M.KUMARASAMY
COLLEGE OF ENGINEERING
NAAC Accredited Autonomous Institution
Approved by AICTE & Affiliated to Anna University
ISO 9001:2015 & ISO 14001:2015 Certified Institution
Thalavapalayam, Karur – 639 113.

A Minor Project Report on

AN ARDUINO BASED AUTOMATED CHARGING SYSTEM FOR ELECTRIC VEHICLE

PRASHANNA SRI M **(20BEE4065)**

RAMYA M **(20BEE4071)**

VISWANATHAN P **(20BEE4323)**

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

M.KUMARASAMY COLLEGE OF ENGINEERING

(An Autonomous Institution - Affiliated to Anna University, Chennai)

Karur - 639 113

APRIL 2023

M.KUMARASAMY COLLEGE Of ENGINEERING

(Autonomous Institution, Affiliated to Anna University, Chennai)

BONAFIDE CERTIFICATE

Certified that this Report titled "**AN ARDUINO BASED AUTOMATED CHARGING SYSTEM FOR ELECTRIC VEHICLE**" is the bonafide work of **PRASHANNA SRI M [20BEE4065], RAMYA M [20BEE4071], VISWANATHAN P [20BEE4323]** who carried out the work during the academic year (2022-2023).

SUPERVISOR	**HEAD OF THE DEPARTMENT**
Mr.A.Udhaya Kumar, M.E.,	Dr.J.Uma, M.E., Ph.D.,
Assistant Professor,	Professor & Head,
Department of Electrical and Electronics Engineering,	Department of Electrical and Electronics Engineering,
M.Kumarasamy College of Engineering,	M.Kumarasamy College of Engineering,
Karur-639113.	Karur-639113.

Submitted for Minor Project IV (18EEP302L) viva-voce Examination held on _____.

DECLARATION

We affirm that the Minor Project report titled "**AN ARDUINO BASED AUTOMATED CHARGING SYSTEM FOR ELECTRIC VEHICLE**" being submitted in partial fulfillment for the award of **Bachelor of Engineering in Electrical and Electronics Engineering**, is the original work carried out by us.

REG.NO	STUDENT NAME	SIGNATURE
20BEE4065	**PRASHANNA SRI M**	**----------**
20BEE4071	**RAMYA M**	**----------**
20BEE4323	**VISWANATHAN P**	**----------**

VISION AND MISSION OF THE INSTITUTION

VISION

- ✓ To emerge as a leader among the top institutions in the field of technical education.

MISSION

- ✓ Produce smart technocrats with empirical knowledge who can surmount the global Challenges.
- ✓ Create a diverse, fully-engaged, learner - centric campus environment to provide Quality education to the students.
- ✓ Maintain mutually beneficial partnerships with our alumni, industry and Professional associations.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

VISION

To produce smart and dynamic professionals with profound theoretical and practical knowledge comparable with the best in the field.

MISSION

- ✓ Produce hi-tech professionals in the field of Electrical and Electronics Engineering by inculcating core knowledge.
- ✓ Produce highly competent professionals with thrust on research.
- ✓ Provide personalized training to the students for enriching their skills

PROGRAMME EDUCATIONAL OBJECTIVES(PEOs)

PEO1: Graduates will have flourishing career in the core areas of Electrical Engineering and allied disciplines.

PEO2: Graduates will pursue higher studies and succeed in academic/research careers.

PEO3: Graduates will be a successful entrepreneur in creating jobs related to Electrical and Electronics Engineering /allied disciplines.

PEO4: Graduates will practice ethics and have habit of continuous learning for their success in the chosen career.

PROGRAMME OUTCOMES(POs)

After the successful completion of the B.E. Electrical and Electronics Engineering degree program, the students will be able to:

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/Development of solutions: Design solutions for Complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal and environmental considerations.

PO4: Conduct Investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The Engineer and Society: Apply reasoning in formed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and Team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multi-disciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES(PSOs)

The following are the Program Specific Outcomes of Electrical and Electronics Engineering Students:

PSO1: Apply the basic concepts of mathematics and science to analyze and design circuits, controls, Electrical machines and drives to solve complex problems.

PSO2: Apply relevant models, resources and emerging tools and techniques to provide solutions to power and energy related issues & challenges.

PSO3: Design, Develop and implement methods and concepts to facilitate solutions for electrical and electronics engineering related real-world problems.

Abstract (Key Words)	Mapping of POs and PSOs
Arduino IDE, Ultrasonic Sensor, Relay, Tesla Coil, Wireless Charging	PO1,PO2,PO3,PO4,PO5,PO6, PO7,PO8,PO9,PO10,PO11,PO12 PSO1,PSO2,PSO3

ACKNOWLEDGEMENT

Our sincere thanks to **Thiru.M.Kumarasamy,** Chairman and **Dr.K.Ramakrishnan, B.E, Secretary of M.Kumarasamy College of Engineering** for providing extraordinary infrastructure, which helped us to complete the Minor project in time.

It is a great privilege for us to express our gratitude to our esteemed Principal **Dr.B.S.Murugan, M.Tech., Ph.D.,** for providing us right ambiance for carrying out the project work.

We would like to thank our **Head of the Department Dr.J.Uma, M.E., Ph.D., Department of Electrical and Electronics Engineering**, for her unwavering moral support throughout the evolution of the project.

We offer our wholehearted thanks to our Minor project coordinator **Mr.B.Rajesh Kumar, M.E., Assistant Professor (SLG)**, **Department of Electrical and Electronics Engineering,** for his constant encouragement, kind co-operation and valuable suggestions for making our project a success.

We would like to express my deep gratitude to our Minor Project Guide **Mr.A.Udhaya Kumar, M.E., Assistant Professor, Department of Electrical and Electronics Engineering,** for his constant encouragement, kind co-operation, valuable suggestions and support rendered in making our project a success.

We glad to thank all the **Faculty Members of Department of Electrical and Electronics Engineering** for extending a warm helping hand and valuable suggestions throughout the project.

Words are boundless to thank Our Parents and Friends for their constant encouragement to complete this Minor project successfully.

TABLE OF CONTENTS

ABSTRACT

This program contains Arduino microcontroller, inductive coils, motor prototype module. Persistent weather conditions have led to the research and development of electric vehicles over the past decade. Rising global warming has created awareness among people to switch to electric vehicles. The waiting time required for charging stations while the battery is being charged will be reduced the amount of time that the discharge will be performed at the station. Although electric vehicles are an alternative, there is a need for improvements in their charging system to be the best mode of transportation. For this purpose, charging systems should be upgraded.

The proposed system uses wireless charging based on the Arduino microcontroller or a production method for charging electric vehicles. This program contains Arduino microcontroller, inductive coils, motor prototype module. Persistent weather conditions have led to the research and development of electric vehicles over the past decade. Rising global warming has created awareness among people to switch to electric vehicles This charging system can also be used in big cities.

Wireless charging performance is based on Electromagnetic Induction. The cable coils in the base unit act as the main coil and create a magnetic field as the current passes through it. This field sends a stream to the nearest coil without touching it. here we look at this nearby coil as a second turn and connect it to the car, wireless charging is available. The car can charge automatically if it is mounted on a battery-connected coil. This method is used to reduce air pollution and demand in petroleum products.

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATION

S No	ABBREVIATION	EXPANSION
1	EV	Electric Vehicle
2	PWM	Pulse width Modulation
3	WEVC	Wireless Electric Vehicle Charging
4	USB	Universal Serial Bus

CHAPTER 1

INTRODUCTION

1.1 Introduction

The proposed system uses wireless charging based on the Arduino microcontroller or a production method for charging electric vehicles. This program contains Arduino microcontroller, inductive coils, motor prototype module. Persistent weather conditions have led to the research and development of electric vehicles over the past decade. Rising global warming has created awareness among people to switch to electric vehicles This charging system can also be used in big cities. Wireless charging performance is based on Electromagnetic Induction. The cable coils in the base unit act as the main coil and create a magnetic field as the current passes through it. This field sends a stream to the nearest coil without touching it. here we look at this nearby coil as a second turn and connect it to the car, wireless charging is available. The car can charge automatically if it is mounted on a battery-connected coil. This method is used to reduce air pollution and demand in petroleum products.

1.2 Necessity

The waiting time required for charging stations while the battery is being charged will be reduced the amount of time that the discharge will be performed at the station. Although electric vehicles are an alternative, there is a need for improvements in their charging system to be the best mode of transportation. For this purpose, charging systems should be upgraded. Solid charging systems are very reliable, easy to use and timely. Also, the battery size can be reduced, and the width can be improved.

1.3 Scope of the work

Traditional charging techniques are less time-efficient, dependable, and user-friendly than dynamic charging systems. This charging gadget is also suitable for usage at bus stops, traffic lights, and travel routes. This project's purpose is to develop a wireless power transfer system for electric vehicles.

CHAPTER 2

SYSTEM MODEL

2.1 Introduction

Wireless charging technology is based on Qi standard (operated by the Wireless Power Consortium). This the standard is used worldwide for wireless charging of smartphones. The same can be said of wireless charging electric vehicles. Wireless performance charging is based on Electromagnetic Induction. Coils phone is a basic unit that serves as the primary and creative wrap the magnetic field where the current passes through it. This field enters the stream to the nearest coil otherwise to touch it. If we look at this nearby coil as a second wrap and connect it to a charging unit, wireless charging is available. Electric car charging systems they are in the development stage for a number of reasons such as security, cost, infrastructure etc. However, in this case paper suggests Static Wireless display charging system as a possible example used in the future.

2.2 Block Diagram

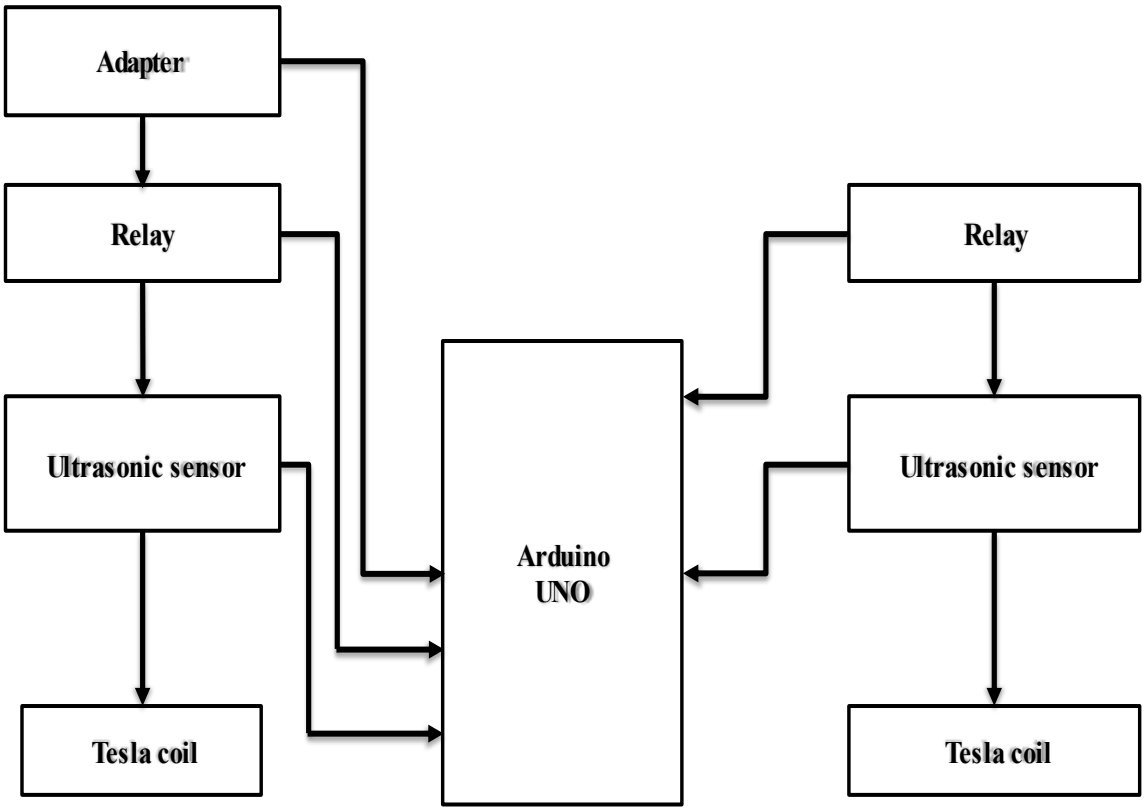

Figure 2.1 Block diagram for the proposed system

2.3 Description of Various Blocks

Arduino

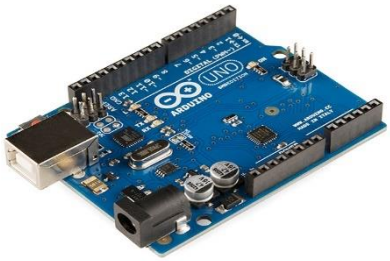

Figure 2.2 Arduino

The Arduino Uno is the most popular one among other Arduino development boards. It is based on the microcontroller ATmega328. Its peripheral features include 14 digital input/output pins (of which 6 can provide PWM outputs), 6 analog inputs, a 16MHz crystal oscillator, a USB connector, a power jack, an ICSP header and a reset button.

Relay

The relay(5V) is always configured by using a small driver circuit which consists of a transistor, diode and resistor. Transistor is used to amplify the current so that full current (from the DC source current-9 V battery) can flow through a coil to fully energies it. The resistor is used to provide biasing to the transistor. And diode is used to prevent reverse current flow, when the transistor is switched OFF.

Ultrasonic Sensor

Ultrasonic sensors work by sending out a sound wave at a frequency above the range of human hearing. The transducer of the sensor acts as a microphone to receive and send the ultrasonic sound. Our ultrasonic sensors, like many others, use a single transducer to send a pulse and to receive the echo.

Mini Tesla Coil

The Tesla coil works with the principle of Electromagnetic Induction. According to which, when a conductor is placed under a varying magnetic field, a small current will be induced inside the conductor.

CHAPTER 3

HARDWARE DESCRIPTION

3.1 Introduction

This program contains Arduino microcontroller, inductive coils, motor prototype module. Persistent weather conditions have led to the research and development of electric vehicles over the past decade. Rising global warming has created awareness among people to switch to electric vehicles. The waiting time required for charging stations while the battery is being charged will be reduced the amount of time that the discharge will be performed at the station. Although electric vehicles are an alternative, there is a need for improvements in their charging system to be the best mode of transportation. For this purpose, charging systems should be upgraded.

3.2 Circuit Diagram

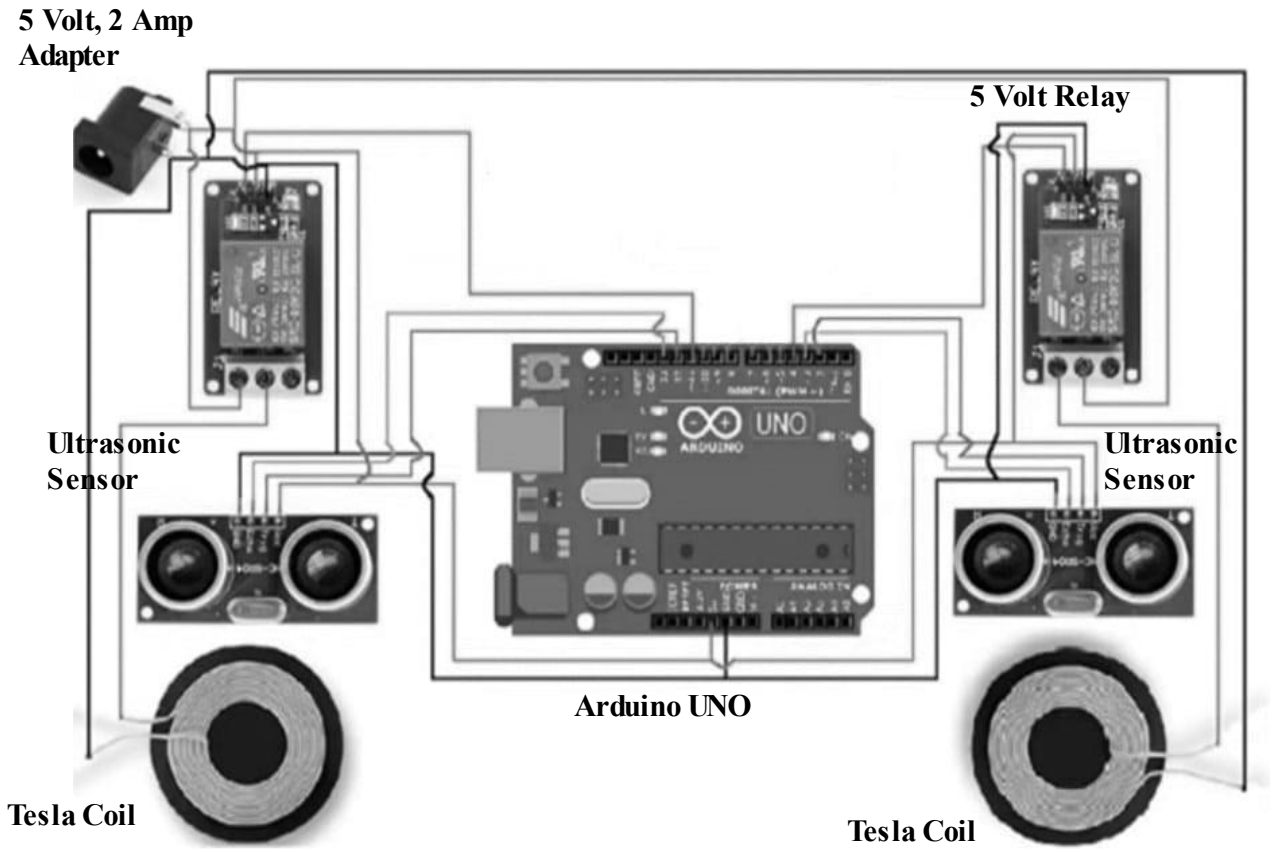

Figure 3.1 Circuit diagram for the proposed system

3.3 Hardware Components

S.NO	COMPONENTS	PRICE(Rs.)
1	Arduino UNO	749
2	Two Ultrasonic Sensor	250
3	Two 5Volt Relay	150
4	Two Mini Tesla Coil	250
5	5Volt,2amp Adapter	75
6	Jumper wires	20
	Total	1494

Table 3.1 Hardware components and its cost

CHAPTER 4

RESULT AND DISCUSSION

4.1 Hardware Implementation

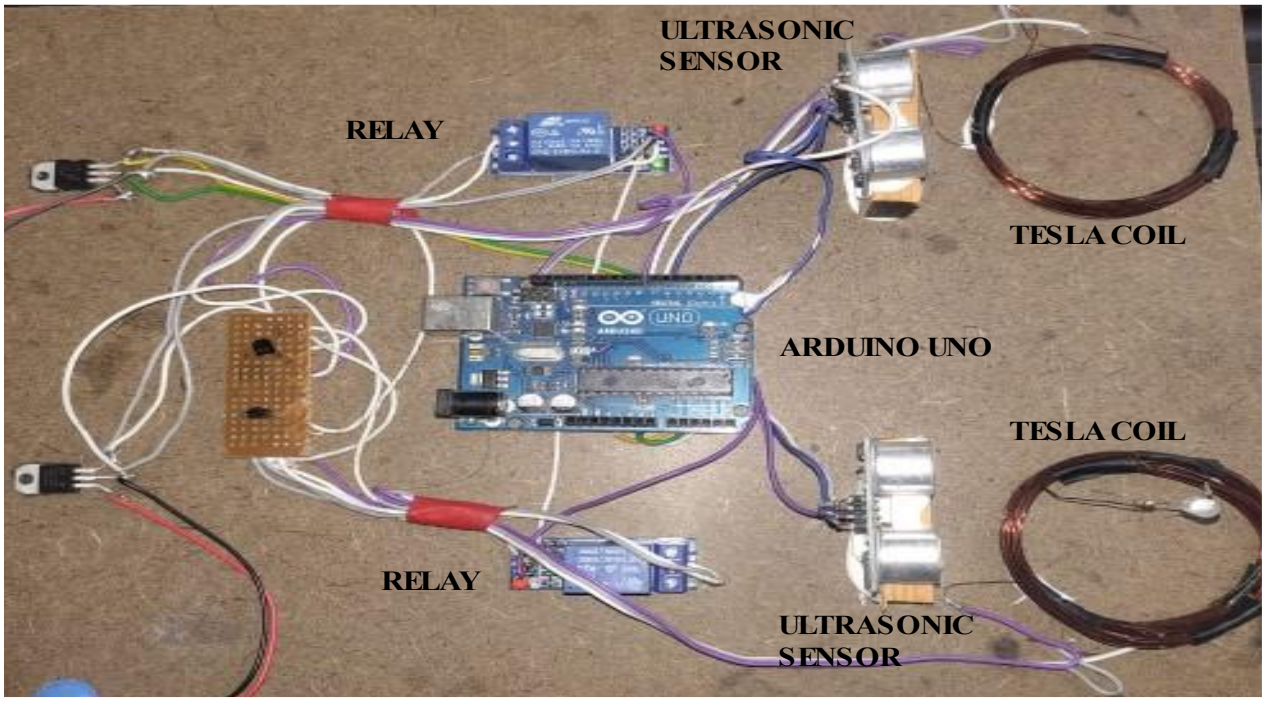

Figure 4.1 Experimental Setup

4.2 Hardware Output

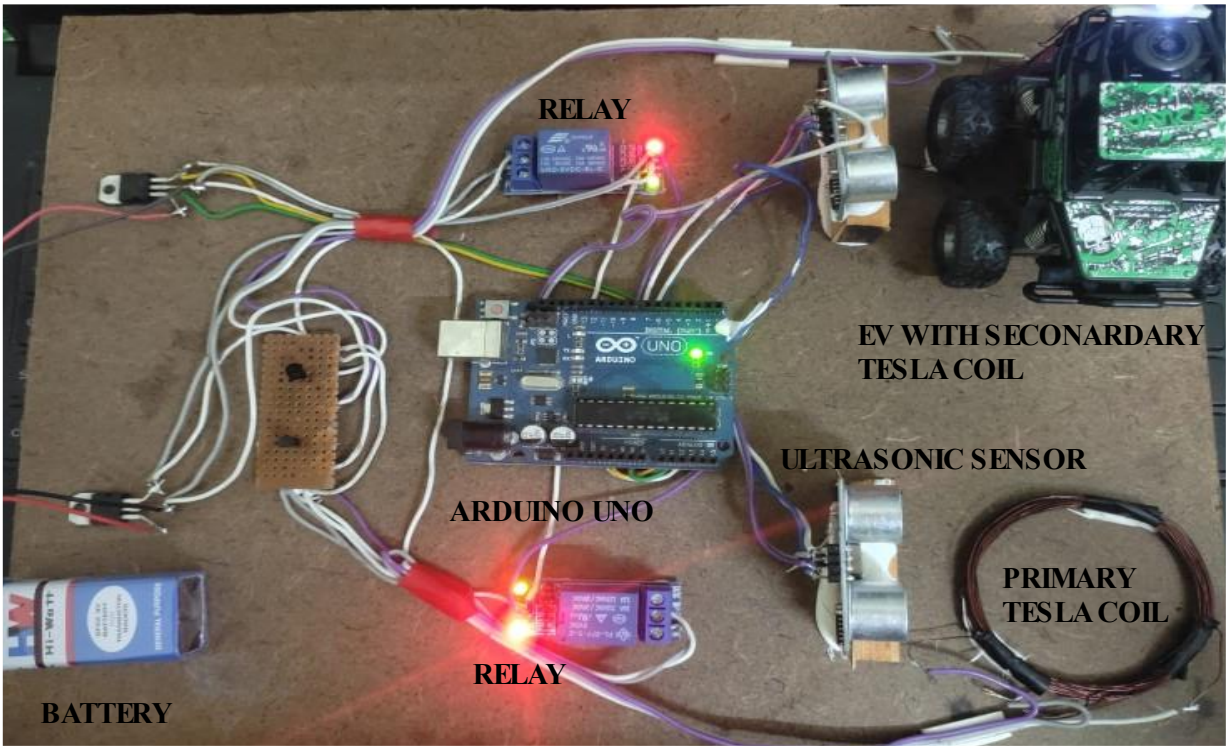

Figure 4.2 Hardware Output

4.3 Working of Project model

- Wireless charging is based on the principle of electromagnetic induction. The main purpose of wireless transmission in electric vehicles is to transfer power over a small distance.

- The wireless power transmission system consists of a transmitter and receiver part that is separated by a small distance.

- Wireless charging helps to eliminate the need for holding cables and thus the possible loss of conductivity over the wire can be completely eliminated.

- Also, manipulating the wires during the plug charging and discharging process can sometimes be dangerous if not done properly.

- Thus, human intervention can be avoided for security purposes. Although wireless charging seems to be time-saving and efficient, it does come with some restrictions.

- A key element of implementation is the development of the infrastructure that needs to be done to achieve the goal. This will require significant investment in all phases of the project and that is why it is costly.

- The first wireless charging technology to be developed is standard, the system is designed to charge EVs in garages or public parking lots, where the vehicle is not operating for a long time.

- Because a portable connection is not required, there has been a great deal of interest in the possibility of charging EVs while on the go. Charging the EV while on the go is called flexible charging.

CHAPTER 5

CONCLUSION AND FUTURE SCOPE

5.1 Conclusion

- With the development of EV technology, charging infrastructure and grid integration areas, EV popularity is expected to grow significantly over the next decade.
- This paper elaborates on EVs wireless charging technology offers the potential for better power efficiency, lower environmental impacts, lower life cycle costs, and greater comfort and safety operating benefits.

5.2 Future Scope

- Based on policy guidelines and emerging technologies. This section should visualize the future of WEVC Today, the international EV list is growing exponentially. Under the trend of industrial prosperity, the two possible approaches to WEVC include how to ensure sustainable growth of EV ownership and how to allow full play of uncontrolled EV development.
- In addition, the emergence of new technologies, building materials and ideas can make WEVC even more competitive. Powerful electrical appliances can benefit from advanced features as well. First, apart from flux leakage, reversing losses are another major source of energy wastage in the WEVC system.

5.3 Applications

- Environmentally Friendly - The most compelling reason to drive an electric vehicle is to help the environment. When compared to gasoline-powered vehicles, they do not emit poisonous emissions that pollute the air.
- No Costs of Fuel or Gas - Because electric automobiles do not require fuel or gas to operate, consumers may avoid the escalating costs of these items. All you have to do now is connect and you'll be ready to travel the additional 100 miles.

CHAPTER 6

REFERENCES

[1] C. Lee, G. Jung, K. Hosani, B. Song, D. Seo and D. Cho, "Wireless Power Transfer System for an Autonomous Electric Vehicle", IEEE Wireless Power Transfer Conference, Nov 15-19. 2020.

[2] Partha Sarathi Subudhi, et.al., “Wireless Power Transfer Topologies used for Static and Dynamic Charging of EV Battery: A Review”, 2020.

[3] Muhammad Adil, et.al., “A Reliable Sensor Network Infrastructure for Electric Vehicles to Enable Dynamic Wireless Charging Based on Machine Learning Technique”, 2020.

[4] B.G. Abhinandh , P.K. Preetha and C.A. Asha, "Solar Integrated Electric Spring for Hospital ICU", 2019 Innovations in Power and Advanced Computing Technologies i-PACT 2019, pp. 8960101, 2019.

[5] Supriyadi, Edi Rakhman, Suyanto, Arif Rahman and Noor Cholis Basjaruddin, “Development of a Wireless Power Transfer Circuit Based on Inductive Coupling, “TELKOMNIKA, Vol.16, No.3,June,2018.

[6] C. Zhu, J. Jiang, K. Song and Q. Zhang, "Research progress of the key technologies for dynamic wireless charging of electric vehicle", Automation of Electric Power System, vol. 41, pp. 61-65, 2017.