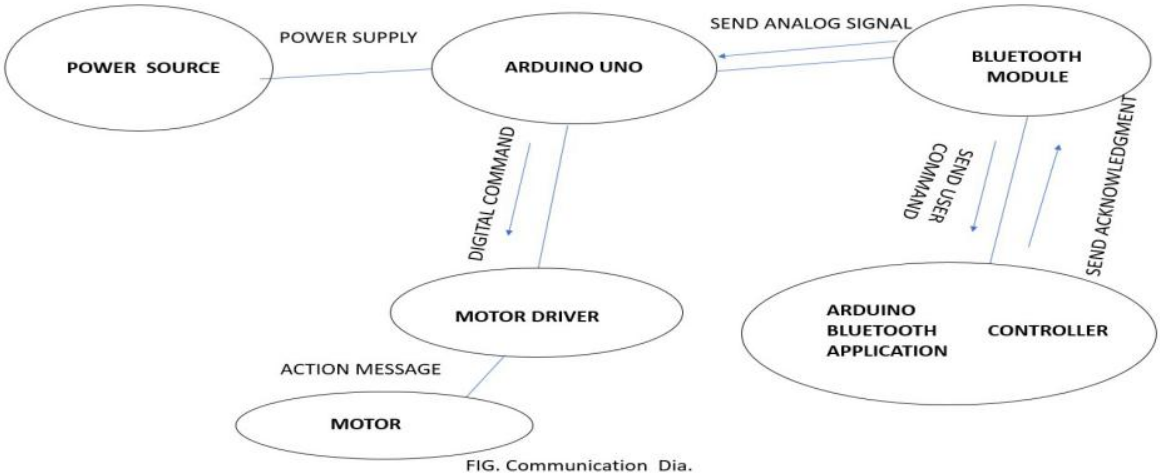


FIG.6.COMMUNICATION DIAGRAM

ARDUINO: The Arduino Integrated Development Environment is a cross-platform application that is written in functions from C and C++. It is used to write and upload the programs into Arduino Boards.

Programming Digital I/O Pins of Arduino:

Each pin is controlled by three commands

associated with it which are designated as:

- pinMode()
- digitalWrite()
- digitalRead()

pinMode():

Configures the specified pin to behave either as an input or an output.

Syntax:

pinMode(pin, mode)

Parameters:

pin: the Arduino pin number to set the mode of.
mode: INPUT, OUTPUT, or INPUT_PULLUP

Returns:

Nothing

Example:

```
void setup()
 {  pinMode(13, OUTPUT);    // sets the digital pin 13 as output}
void loop()
{
 digitalWrite(13, HIGH); // sets the digital pin 13 on
 delay(1000);            // waits for a second
 digitalWrite(13, LOW);  // sets the digital pin 13 off
 delay(1000);            // waits for a second
}
```

digitalWrite:

Write a HIGH or a LOW value to a digital pin.

Syntax:

digitalWrite(pin, value)

Parameters:

pin: the Arduino pin number.
value: HIGH or LOW.

Return:

Nothing.

Example:

```
void setup()
 {  pinMode(13, OUTPUT);    // sets the digital pin 13 as output
}
void loop()
{  digitalWrite(13, HIGH); // sets the digital pin 13 on
delay(1000);            // waits for a second
digitalWrite(13, LOW);  // sets the digital pin 13 off
 delay(1000);            // waits for a second
}
```

digitalRead:

Reads the value from a specified digital pin, either HIGH or LOW.

Syntax:

digitalRead(pin)

Parameters:

pin: the Arduino pin number you want to read

Returns:

High or Low

Example:

```
int ledPin = 13;  // LED connected to digital pin 13
int inPin = 7;    // pushbutton connected to digital pin 7
int val = 0;      // variable to store the read value
void setup()
{
  pinMode(ledPin, OUTPUT);  // sets the digital pin 13 as output
pinMode(inPin, INPUT);    // sets the digital pin 7 as input
}
void loop()
```

```
{  val = digitalRead(inPin);   // read the input pin
  digitalWrite(ledPin, val);  // sets the LED to the button's value
}
```

Source Code:

```
char t;
 void setup()
{
pinMode(13,OUTPUT);   //left motors forward
pinMode(12,OUTPUT);   //left motors reverse
pinMode(11,OUTPUT);   //right motors forward
pinMode(10,OUTPUT);   //right motors reverse
pinMode(9,OUTPUT);   //Led
Serial.begin(9600);
 }
 void loop()
{
if(Serial.available())
{
  t = Serial.read();
  Serial.println(t);
}
 if(t == 'F')
{
  digitalWrite(13,HIGH);
digitalWrite(11,HIGH);
}
 else if(t == 'B'){      //move reverse (all motors rotate in reverse
direction)  digitalWrite(12,HIGH);
  digitalWrite(10,HIGH);
```

```
}
 else if(t == 'L')
{      //turn right (left side motors rotate in forward direction, right side motors doesn't rotate)
digitalWrite(11,HIGH);
}
 else if(t == 'R')
{      //turn left (right side motors rotate in forward direction, left side motors doesn't rotate)
  digitalWrite(13,HIGH);
}
else if(t == 'W'){    //turn led on or off)
  digitalWrite(9,HIGH);
}
else if(t == 'w')
{
  digitalWrite(9,LOW);
}
else if(t == 'S')
{     //STOP (all motors stop)
  digitalWrite(13,LOW);
  digitalWrite(12,LOW);
  digitalWrite(11,LOW);
  digitalWrite(10,LOW);
}
delay(100);
}
```

CONCLUSIONS:

The technology used in this project to communicate is bluetooth connection.The Arduino board is controlled using command send by the android mobile phone using an application or interface. This system of communication is very effective and range is also good.It is used for controlling the Arduino board having a Atmega328p microcontroller used in this project. This technology used in various fields like making a robot for the surveillance purpose which is somewhat a risky job to do for a person than we use robots like this having a camera attached to it. Wireless control is one of the most important basic needs for all the people all over the world. But unfortunately, the technology is not fully utilized due to a huge amount of data and communication overheads. Generally, many of the wireless-controlled robots use RF modules. But our project for robotic control make use of Android mobile phone which is very cheap and easily available.

APPLICATION AND FUTURE SCOPE:

This project can be used at homes for many purposes like picking up and placing some objects from one to other. This technology is used in the surveillance field and can be very effective. This technology is used in many different Purpose if a sensor and detector is attached to it. The knowledge is ever expanding and so are the problems which the mankind Strive to solve. In this spirit, it is hoped that the current activity will lead to further enhancements. For example; work on future for military purpose by the robot.

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