DEPT. OF ELECTRONICS AND TELECOMMUNICATION ENGG.

DKTE SOCIETY'S

TEXTILE AND ENGINEERING INSTITUTE, ICHALKARANJI

(An Autonomous Institute)

Promoting Excellence in
Teaching, Learning & Research

ON ROAD WIRELESS CHARGING SYSTEM

A Project Report Submitted

in Partial Fulfillment of the Requirements
for the Degree of

BACHELOR OF TECHNOLOGY
IN
ELECTRONICS AND TELECOMMUNICATION
ENGINEERING

By

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Under the Guidance of

PROF. MR.V.B. SUTAR

2023-24

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CERTIFICATE

This is to certify that the project entitled **ON ROAD WIRELESS CHARGING SYSTEM** submitted by

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Mr. AVINASH JAGANNATH MASAL	20UET080

in the partial fulfillment of the requirements for the degree of **Bachelor of Technology** in **Electronics and Telecommunication Engineering** at the DKTE Society's Textile and Engineering Institute, Ichalkaranji (An Autonomous Institute Affiliated to Shivaji University, Kolhapur) is an authentic work carried out by them under our supervision and guidance. The students have satisfactorily completed the project work and to the best of our knowledge and belief, the matter embodied in this submission has not been submitted to any other University/ Institute for the award of any degree or diploma.

Place: Ichalkaranji
Date:

Prof. V.B. Sutar	Prof. (Dr.) S. A. Patil	Prof.(Dr.) L.S. Admuthe
[Guide]	[HOD]	[I/c Director]

DECLARATION

We declare that this written submission represents our ideas in our own words and where others' ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. Weunderstand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

Name of the Students	Signature of the students

1) Mr. GOURAV SURYAKANT JALAN
2) Mr. MANOJ MAHESH KUMBHAR
3) Mr. AVINASH JAGANNATH MASAL

Place: Ichalkaranji
Date:

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Mr. GOURAV SURYKANT JALAN
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Abstract:

As an alternate form in the road transportation system, electric vehicle (EV) can help reduce the fossil-fuel consumption. However, the usage of EVs is constrained by the limited capacity of battery. Wireless Power Transfer (WPT) can increase the driving range of EVs by charging EVs in motion when they drive through a wireless charging lane embedded in a road. The amount of power that can be supplied by a charging lane at a time is limited.

A problem here is when a large number of EVs pass a charging lane, how to distribute the power among different penetration levels of EVs efficiently? However, there has been no previous research devoted to tackling this challenge. To handle this challenge, we propose a system to balance the State of Charge (called BSoC) among the EVs. It consists of three components:

i) fog-based power distribution architecture

ii) power scheduling model

iii) efficient vehicle-to-fog communication protocol.

The fog computing center collects information from EVs and schedules the power distribution. We use fog closer to vehicles rather than cloud to reduce the communication latency. The power scheduling model schedules the power allocated to each EV. In order to avoid network congestion between EVs and the fog, we let vehicles choose their own communication channel to communicate with local controllers.

This paper presents a comprehensive review of on-road WPT technologies for EV's. It discusses the principles of electromagnetic induction and resonance that underlie WPT systems, along with the key components such as transmitter coils embedded in the road surface and receiver coils integrated into the vehicle. Various WPT standards and protocols are also examined, highlighting the importance of interoperability and safety standards.

Chapter 1

INTRODUCTION

1.1 Introduction

In the field of transportation, electric vehicles (EVs) represent a novel concept. Electric vehicles (EVs) are predicted to take over the automobile market in the near future. The charging procedure for electric vehicles (EVs) must be regulated in this context in order to preserve the quality of the power networks. In spite of this, with the growth of electric vehicles (EVs), there will be a significant quantity of energy stored in the batteries, which will allow for the opposite effect. Due to decreasing carbon dioxide emissions and rising fossil fuels, the electric vehicle has become more competitive than the conventional internal combustion engine vehicle. In spite of these drawbacks, the EV was not generally adopted in the market because of its high vehicle cost. Thereis a dearth of fast-charging stations and a paucity of all-electric vehicles.

There are two types of electric vehicles: those that are powered entirely by electric power and those that are partially powered by electric power. In addition to their low operating costs and little impact on the environment, electric vehicles utilize little or no fossil fuels at all. Electric vehicles will be the primary means of transportation in the future to enhance charging station efficiency [1]. When it comes to acquiring an electric vehicle, the absence of charging infrastructure is the most common argument given for not doing so. The portable EV charger was tested by lowering charging time with renewable energy. A hybrid power system is used in this study to provide a unique service to long-distance EV drivers. Between major highways, there aren't any places for these drivers to refuel their automobiles with electricity. The wireless EV charger is a greatchoice for people who want to use electricity to charge their electric vehicles [2]. Because of rising fossil fuel prices and declining CO2 emissions, electric vehicles are now more cost-competitive than traditional Considered as a continuous vehicles. Electric vehicles were not extensively adopted because of restrictions such as There is a dearth of fast-charging stations and a paucity of all-electric vehicles. It is possible for EVs to be powered entirely or in part by electricity. Due to their lack of moving parts and little impact on the environment, electric cars have lower operating expenses than gasoline powered counterparts [3]. Our project system uses a power source, battery, transformer, regulator circuits, copper coils, AC to DC converter, controller, and LCD display to build the system. There is no need to stop for recharging with this system because electric vehicles may be charged while travelling. A charge controller connects the battery to the solar panel. dc electricity is being stored in the battery. Now, in order to send the DC power, it must be converted to AC power. A transformer is used here to accomplish this task.

1.2 Motivation

Wireless Power Transfer (WPT) for electric vehicles offers a transformative solution to the challenges of traditional charging methods. By eliminating the need for physical cables and plugs, WPT enhances convenience, safety, and scalability in EV charging infrastructure. It simplifies the charging process, reduces wear and tear on vehicles and infrastructure, and supports urban aesthetics. Moreover, WPT aligns with the broader goals of sustainable transportation, reducing emissions and fostering innovation in clean energy technologies.

1. Convenience: WPT eliminates the need for physical cables and plugs, making the charging process more convenient for EV owners. Users simply need to park their vehicles over designated charging pads, which can be integrated into parking lots, garages, or even roads

2. Ease of Use: WPT simplifies the charging process, especially for those who may have physical limitations or mobility issues. There's no need to handle heavy charging cables or maneuver them into position.

3. Enhanced Safety: With no exposed electrical connectors, WPT reduces the risk of electric shock or short circuits, improving safety for both users and pedestrians.

4. Reduced Wear and Tear: Traditional plug-in charging systems involve repeated plugging and unplugging, which can lead to wear and tear on both the charging infrastructure and the vehicle's charging port. WPT eliminates this issue, potentially extending the lifespan of both.

5. Scalability and Future Integration: WPT offers scalability and flexibility for infrastructure deployment. It can be integrated into existing infrastructure, such as parking lots and roads, facilitating widespread adoption of electric vehicles without the need for extensive retrofitting.

6. Urban Planning and Aesthetics: WPT technology can be integrated into urban environments more seamlessly, without the need for visible charging stations or cables, thus preserving the aesthetics of city landscapes.

7. Grid Management and Peak Load Reduction: By enabling continuous, automated charging, WPT can help utility companies manage energy demand more efficiently, potentially reducing peak loads and the need for costly grid upgrades.

8. Environmental Impact: WPT supports the broader transition to sustainable transportation by reducing greenhouse gas emissions associated with fossil fuel-powered vehicles. It encourages the adoption of electric vehicles, which can be powered by renewable energy sources, further reducing carbon footprints.

9. Innovation and Technological Progress: Investing in WPT for EVs drives innovation in wireless charging technologies, potentially leading to advancements that can be applied in other industries or applications, such as consumer electronics or industrial automation.

1.3 Engineering Problem Statement

The widespread adoption of electric vehicles (EVs) presents a significant challenge regarding their charging infrastructure, particularly for vehicles in motion. The conventional charging methods require stationary vehicles, resulting in limited mobility and inconvenience for EV owners. To address this issue, the development of an efficient wireless charging system for moving electric vehicles is imperative.

The primary challenge lies in designing a system capable of wirelessly transferring power to EVs while they are in motion, ensuring seamless charging without compromising safety or efficiency. Factors such as the distance between the charging infrastructure and the vehicle, power transfer efficiency, and compatibility with different vehicle speeds and sizes need to be carefully considered.

1.4 Organization of Work

Months	**Description**
September	Finalization of project
October	Literature review
November	Finalization of components, Purchase of components
December	Preparing for synopsis
December	Gathering required information for programming and collecting hardware specification
January	Completion of program and Hardware implementation
February	Testing the project
May	Finalization of project and Preparing the project report

Chapter 2

Literature review

TITLE: Design of a High Power Transfer Pickup for On-Line Electric Vehicle

AUTHOR: Boyune Song, Jaegue Shin, Seokhwan Lee, Seungyong Shin, Yangsu Kim, Sungjeub Jeon and Guho Jung.

DESCRIPTION:

Recent electric vehicle technology with battery has faced many problems: high cost, weight, driving distance, long charging time and danger of electric shock. An inductive power transfer pickup for electric vehicles such as pickup of traditional transformer enables electric vehicles to overcome these problems by using contactless power transfer. Also, inductive power transfer pickup has many advantages including high efficiency, high power, a large air gap and lightweight. In this paper, proposed inductive power pickup was developed using series capacitor with ferrite cores and multi-windings and was tested for its ability to transfer electricity wirelessly. When tested for output power and efficiency of pickup, output power of 20kW and efficiency of 86.7% were achieved at 20 kHz and 250mm air gap.

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TITLE: Invention of Tesla coil

AUTHOR: Nikola Tesla

DESCRIPTION:

The Tesla coil operates on the principles of electromagnetic induction and resonance to produce high-voltage, high-frequency electrical discharges. It consists of two main coils: the primary and secondary coils. The primary coil, typically wound with a few turns of thick wire, is connected to an alternating current (AC) power source. When the AC power is applied, it creates a rapidly changing magnetic field around the primary coil. Positioned above or around the primary coil is the secondary coil, wound with many more turnsof finer wire. This changing magnetic field induces a high voltage across the windings of the secondary coil through electromagnetic induction. The primary and secondary coils, along with a capacitor connected in parallel to the primary coil, form a tuned LC (inductance-capacitance) circuit. This circuit is designed to resonate at a specific frequency determined by the inductance of the coils and the capacitance of the capacitor. Resonance allows the system to efficiently transfer energy between the primary and secondary circuits. As the voltage across the secondary coil builds up rapidly, it can reach extremely high levels, often in the hundreds of thousands to millions of volts. At a certain voltage threshold, the air gap between two electrodes in the primary circuit breaks down, causing a spark to jump across it. This event marks the discharge of energy stored in the primary circuit, leading to a surge of current through the primary coil. This surge creates a rapidly oscillating magnetic field that further induces a high voltage in the secondary coil. The voltage across the secondary coil isthen released as a series of high-voltage electrical discharges, typically in the form of long, arcing sparks. This process repeats cyclically as long as the AC power source continues to supply power to the primary circuit. Overall, the Tesla coil's operation relies on the interplay of electromagnetic phenomena to produce its characteristic electrical effects, making it a fascinating device for demonstrations, entertainment, and educational purposes

Chapter 3 Hardware Implementation

3.1 System Block Diagram

Block Diagram shows the modular representation of on road wireless charging (power transform). There are 8 IR Sensors for detecting the vehicle on road. There are 8 Relay modules which is used for switching coils. Microcontroller used in this project is Arduino UNO. 4 DC motors are used in the vehicle along withrechargeable battery. There are multiple coils are present on road (Primary Coil) and vehicle consist of single coil (Secondary Coil).

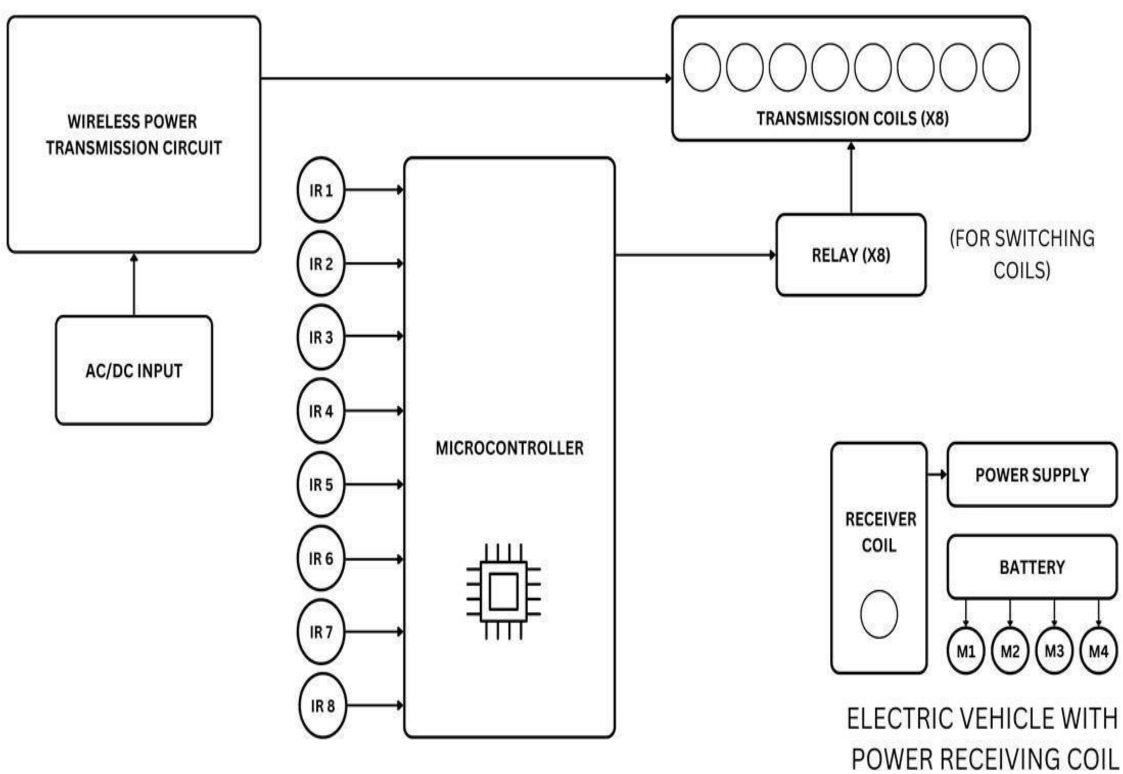

Fig 3.1.1 System Block Diagram

3.2 Hardware Design Details

3.2.1 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 digitaldevices and interactive objects that can sense and control objects in the physical world. Arduino is an open- source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs

- light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, and a reset button.

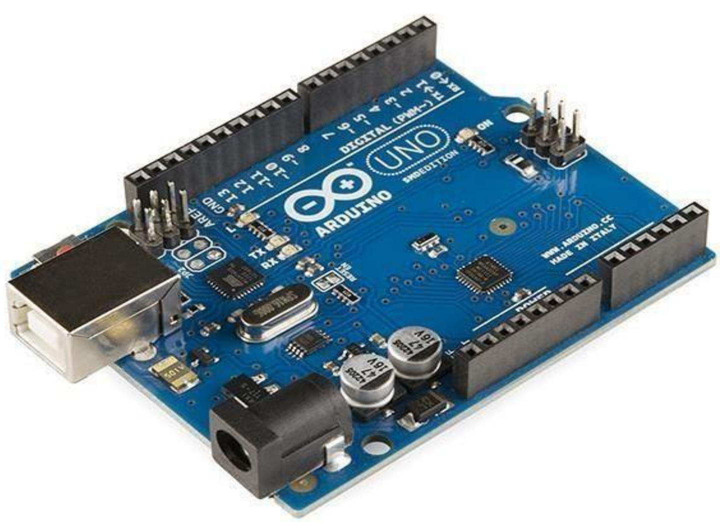

Fig 3.2.1 Arduino

FEATURES:

- Microcontroller: ATmega328P
- Operating voltage: 5V
- Input voltage: 7-12V
- Flash memory: 32KB
- SRAM: 2KB

- EEPROM: 1KB

3.2.2 Relay

Relays are simple switches which are operated both electrically and mechanically. Relays consist of an electromagnet and also a set of contacts. The switching mechanism is carried out with the help of the electromagnet. The main operation of a relay comes in places where only a low-power signal can be used to control a circuit. It is also used in places where only one signal can be used to control a lot of circuits. They were used to switch the signal coming from one source to another destination. The high end applications of relays require high power to be driven by electric motors and so on. Such relays are called contactors.

A relay is an electromechanical switch which is activated by an electric current. A single relay board arrangement contains driver circuit, power supply circuit and isolation circuit. A relay is assembled with that circuit. The driver circuit contains transistors for switching operations. The transistor is use for switching the relay. An isolation circuit prevents reverse voltage from the relay which protects the controller and transistor from damage. The input pulse for switching the transistor is given from the microcontroller unit. It is used for switching of a single device.

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Fig 3.2.2 Relay

FEATURES:

- Input voltage: 12VDC
- Driver unit: ULN2003A
- Isolation unit: In4007

- Fast switching

3.2.3 IR Sensor

An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes, that can be detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, The resistances and these output voltages, change in proportion to the magnitude of the IR light received.

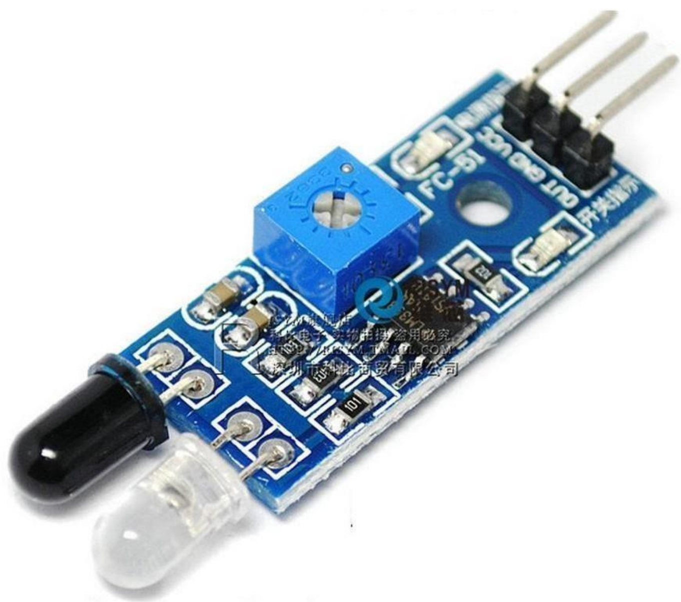

Fig 3.2.3 IR Sensor

FEATURES:

- Input voltage: 3.3v
- Output: analog

3.2.4 Lead-Acid Battery (4v, 1.5A)

Lead-acid batteries are a type of rechargeable battery commonly used in vehicles, uninterruptible power supplies (UPS), and various industrial applications. They consist of lead dioxide (positive plate), sponge lead (negative plate), and sulfuric acid electrolyte.During discharge, lead sulfate forms on the plates; during charging, it converts back to lead dioxide and sponge lead. Lead-acid batteries are known for their reliability, low cost, and ability to deliver high surge currents. However, they are heavy, have a low energy-to-weight ratio, and require regular maintenance due to electrolyte evaporation and plate sulfation. Despite these drawbacks, advancements like sealed maintenance-free designs and absorbent glass mat (AGM) technology have improved their usability. They remain a prevalent choice for automotive starting, lighting, and ignition (SLI) systems, standby power, and renewable energy storage due to their mature technology and cost-effectiveness. Proper disposal and recycling are crucial due to their lead and sulfuric acid content, which can be hazardous to the environment if not handled responsibly.

Fig 3.2.4 Lead Acid Battery

FEATURES:

- Nominal voltage: 4V
- Nominal capacity: 1.5Ah
- Charging voltage: 3.4V to 3.7V
- Recommended charging current: not more than 0.5A
- Long-lasting battery
- Maintenance-free

3.2.5 Motors

Toy motors are small electric motors commonly used in various toys and hobby projects. They come in different sizes and specifications, ranging from simple DC motors to more complex brushed or brushless motors. DC toy motors operate based on the principles of electromagnetism. When an electric current is passed through the motor's coils, it creates a magnetic field that interacts with permanent magnets, causing the motor to spin. These motors are often used in simple toys like model cars, boats, or small robots.

Toy motors are typically rated by their voltage, current, speed, and torque capabilities. Choosing the right motor depends on the specific application and desired performance characteristics of the project.

Fig 3.2.5 Motor

FEATURES:

- Operating Voltage: 4.5V to 9V
- Rated Voltage: 6V
- Current at No load: 70mA (max)
- Loaded current: 250mA (approximate)

3.2.6 Copper coils

Tesla coils are electrical resonant transformers invented by Nikola Tesla in the late 19th century. While Tesla experimented with various configurations, the primary design typically involves two main components: a primary coil and a secondary coil. The primary coil is connected to a high-voltage power source and oscillates at a specific frequency, creating an oscillating magnetic field. This field induces a high voltage in the secondary coil, which can produce spectacular electrical discharges.

Copper is commonly used in Tesla coils due to its excellent conductivity, allowing for efficient energy transfer between the coils. The primary coil is often made of thick copper wire, capable of handling high currents without significant resistance. The secondary coil, wound around a cylindrical form, also utilizes copper wire, typically thinner and more tightly wound to create a higher voltage output.

Tesla coils are renowned for their ability to generate extremely high voltages, resulting in long, branching electrical discharges known as streamers. They are popular in demonstrations of high-voltage phenomena and are utilized in entertainment, such as creating visual effects in concerts or science exhibitions. Additionally, they have applications inwireless power transmission, although practical implementations are limited due to safety concerns and efficiency issues. Despite being over a century old, Tesla coils continue to captivate enthusiasts and inspire experimentation in the realm of electrical engineering and high-voltage physics.

Fig 3.2.6 Copper Coils

3.2.7 Mosfet

The IRF540N is an N-Channel Mosfet. This M osfet can drive loads upto 23A and can support peak current up to 110A. It also has a threshold voltage of 4V, which means it can easily driven by low voltages like 5V. Hence it is mostly used with Arduino and other microcontrollers for logic switching. Speed control of motors and Light dimmers are also possible with this Mosfet since it has good switching characteristics.

Fig 3.2.7 MOSFET

Pin1 (Source): Current supplies out throughout Source terminal

Pin2 (Gate): This pin controls the MOSFET biasing

Pin3 (Drain): Current supplies throughout Drain terminal

FEATURES:

1. Switching capacity is very quick
2. Minimum gate threshold voltage is 2V
3. Very less resistance
4. Maximum gate threshold voltage is 4V

3.2.8 IC- CD4047BD

The CD4047BD is a CMOS (Complementary Metal-Oxide-Semiconductor) integrated circuit primarily designed for generating precise timing pulses. It features a low- power consumption design, making it suitable for battery-operated devices. The IC includes an astable multivibrator configuration with complementary outputs. It operates over a wide voltage range, typically from 3V to 15V, making it versatile for various applications.

The CD4047BD is commonly used in applications such as frequency synthesis, precision timing circuits, and waveform generation. Its flexibility and reliability make it popular among hobbyists and professionals alike for tasks ranging from signal generation in electronic projects to driving power switching circuits in inverters and other power electronics applications.

Moreover, its compact size and ease of use make it an attractive option for designers seeking to implement timing and waveform generation functionalities without the need for extensive external components. Overall, the CD4047BD offers a convenient solution for generating accurate timing pulses in a wide range of electronic systems

Fig 3.2.8 CD4047BD

FEATURES:

1. Supply voltage range is in between 3.0V to 15V
2. Provides balanced output

Chapter 4 Software Implementation

4.1 Flowchart

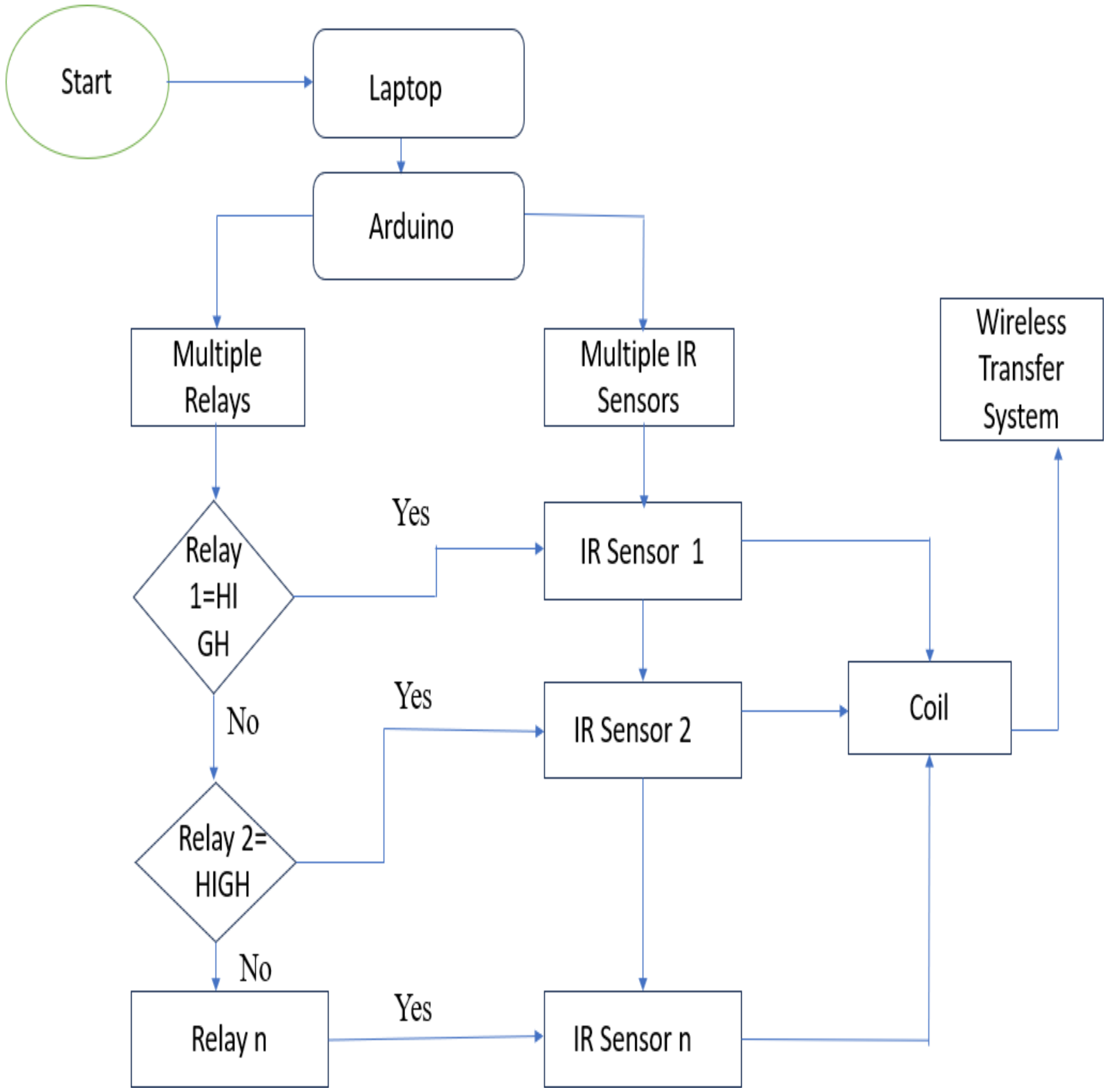

Fig 4.1.1 Software Implementation

4.2 Project coding

detailsCode

```
void setup()
{

    pinMode(2, INPUT);
    pinMode(3, INPUT);
    pinMode(4, INPUT);
    pinMode(5, INPUT);
    pinMode(6, INPUT);
    pinMode(7, INPUT);
    pinMode(8, INPUT);
    pinMode(9, INPUT);
    pinMode(10, OUTPUT);
    digitalWrite(10, HIGH);
    pinMode(11, OUTPUT);
    digitalWrite(11, HIGH);
    pinMode(12, OUTPUT);
    digitalWrite(12, HIGH);
    pinMode(A0, OUTPUT);
    digitalWrite(A0, HIGH);
    pinMode(A1, OUTPUT);
    digitalWrite(A1, HIGH);
    pinMode(A2, OUTPUT);
```

```
      digitalWrite(A2,  HIGH);
      pinMode(A3, OUTPUT);
      digitalWrite(A3,  HIGH);
      pinMode(A4, OUTPUT);
      digitalWrite(A4, HIGH);
}
void loop()
{
 if(digitalRead(2)==0)
     {
        digitalWrite(10, LOW);
       }
     if(digitalRead(2)==1)
     {
       digitalWrite(10, HIGH);
       }
     if(digitalRead(3)==0)
     {
        digitalWrite(11, LOW);
       }
     if(digitalRead(3)==1)
     {
       digitalWrite(11, HIGH);
       }
```

{


```
if(digitalRead(4)==0)
{
  digitalWrite(12, LOW);
}
if(digitalRead(4)==1)
{
  digitalWrite(12, HIGH);
}
if(digitalRead(5)==0)
{
  digitalWrite(A0, LOW);
}
if(digitalRead(5)==1)
{
  digitalWrite(A0, HIGH);
}

if(digitalRead(6)==0)
{
  digitalWrite(A1, LOW);
}
if(digitalRead(6)==1)
{
  digitalWrite(A1, HIGH);
```

```
      }
 if(digitalRead(7)==0)
    {
       digitalWrite(A2, LOW);
      }
    if(digitalRead(7)==1)
    {
      digitalWrite(A2, HIGH);
}
 if(digitalRead(8)==0)
    {
       digitalWrite(A3, LOW);
  }
    if(digitalRead(8)==1)
    {
      digitalWrite(A3, HIGH);
 }
if(digitalRead(9)==0)
    {
       digitalWrite(A4, LOW);
      }
    if(digitalRead(9)==1)
    {
      digitalWrite(A4, HIGH);
```

```
    }
    delay(200);
}
```

Chapter 5 Result and Discussion

5.1 Results

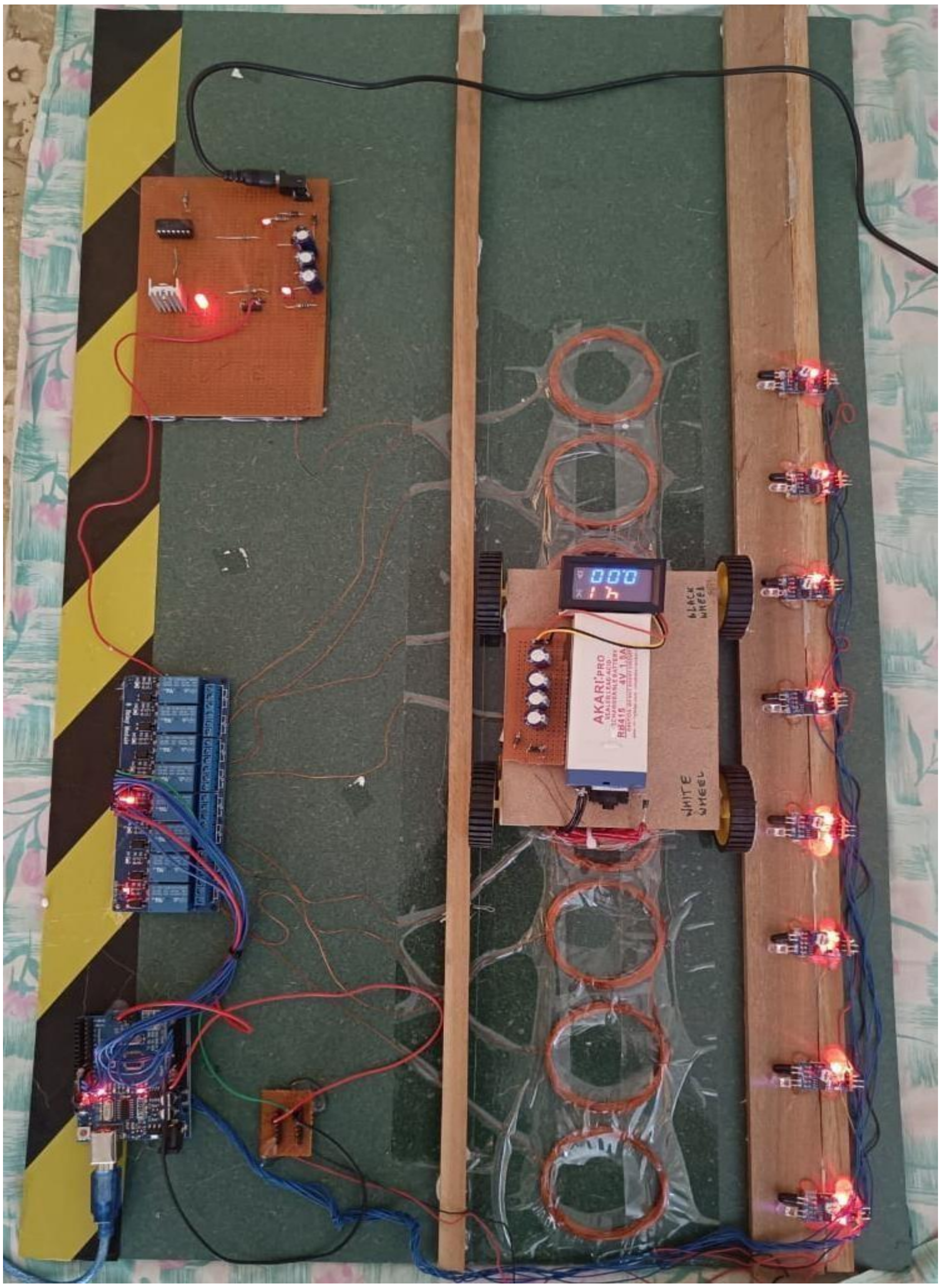

Fig 5.1.1
Snapshot of Project

- Coil readings for different coils:

Coil No.	**Reading (Output in Volts)**
Coil 1	3.9
Coil 2	3.4
Coil 3	3.6
Coil 4	4.0
Coil 5	4.0
Coil 6	3.8
Coil 7	3.3
Coil 8	3.4

5.2 Merits:

- **Convinience :** On-road wireless charging eliminates the need for physically plugging in an EV to charge, providing convenience to traditional fueling for internal combustion engine vehicles.
- **Continuous operation:** Vehicles equipped with on-road wireless charging can potentially charge while in motion, extending their range and reducing the need for frequent stops.
- **Infrastructure integration:** Integrating wireless charging technology into existing road infrastructure, such as highways or city streets, can provide a more widespread charging network without the need for additional charging stations.
- **Reduced environmental impact:** On-road wireless charging can potentially reduce the environmental impact associated with battery production.
- **Safety:** On-road wireless charging eliminates the risks associated with physical plug-in connections, such as tripping hazards and potential electrical hazards.

5.3Applications

● **Electric Vehicles (EV's):** On-road wireless charging can be used to charge Evs while they are in motion, extending their range and reducing the need for frequent stops. This technology can be particularly useful for electric buses, taxis, and delivery vehicles, which operate on fixed routes or in urban areas where continuous charging infrastructure can be deployed.

● **Public Transportation:** Wireless on-road charging can be integrated into public transportation systems, such as electric buses and trams, enabling them to charge seamlessly while in operation. This can help reduce emissions and noise pollution in urban areas while improving the efficiency of public transportation networks.

● **Fleet Management:** Companies with large fleets of electric vehicles, such as delivery companies or logistics providers, can utilize on-road wireless charging to keep their vehicles charged and operational throughout the day. This can improve the reliability and cost-effectiveness of electric vehicle fleets compared to traditional fossil fuel-powered vehicles.

● **Autonomous Vehicles:** Wireless on-road charging can be integrated into infrastructure to support autonomous vehicle fleets, enabling them to operate continuously without the need for human intervention to recharge. This can help facilitate the widespread adoption of autonomous vehicle technology by addressing concerns about range and charging infrastructure.

● **Military and Emergency Vehicles:** On-road wireless charging can be utilized in military and emergency vehicle fleets to ensure they remain operational during critical missions or disaster response efforts. This technology can provide a reliable source of power in remote or challenging environments where traditional charging infrastructure is not available.

Limitations

- While on-road wireless charging systems offer several advantages, they also face certain limitations which is as follows:

- Efficiency: Wireless charging systems may be less efficient compared to traditional wired charging, resulting in energy losses during the transfer process. Improving efficiency is crucial to minimize waste and maximize the effectiveness of on-road charging.

- Cost: The initial cost of installing on-road wireless charging infrastructure can be prohibitively high. This includes the cost of equipment, installation, and maintenance. Lowering the cost barrier is essential to make this technology economically viable for widespread deployment.

- Standardization: Lack of standardization in on-road wireless charging systems can pose interoperability issues, especially for vehicles from different manufacturers. Developing common standards and protocols is necessary to ensure compatibility and seamless integration across various platforms.

- Range and Speed: The charging range and speed of on-road wireless systems may be limited compared to stationary chargers. Improving the efficiency and power delivery capabilities of these systems is essential to reduce charging times and extend driving range.

- Road Maintenance: Embedding charging infrastructure into roads may require additional maintenance and could potentially impact road durability and safety. Mitigating these effects and ensuring the longevity of both the charging infrastructure and road surface is crucial for sustainable implementation.

Chapter 6 Summary and Conclusion

6.1 Summary

The project on on-road wireless charging system aims to explore and implement innovative technology to revolutionize electric vehicle (EV) charging infrastructure. This project entails designing, developing, and testing a system that enables Evs to charge wirelessly while in motion, thereby addressing the limitations of traditional stationary charging stations and enhancing the practicality of Evs for everyday use.

The primary objective of the project is to investigate the feasibility and effectiveness of on-road wireless charging technology in real-world applications. This involves conducting thorough research into existing wireless charging systems, identifying potential challenges and opportunities, and designing a customized solution tailored to the specific requirements of on-road charging.

The project encompasses multiple phases, including conceptualization, design, prototyping, testing, and implementation. During the conceptualization phase, the project team conducts comprehensive market research and feasibility studies to assess the technical, economic, and environmental aspects of on-road wireless charging. This phase also involves defining the project scope, objectives, and deliverables.

In the design phase, the project team develops detailed engineering specifications and blueprints for the on-road wireless charging infrastructure. This includes selecting appropriate charging technologies, determining optimal placement and configuration of charging units, and integrating safety features and communication protocols.

Following the design phase, the project progresses to prototyping and testing. Prototype systems are built and subjected to rigorous testing under simulated and real-world conditions to evaluate their performance, efficiency, and reliability. This phase involves iterative refinement and optimization based on test results and feedback.

Once the prototype has been successfully validated, the project moves to the implementation phase, where the on-road wireless charging system is deployed and integrated into existing road infrastructure. This phase may involve collaboration with transportation authorities, utility companies, and other stakeholders to ensure seamless integration and regulatory compliance.

Throughout the project, a multidisciplinary team of engineers, researchers, and industry experts collaborates closely to overcome technical challenges, optimize system performance, and maximize the potential benefits of on-road wireless charging technology. The project culminates in the development of a scalable and sustainable solution that has the potential to transform the future of electric mobility and contribute to the global transition towards clean and sustainable transportation.

6.2 Conclusion

● The perception of peoples towards EV’s is still unsatisfactory as a major section of our society is still unaware of various alternative technology used in automobiles.

● The current EV’s don‘t meet the customer expectations to a large extent.

● The government initiatives taken for the promotion of EV’s is still in developing stages and is up to paper though various agencies have been formed and various plans have been brought by them but still its implements is not yet done.

● Though many customers will prefer EV’s only if they are comparable with current vehicles on the road, so a change in consumer‘s behavior is important. They should gradually become more conscious about the use of cleaner technologies.

● Marketing of such products will really play an important role as a stepping foot towards GREENER ENVIRONMENT.

● Various companies should take initiatives to promotes electric vehicles as a part of their corporate social responsibilities. Finally the future of electric vehicles is GREEN.

6.3 Future Development in the Project

Electric vehicle (EV) sales grew 60 percent worldwide last year, according to Bloomberg New Energy Finance, which predicts in an article, “Here’s How Electric Cars Will Cause the Next Oil Crisis,” that electric vehicles will account for 35 percent of new car sales globally by 2040.Industry expert Navigant Research also forecasts strong EV growth in 2016 as new, longer range models enter the market and more charging stations are installed. Already through the first two months of 2016, EV sales are up 9 percent compared to the same time last year, according to InsideEVs.com. No wonder the oil industry is skittish. Bloomberg predicts the EV “revolution” will displace 13 million barrels a day of crude by 2040 and 2 million barrels per day as early as 2023.It’s easy to see why the future of electric vehicles is bright. Here are five reasons.

- Battery costs are dropping fast
- Longer range, affordable electric cars are coming
- More charging stations are coming
- Auto industry is embracing EV’s
- The global imperative to cut carbon pollution and oil dependency

6.4 References

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