JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

WIRELESS CHARGING DEVICE USING MICROCONTROLLER WITH ANDROID APPLICATIONS

[1]Dr. Ranadip Roy, [2]Mainak Mukherjee, [3]Bikram Sinha, [4]Rudra Pratap Singh, [5]Dharambir Prasad

[1]Associate Professor, [2]Assistant Professor, [3]Student, [4]Assistant Professor, [5]Dharambir Prasad
[1-3]Department of Electrical Engineering,
[1]Sanaka Educational Trust's Group of Institutions, Durgapur, India
[4-5]Department of Electrical Engineering,
[1]Asansol Engineering College, Asansol, India

Abstract : It depicts a wireless charging device that is controlled by a computer efforts to fulfil numerous functions. The purpose of this study is to discuss the design and control of an automated vehicle type robot that can move in the appropriate direction and record photographs and videos of the required place. An Android application was created using MIT App Inventor, and a Wireless Charging communication was established with a robot that connects with a microcontroller to regulate its speed and direction. The purpose of this study is to create a robot that can be designed and controlled using a solar-powered Android phone and a wireless charging pad.

IndexTerms **- Automated Vehicle; Charging Device; Wireless Charging; Solar-Powered**

I. INTRODUCTION

A robot is an electromechanical machine that is controlled by a computer programme to execute various tasks. Industrial robots are meant to reduce human effort and time in order to increase productivity and cut industrial costs. Today, human-machine interaction is moving away from the mouse and pen and becoming much more widespread and compatible with the physical environment. Using Wireless Charging communication to interface controller and android, an Android app may control the robot motion from a long distance. The ATMEGA328P-PU microcontroller is connected to the Wireless Charging module through the UART protocol, and the programming is written in embedded C.

Robot motion can be managed via commands sent from an Android app. A robotic vehicle can produce precise and consistent movements. Robots that pick and place objects may have their programs modified and their tools swapped out to accommodate a variety of tasks. The goal of this project is to design and build an Android-controlled wireless charging robot for surveillance, home automation, wheelchairs, military, and hostage rescue applications.

II. LITERATURE REVIEW

Nikola Tesla, a pioneer in wireless power transfer, developed the concept in the late 19th and early 20th centuries. He used high-frequency electromagnetic fields to transfer power over short distances, but the technology was not yet widespread [1]. "Review and Comparative Analysis of Topologies and Control Methods in Dynamic Wireless Charging of Electric Vehicles," A.C. Bagchi, A. Kamineni, R. A. Zane, and R. Carlson, DWPT systems have been developed to solve EV range and battery size limitations, but there are still significant challenges to achieving stability and interoperability [2]. Christ and M G. Douglas, "Evaluation of Wireless Resonant Power Transfer System with Human Electromagnetic Exposure Limits." This study investigates the potential exposure of individuals in the reactive near-field of wireless power transfer systems, with the objective of providing scientifically sound recommendations for the evaluation of such systems in terms of human exposure limits. The study seeks to guide the evaluation of potential risks associated with wireless power transfer systems and ensure compliance with established safety standards [3].

III. WORKING PROCEDURE

A robot can be controlled using Wireless Charging module and ATMEGA328P-PU microcontroller with android Smartphone device. The controlling devices of the whole system are a microcontroller. Wireless Charging module, DC BO motors are interfaced to the microcontroller.

The data receive by the Wireless Charging module from android smart phone is fed input to the controller. The controller acts accordingly on the DC motor of the robot. The robot can move to move in all the four directions using the android phone. The direction of the robot is indicators using LED indicators of the Robot system. In achieving the task the controller is loaded with program written using Embedded 'C' Languages. Android smart phone controller Wireless Charging.

IV. COMPONENTS REQUIRED

1. Arduino uno
2. Motor Driver-729D
3. Power supply
4. Wireless charging
5. BO motor

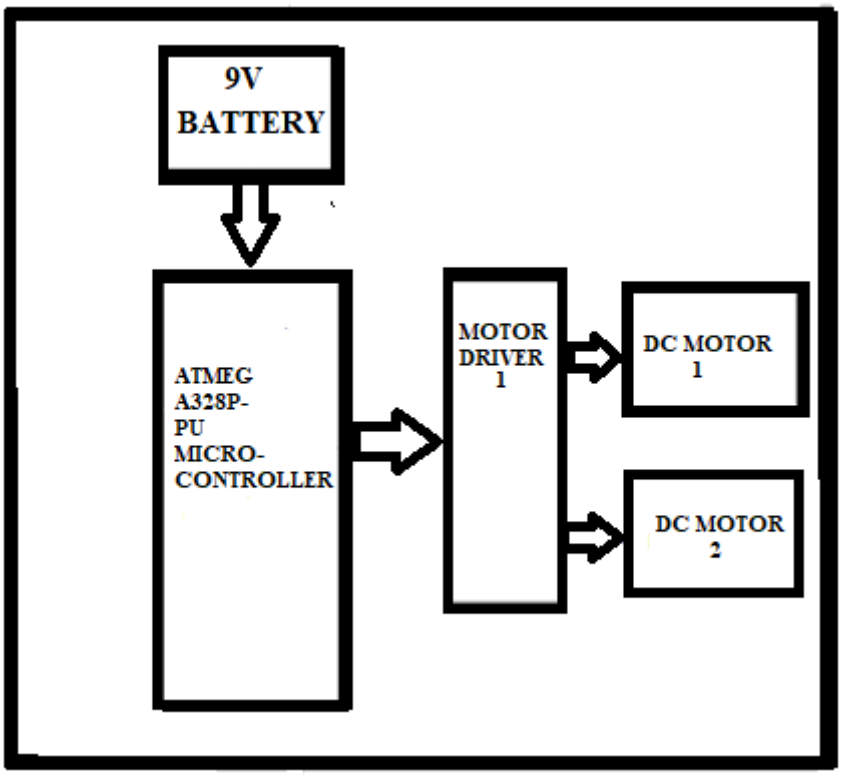


Fig.1. Block diagram representation

V. MATERIALS AND METHODOLOGY

ARDUINO UNO:

Arduino is an open source computer hardware and software company, project, and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical and digital world. The project's products are distributed as open-source hardware and software, which are licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially in preassembled form, or as do-it-yourself (DIY) kits. Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards or Breadboards (shields) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++. 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 2003 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. 11 The name Arduino comes from a bar in Ivrea, Italy, where some of the founders of the project used to meet. The bar was named after Arduin of Ivrea, who was the margrave of the March of Ivrea and King of Italy from 1002 to 1014

Features of the Arduino Uno :
Microcontroller: ATmega328
Operating Voltage: 5V

Input Voltage (recommended): 7-12V
Input Voltage (limits): 6-20V
Digital I/O Pins: 14 (of which 6 provide PWM output)
Analog Input Pins: 6
DC Current per I/O Pin: 40 mA
DC Current for 3.3V Pin: 50 mA
Flash Memory: 32 KB of which 0.5 KB used by bootloader
SRAM: 2 KB (ATmega328)
EEPROM: 1 KB (ATmega328)
Clock Speed: 16 MHz

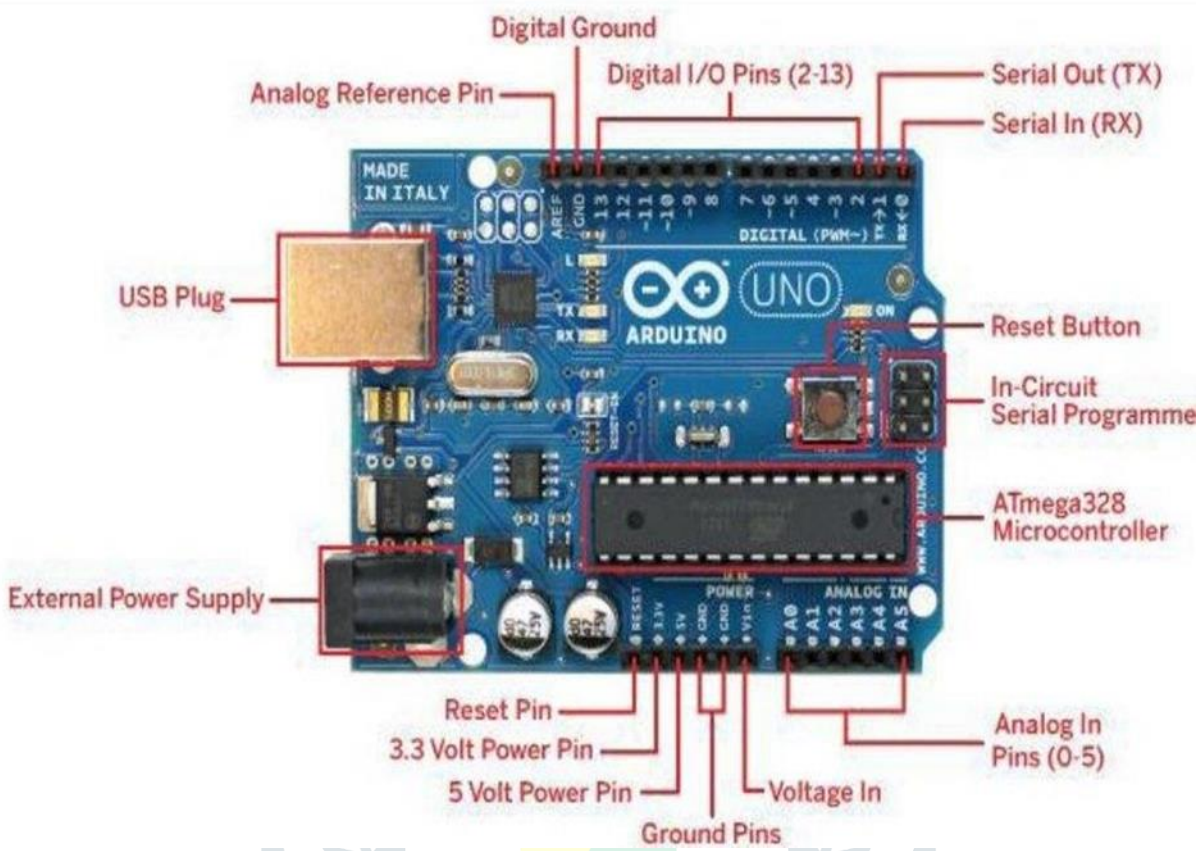


Fig.2. Features of the Arduino Uno

VI. RESULTS AND DISCUSSIONS

ARDUINO HARDWARE PART:

Arduino is open-source hardware. The hardware reference designs are distributed under a Creative Commons Attribution Share-Alike 2.5 license and are available on the Arduino website. Layout and production files for some versions of the hardware are also available. Although the hardware and software designs are freely available under copy left licenses, the developers have requested the name Arduino to be exclusive to the official product and not be used for derived works without permission. The official policy document on use of the Arduino name emphasizes that the project is open to incorporating work by others into the official product. Several Arduino-compatible products commercially released have avoided the project name by using various names ending in -duino. Most Arduino boards consist of an Atmel 8- bit AVR microcontroller (ATmega8, ATmega168, ATmega328, ATmega1280, ATmega2560) with varying amounts of flash memory, pins, and features. The 32-bit Arduino Due, based on the Atmel SAM3X8E was introduced in 2012. The boards use single or double-row pins or female headers that facilitate connections for programming and incorporation into other circuits. These may connect with add-on modules termed shields. Multiple and possibly stacked shields may be individually addressable via an I²C serial bus. Most boards include a 5 V linear regulator and a 16 MHz crystal oscillator or ceramic resonator. Some designs, such as the LilyPad, run at 8 MHz and dispense with the onboard voltage regulator due to specific form-factor restrictions. Arduino microcontrollers are pre-programmed with a boot loader that simplifies uploading of programs to the on-chip flash memory. Boards are loaded with program code via a serial connection to another computer. Some serial Arduino boards contain a level shifter circuit to convert between RS232 logic levels and transistor–transistor logic (TTL) level signals. Current Arduino boards are programmed via Universal Serial Bus (USB), implemented using USB-to- serial adapter chips such as the FTDI FT232. Some boards, such as later-model Uno boards, substitute the FTDI chip with a separate AVR chip containing USB-to-serial firmware, which is reprogrammable via its own ICSP header. When used with 14 traditional microcontroller tools, instead of the Arduino IDE, standard AVR in-system programming (ISP) programming is used.

The Arduino board exposes most of the microcontroller's I/O pins for use by other circuits. The Diecimila,Duemilanove, and current Uno provide 14 digital I/O pins, six of which can produce pulse-width modulated signals, and six analog inputs, which can also be used as six digital I/O pins. These pins are on the top of the board, via female 0.1-inch (2.54 mm) headers. Several plug-in application shields are also commercially available. The Arduino Nano, and Arduino-compatible Bare Bones Board and Boarduino boards may provide male header pins on the underside of the board that can plug into solderless breadboards. Many Arduino-compatible and Arduino-derived boards exist. Some are functionally equivalent to an Arduino and can be used interchangeably. Many enhance the basic Arduino by adding output drivers, often for use in school-level education, to simplify making buggies and

small robots. Others are electrically equivalent but change the form factor, sometimes retaining compatibility with shields, sometimes not. Some variants use different processors, of varying compatibility.

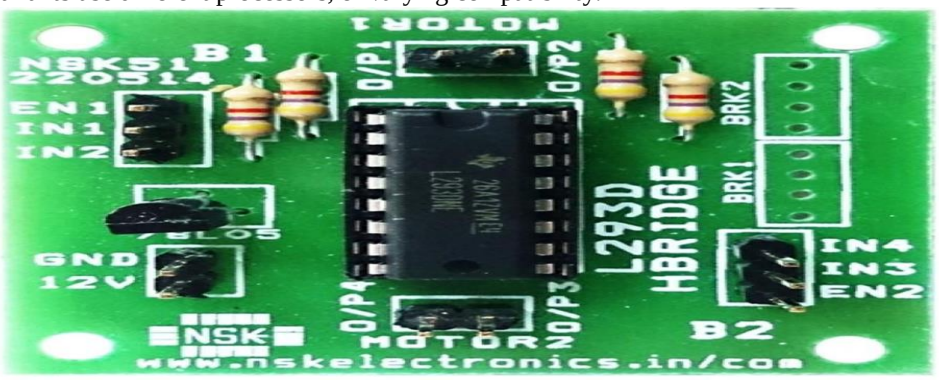


Fig.3. Outline of L293D

ARDUINO SOFTWARE PART IDE

The Arduino integrated development environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in the programming language Java. It originated from the IDE for the languages Processing and Wiring. It includes a code editor with features such as text cutting and pasting, searching and replacing text, automatic indenting, brace matching, and syntax highlighting, and provides simple one-click mechanisms to compile and upload programs to an Arduino board. It also contains a message area, a text console, a toolbar with buttons for common functions and a hierarchy of operation menus. The source code for the IDE is released under the GNU General Public License, version 2. The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub main() into an executable cyclic executive program with the GNU toolchain, also included with the IDE distribution. The Arduino IDE employs the program avrdude to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

Microcontroller cannot supply the current required to run DC motor. So satisfy this requirement IC's are used to drive the motor. The L293 and L293D are quadruple high- current half –H drivers. The L293D provides bidirectional drive currents of up to 1A at voltage from 4.5V to 36V. The L293D is designed to provide bidirectional drive currents of up to 600-MA at voltages from 4.5V to 36V. 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. On the L293D, external high-speed output clamp diodes should be used for inductive transient suppression. A Vcc1 terminal, separate from Vcc2, is provided for the logic inputs to minimize device power dissipation. The L293 and L293D are characterized for operation from 0ɔC to 700C.

Working of L293D

The 4 input pins for this l293d, pin 2, 7on the left and pin 15, 10 on the right as shown on the pin diagram. Left input pins will regulate the rotation of motor connected across left side and right input for motor on the right hand side. The motors are rotated on the basis of the inputs provided across the input pins as LOGIC 0 or LOGIC 1.In simple you need to provide Logic 0 or 1 across the input pins for rotating the motor.

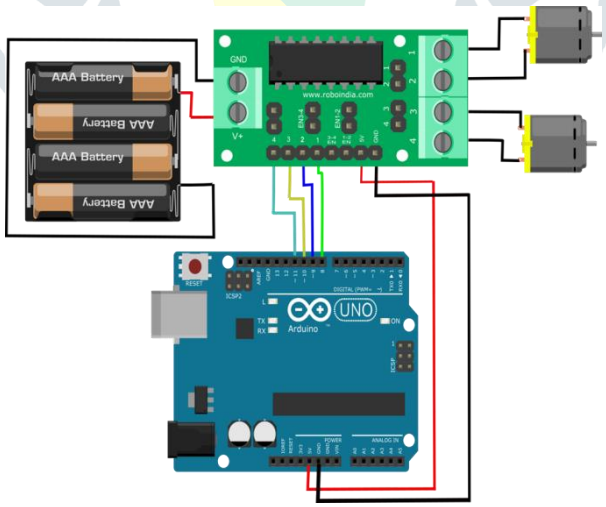


Fig.4. Outline of the L293D

L293D IC Pin Out

The L293D is a 16 pin IC, with eight pins, on each side, to controlling of two DC motor simultaneously. There are 4 INPUT pins, 4 OUTPUT pins and 2 ENABLE pin for each motor.

Pin 1: When Enable1/2 is HIGH, Left part of IC will work, i.e motor connected with pin 3 and pin 6 will rotate.

Pin 2: Input 1, when this pin is HIGH the current will flow though output 1. Pin 3: Output 1, this pin is connected with one terminal of motor.

Pin 4/5: GND pins

Pin 6: Output 2, this pin is connected with one terminal of motor.

Pin 7: Input 2, when this pin is HIGH the current will flow though output 2.

Pin 8: VSS, this pin is used to give power supply to connected motors from 5V to 36V maximum depends on Motor connected.

Pin 9: When Enable 3/4 is HIGH, Right part of IC will work, i.e motor connected with pin 11 and pin 14 will rotate.

Pin 10: Input 4, when this pin is HIGH the current will flow though output 4. Pin 11: Output 4, this pin is connected with one terminal of motor.

Pin 12/13: GND pins

Pin 14: Output 3, this pin is connected with one terminal of motor.

Pin 15: Input 3, when this pin is HIGH the current will flow though output 3. Pin 16: VCC, for supply power to IC i.e 5V.

2. Connections with Arduino

1.Module 5V (VCC) - Arduino 5V.

2.Module GND - Arduino GND.

3.Module 1 - Arduino D8.

4.Module 2 - Arduino D9.

5.Module 3 - Arduino D10.

6.Module 4 - Arduino D11.

7.Module Motor terminals - DC motors.

8.Module VSS power terminal- External power source of 9V.

BO MOTOR:

Fig.5.Outline of the BO MOTOR

DC motor (BO) Battery Operation. DC motor converts electrical energy into mechanical energy. Why DC gear motor used in robot Motor control circuit. DC MOTOR concept is where gears reduce the speed of the vehicle but increase its torque is known as gear reduction.

Wireless charging system

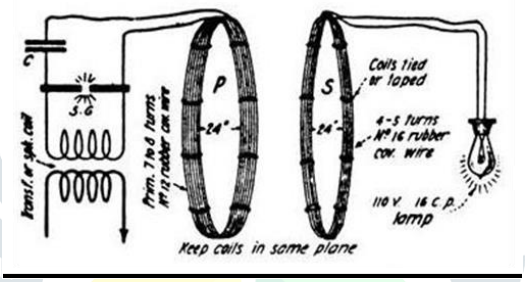


Fig.6. Diagram of one of Tesla's wireless power experiment

Generally, a Qi wireless charger has a flat surface, referred to as a charging pad, of which a mobile device can be laid on top. As aforementioned, the tightness of coupling is a crucial factor in the inductive charging efficiency. To achieve tight coupling, a mobile device must be strictly placed in a proper alignment with the charger. Qi specifies three different approaches for making alignment.

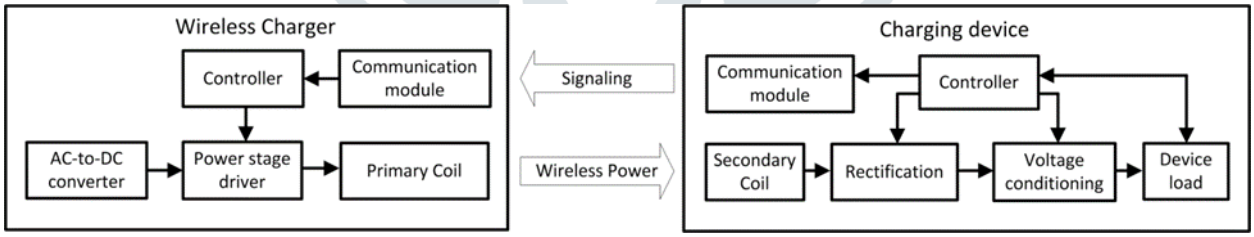


Fig. 7. Qi-compliant wireless power transfer model

Guided positioning, shown in Figure 7, i.e., a one-to one fixed-positioning charging, provides guideline for a charging device to be placed, for achieving an accurate alignment. The Qi specification guides the mobile device into a fixed location by using magnetic attractor. The advantage of this alignment approach is simplicity; however, it requires implementation of a piece of material attracted by a magnet in the charging device. Consequently, eddy current- related power loss (and thus temperature rise) will be induced in the magnetic attractor.

Free-positioning with movable primary coil, illustrated in Figure, is also a one-to-one charging that can localize the charging device. This approach requires a mechanically movable primary coil that tunes its position to make coupling with the charging device. This can be achieved by either inductive or capacitive means. The implementation of this alignment approach is simple if the charging pad is designed to accommodate only one device. However, the movable mechanical components tend to make the systems less reliable. Additionally, for multiple device charging, the motor control for the primary coils can be complicated and costly. Free-positioning with coil array, demonstrated in Figure 7, allows multiple devices to be charged simultaneously irrespective of their positions. The Qi specification endorses the “vertical-flux” approach, which utilizes the whole charger surface for power transfer without any restriction on the orientation of the secondary coil. For example, this free-positioning approach can be applied based on the three-layer coil array structure. Compared with the above two approaches, this alignment approach offers more user-friendliness, at the expense of more costly and complex winding structure and control electronic element.

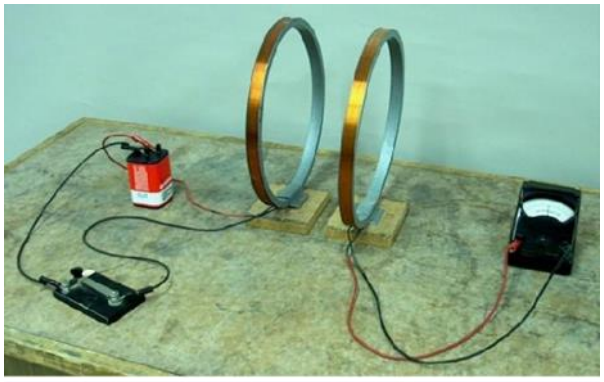
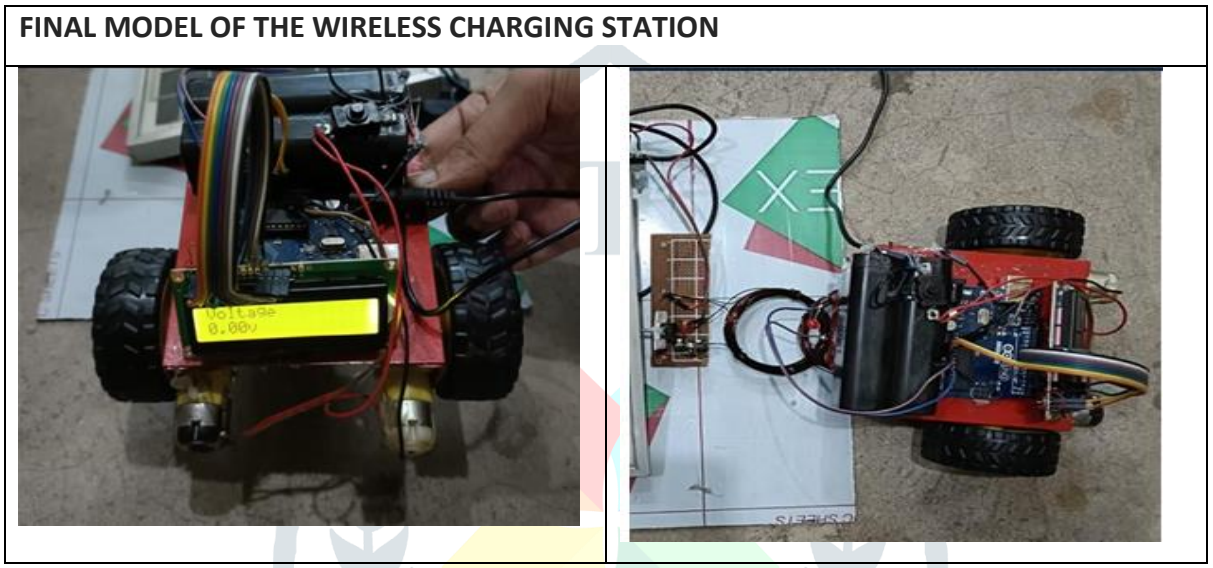


Fig.8. Glimpse of wireless charging system

FINAL MODEL OF THE WIRELESS CHARGING STATION



VII. CONCLUSION

The operating system of smart phone is android which can develop effective remote control program. At the same time , this program uses blue-tooth connection to communicate with robot. It has proven to allow for meaningful two- way communication between the Android phone and the robot which would allow a non-expert to interact with and adjust the functionality of a system which uses ATmega328 controller, a single board micro-controller intended to make the application of interactive objects or environments more accessible. The surveillance is always has been a quite sensitive task. And it includes so many risks. So it's better to use robot for this job instead of people. And if you are able to control the robots with efficiency and accuracy then you can guarantee yourself with good results and success. This system is a good step for secure surveillance using robots.

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. The available control commands are more than RF modules. For this purpose the android mobile user has to install a designed application on her/his mobile.

VIII. ACKNOWLEDGMENT

The authors are thankful to all co-authors as well as institute to carry out this manuscript.

REFERENCES

[1] Tesla, N. 1905.The transmission of electrical energy without wires. 03.

[2] Bagchi, A. C, Kamineni. A, Zane, R.A and Carlson, R. (2021). Review and Comparative Analysis of Topologies and Control Methods in Dynamic Wireless Charging of Electric Vehicles. in IEEE Journal of Emerging and Selected Topics in Power Electronics, 9(4). 4947-4962.

[3] Christ, A and Douglas, M.G. (2013). Evaluation of Wireless Resonant Power Transfer System with Human Electromagnetic Exposure Limits.IEEE Trans. on Electromagnetic Compatibility, 55(2). 265-274.

[4] Manurkar, S. Satre, H. Kolekar, B. Patil, P and Bailmare, S. (2020). Wireless Charging of Electric Vehicle.International Research Journal of Engineering and Technology, 07(03), 2395-0072.

[5] Magudeswaran, P. Pradeeba, G. Priyadarshini, S and Sherline Flora, M. (2019). Dynamic Wireless Electric Vehicle Charging System, International Research Journal of Engineering and Technology, 6(3).

[6] Wagh, D.(2021).Wireless Charging Station for Electric Vehicle.International Research Journal of Engineering and Technology, 08(01).