SOLAR POWERED VOICE CONTROLLED VEHICLE

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Abstract **-** This paper presents the application of solar energy to control a robotic vehicle using speech recognition. An Arduino is used along with an Android Application for the desired operation. The Android Application is connected to the Bluetooth module (HC-05) present on the Robot via Bluetooth. The commands are given to the robot using voice commands present on the android application. At the receiving end two dc motors are interfaced to the microcontroller where they are used for the movement of the vehicle. The RF transmitter of the Bluetooth takes 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 purpose. Further the project can be developed using IoT technology, where a user can control the robot from any corner of the world.

Key Words: Bluetooth module, Android Application, IoT (Internet of things), DC motor.

INTRODUCTION

Voice recognition is the process of taking spoken word as an input to the program. It is the ability of the machine to receive and interpret dictation, or to understand and carry out spoken commands. Transferring information or commands through voice is a natural process and Research in Speech Recognition or voice Recognition are actively under process. "In this Project, we have controlled the movements of the vehicle using voice commands from the user. These commands were 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 (VCRV) is to listen and act on the commands received from the user.

2. BLOCK DIAGRAM OF THE SYSTEM

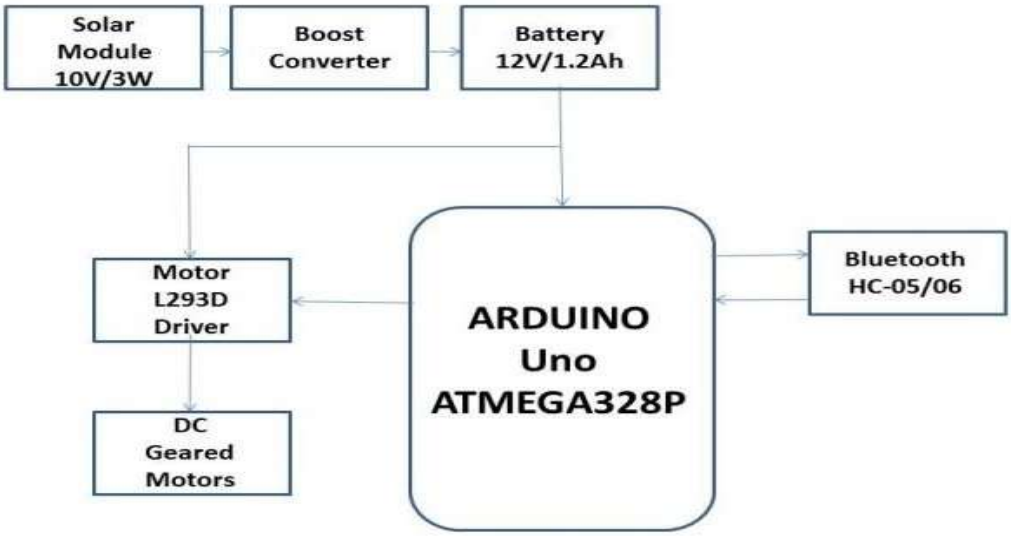


Fig1. Block Diagram of the Proposed System

Block diagram consists of Solar panel, Boost converter, Battery, Arduino, Motor driver, Geared Motors and Bluetooth.Solar panel converts the light energy into DC Voltage and this voltage is boosted up by boost converter upto 14V. Lead acid battery of 12 volts gets charged. With the help of charged battery, Arduino and Bluetooth get started. The main function of the Arduino is that, it helps in transmitting the signal received by Bluetooth to control the vehicle.With the help of motor drivers, the DC Geared Motors get started, By which vehicle moves Forward or Backward and Left or Right.

3. COMPONENTS OF THE PROPOSED SYSTEM

A. Solar Panel :

Fig. 2. Solar Panel

Fig.2 shows solar panel. Photo Voltaic Solar panels are devices that convert light energy into Direct Current. A solar panel contains a collection of Photovoltaic cells. Many small PV cells connected in series or parallel work together to provide enough direct current that can be useful. With increase in the intensity of light, voltage produced by panel also increases. A 10 Volts 3 Watts poly crystalline Solar Panel is used.

B. Boost Converter

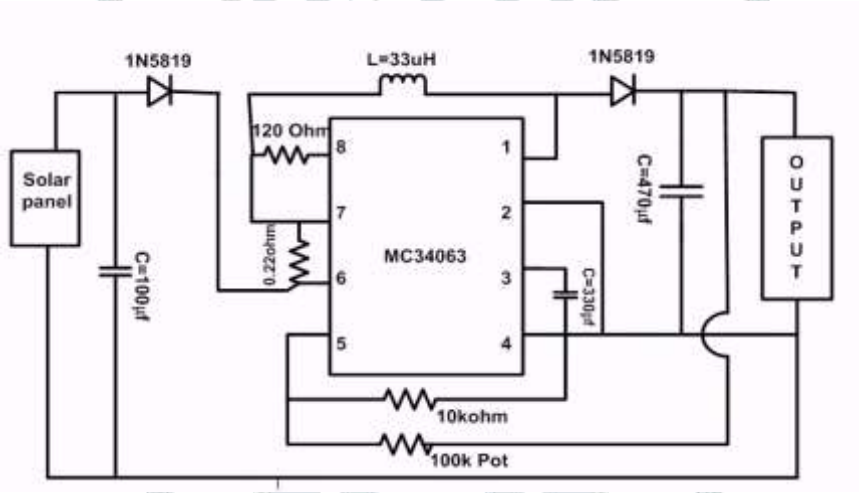


Fig 3. Boost Converter

A boost converter (step-up converter) is a DC-to-DC power converter that Increases DC Voltage (stepping down current) from its input to its output . It Consists of MC34063 IC, which is a monolithic circuit and can be designed to operate as a Buck or Boost Converter. Two Schottky barrier Diodes are used , one near the solar panel and other near the output. These Diodes have low voltage drop compared to conventional diodes. To reduce voltage ripple, Two filter capacitors are used, one near the input and other near the output.

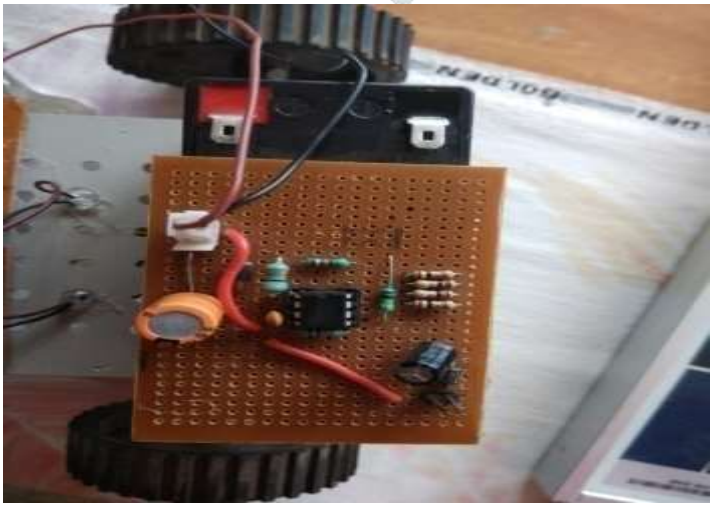


Fig. 4. Boost Converter Mounted on the top of the Battery

C. Battery

Fig. 5. Lead - Acid Battery

Lead-Acid Battery is a rechargeable battery, Commonly used in automobiles and Solar Power Applications. It is cheaper compared to other rechargeable batteries.

D. Bluetooth Module

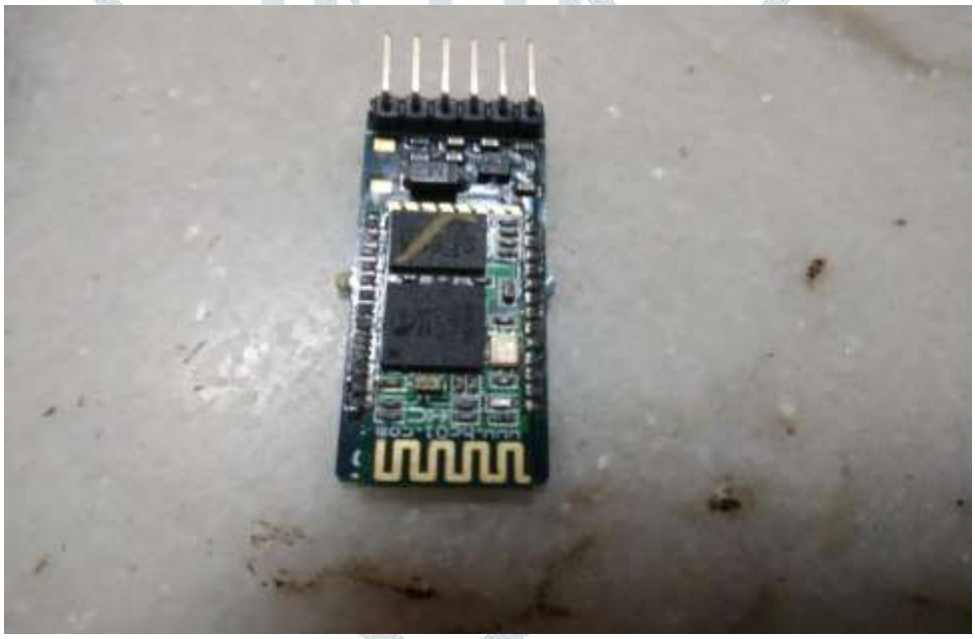


Fig.6. Bluetooth Module

HC-05 Bluetooth Module is a serial port protocol module, which is used for wireless serial connection setup. It consists of a CSR Bluecore 04-External single chip Bluetooth system with CMOS technology and with AFH Technology. The Blue tooth module receives commands from android smart mobile and sends it to arduino, which in turn gives signals to the motor driver circuit. If the master and slave pins are paired then, red and blue Light emitting diodes on the module blinks at one time per two seconds in interval and if disconnected, blue Light emitting diode blinks for two times per second. Default password for pairing Bluetooth with smart phone is " 0000 " and it automatically reconnects in 30 mins when disconnected because of exciding the range of connection.

Proposed Algorithm:

Step1:Communication has to be established between Bluetooth module and smart mobile.
Step2:Input signal is given from App
Step3: Command is received by the Bluetooth
Step4: close the application

E. Arduino

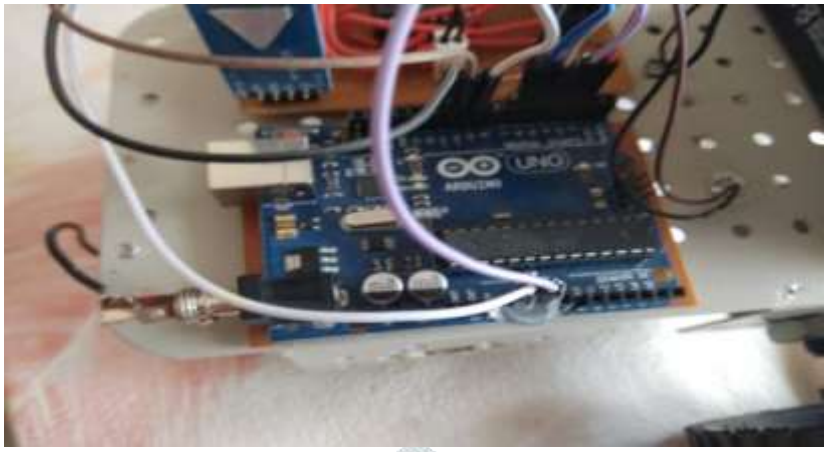


Fig. 7. Arduino

Arduino Uno consists of two microcontrollers, one is ATmega328, and other one is ATmega16U2. ATmega328 is a 8 bit Microcontroller which is regarded as the core of the Arduino UNO. ATmega16U2 helps in connecting the Arduino to the Laptop or CPU. UNO has a crystal oscillator, which generates frequency of 16 MHz. It also has an internal RC phase shift Oscillator using which, it can generate 2 to 8 MHz frequency. It has Digital Input/Output Pins and Analog Input/Output Pins. Arduino can be powered using USB cable and DC Jack. It has an Internal Voltage Regulator to stabilize the fluctuations of input voltage.

A. Arduino IDE

It is an Integrated Development Environment Software.

The Programs are based upon C and C++ Languages, which are easy to develop. The IDE Consists of a Text Editor for developing the code, message area, and a Tool Bar. It connects to the arduino hardware to upload programs into the microcontroller. Programs developed with the help of software are called Sketches. IDE has Two inbuilt functions necessary for any program such as Setup() and Loop(). Setup() function will only run once, as soon as the arduino is powered ON or arduino is reset. Loop() function executes the statements inside the loop infinite times. Fig. 8 shows Arduino IDE with empty loop() and Setup() functions.

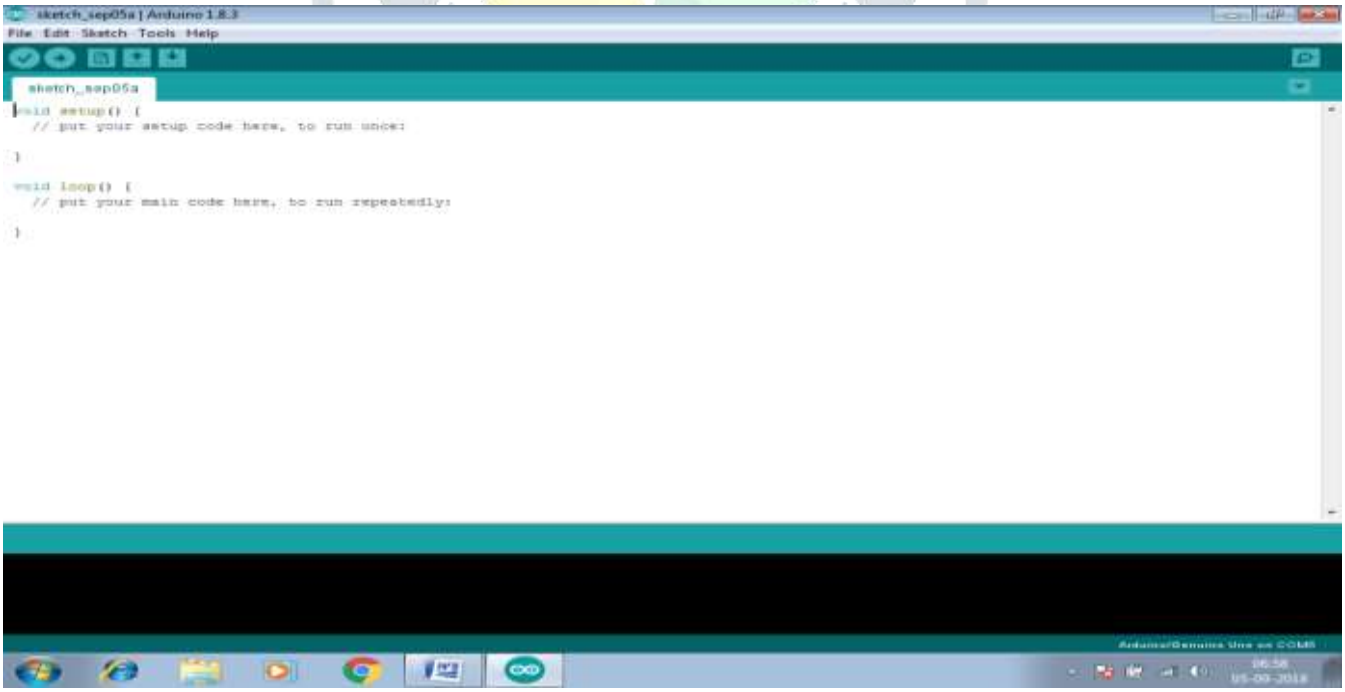


Fig. 8. Arduino IDE

A. Motor Driver Circuit

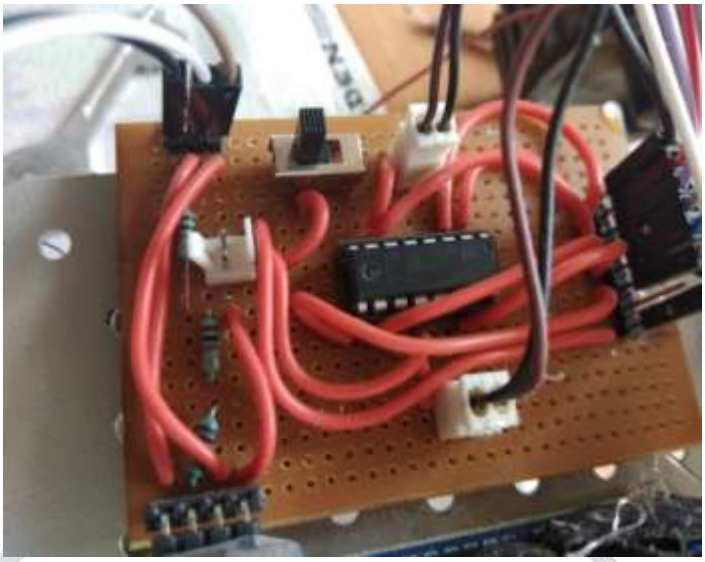


Fig. 9. Motor Driver Circuit

L293D IC is a 16 pin IC which can be used to control 12 Volts DC Motors. Motor Driver circuit receives signal from Arduino , which is a low current signal and is not sufficient to drive DC Motors. Hence, L293D IC is used to Amplify it to a high current signal, which is sufficient to drive the DC Motors. For rotating the motor in clockwise direction, Pin 2 is assigned Logic '1' and Pin 7 is assigned logic '0' and to rotate the motor in anticlockwise direction, Pin2 is assigned Logic 0 and Pin 7 is assigned Logic'1'.

5. SOFTWARE PROGRAM

```
define m11 3
#define m12 2
#define m21 4
#define m22 5
#define pwm1 6
#define pwm2 9
#include <SoftwareSerial.h>
SoftwareSerial Bluetooth(10, 11);   // Rx, Tx char c=0;
String readString;
int i=0; int j=0;
void setup() {
Serial.begin(9600);
pinMode(m11, OUTPUT); pinMode(m12, OUTPUT); pinMode(m21, OUTPUT); pinMode(m22, OUTPUT); pinMode(pwm1,
OUTPUT); pinMode(pwm2, OUTPUT); analogWrite(pwm1, 0);
analogWrite(pwm2, 0);
}
void loop() {
while (Bluetooth.available()) {
delay(10); //small delay to allow input buffer to fill
char c = Bluetooth.read(); //gets one byte from serial buffer
if (c == ',') {
break;
} //breaks out of capture loop to print readstring
readString += c;
} //makes the string readString
analogWrite(pwm1, i); analogWrite(pwm2, j);
if (readString == "forward")
{
Serial.println(readString); digitalWrite(m11, LOW); digitalWrite(m12, HIGH); digitalWrite(m21, LOW); digitalWrite(m22,
HIGH); delay(1000);
}
```

```
if (readString == "backward")
{
Serial.println(readString); digitalWrite(m11, HIGH); digitalWrite(m12, LOW); digitalWrite(m21, HIGH); digitalWrite(m22, LOW); delay(1000);
}
if (readString == "left")
{
Serial.println(readString); digitalWrite(m11, LOW); digitalWrite(m12, HIGH); digitalWrite(m21, HIGH); digitalWrite(m22, LOW); delay(1000);
}
if (readString == "right")
{
Serial.println(readString); digitalWrite(m11, HIGH); digitalWrite(m12, LOW); digitalWrite(m21, LOW); digitalWrite(m22, HIGH); delay(1000);
}
if (readString == "stop")
{ i=0; j=0;
delay(100);
}
if (readString == "full")
{ i=255;
j=255;
delay(100);
}
if (readString == "half")
{ i=127; j=127;
delay(100);
}
readString=""; //clears variable for new input
}
```

7. RESULTS AND DISCUSSION

Fig. 10. Complete setup of Solar Powered Vehicle

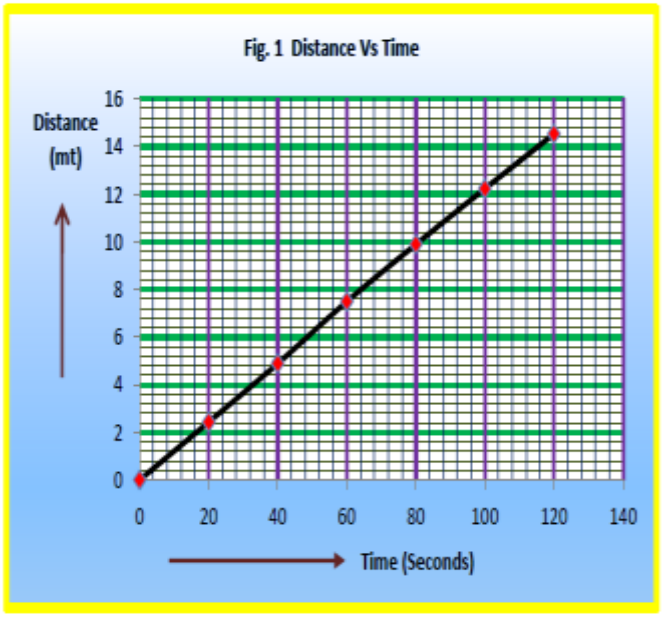
During the initial period upto 3 mins, Battery was getting charged , and after 3 mins, arduino and Blue tooth module Switched ON. Smart phone was Paired with the Bluetooth module using the default password “1234”. Arduino Voice Control Application was downloaded from Google play store. Vehicle was able to recognize the voice commands from smart mobile and was functioning properly. Using a stop watch, amount of time consumed to cover a distance of 9.89 mt was measured. A Graph was plotted between Distance Vs Time, which was a Linear Graph. Speed of the vehicle was measured using the basic formula Speed = $\frac{Distance}{Time}$. A Graph was plotted between Distance and speed , which showed that as Time increases, Speed was maintained constant by the vehicle.

Table1: Distance covered in 2 mins

Sl. no	Time (Sec)	Distance (mt)
1	0	0
2	30	2.43
3	60	4.89
4	90	7.49
5	120	9.89

Table2: Speed obtained in 2 mins

Sl. no	Speed (m/sec)	Distance (mt)
1	0	0
2	0.1215	2.43
3	0.12225	4.89
4	0.124833	7.49
5	0.1236	9.89



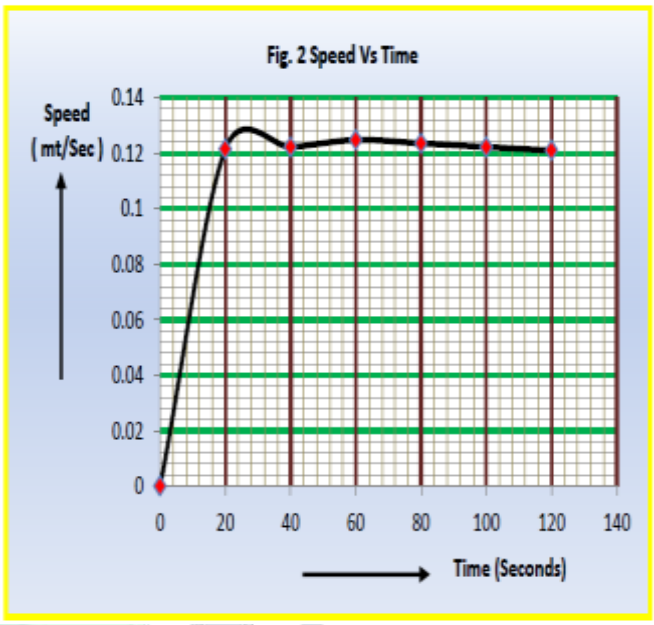


Fig. 10. Graph of Distance Vs Time

Fig. 11. Graph of Speed Vs Time

8. CONCLUSION

The complete system was Successfully tested in Solar Research Laboratory. Indian Economy is rapidly growing and Automobile Industry plays an important role in driving Indian Economy. Production of solar vehicles will create employment opportunities and less pollution. Solar vehicles also require less maintenance compared to conventional automobiles.

9. REFERENCE

[1] Ned Mohan, Torre M. Undelad, William P. Robbins, "Power Electronics Converters, Applications and Design", 4th edition, John Wiley & Sons, New York, 2003.
[2] Muhammad .H. Rashid, power electronics circuits, devices and applications, 3rd edition, Prentice-Hall of India, New-Delhi, 2004.
[3] Ritika Pahuja, Narender Kumar, "Android Mobile Phone Controlled Bluetooth Robot Using 8051 Microcontroller",Bahal,India,2014.
[4] Bharat Shresth Awasthi, Sabya Sanchi Pandey, Ashish Singh, Mrs.M.V. Patil "Robotic arm Wirelessly controlled by app", IJETR, June 2015.
[5] Atul Sharma and Dr. Arun Parakh, "Design of Solar Powered Induction Motor Drive for Pumping Application", International Journal of Latest Trends in Engineering and Technology, 2016.

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