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IoT-Enabled Wireless Power Transfer System for Electrical Vehicles with Real-Time Cloud Monitoring

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Abstract - This paper outlines the design and implementation of a wireless charging system for electric vehicles (EVs) paired with an Internet of Things (IoT)-based monitoring platform. The new system seeks to replace traditional plug-in charging methods that use physical cables with a contactless and more efficient solution. It operates on the principle of resonant magnetic coupling. This allows power to transfer effectively between the transmitter and receiver coils without direct electrical contact. This method improves user safety, reduces wear and tear, and lowers the chances of electric shock and cable-related failures.

To boost the accuracy and reliability of vehicle positioning during charging, the system includes a retroreflective photoelectric sensor. This sensor pinpoints the exact position of the electric vehicle and helps align it with the charging pad. This ensures optimal energy transfer and facilitates smooth parking. The proposed system can reach a maximum power transfer efficiency of up to 95% under ideal conditions.

Moreover, the integration of IoT technology allows for real-time monitoring and control of the charging process. Users can remotely access key parameters such as charging status, efficiency, and system performance through connected devices. Overall, this system offers a safe, efficient, and smart solution for the future of EV charging infrastructure.

Keywords - Wireless charging, Electric vehicles, IoT, Magnetic coupling

I. INTRODUCTION

The EVs are not developed by a single person; many of them are involved in developing EVs, and the first electric motor was developed by the *Hungarian* physicist and engineer ***Anyos Jedlik,*** but it was a small model car and not for road vehicles [1,3,4].

The first crude EVs are developed between the years of 1832 and 1839 by Robert Anderson of Scotland, but not the rechargeable vehicle[2].

And Thomas Davenport was also involved in developing the practical electric motor for powering a small vehicle. The first rechargeable battery tricycles were introduced (or developed) by the ***French innovator Gustave Trouvé for EV vehicles' charging[5].***

The first rechargeable battery was a lead-acid battery in the year 1859 by ***Gaston Planté,*** but it was used for vehicles in 1881 by ***Gustave Trouvé[11].*** *The* recharge of the battery is 3.50 km. The recharge type is the wired type only.

The recharge type

The most widely used net charge type is the wired DC charging type only, but there are alternative types[2,5,19]. AC level 1 charging and slow charging from the source of a standard household outlet: the voltage range is 100-120 V, and charging speed is 8-20 hours. And using it for home charging in the countries used by the USA, Canada[2]

ACs level charging (normal/moderate charging)

The power source is a dedicated AC changer, and the voltage range is 220-240V. The speed of charging is 4-8 hours, and it is used for homes, workplaces and public charging stations in the countries used by Europe, India, Asia and Australia[12-15].

The levels are DC charging.

This type is the most commonly used type of DC charging, which is direct charging on battery, and the charge speed is 20-60 minutes (up to 80%), and they are used for highways and commercial stations. The Combined Charging System is used in North America, Europe, India, and Australia. but North America (CC1) using a single-phase AC supply[16-18,20].

(or)

The AC-connected base is SAE J1772, and the others are used CC52 AC connector bases (IEC 62192) and used (single- and three-phase) AC supply bases[6,10]

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CHAdeM0 is an association.

They are used by Japan and some Asian countries. (GBIT) – it is used in China, and (Tesla NACs) – they are used by the USA.

Ultra-fast/high-power DC charge

The power range of 150-350 kW and charging time of 10-20 minutes are only used for long-distance travelling and high-speed vehicles, and they are used in Europe, the USA, China, and South Korea[7,8].

Wireless charging (induction types)

It is an experimental type, and the charging speed is slow to moderate for the vehicle, and it is used by the USA, Europe, and South Korea[6-10].

Battery swapping (replacement method)

The fully charged battery is being replaced, and the time required is 3-5 minutes, and it is used for commercial fleets, two-wheelers, and this used by China, India, and Taiwan[21,22].

Pantograph charging (overhead automatic connector)

The ICE train is in India, but it is used for electric buses in Europe and China, and very fast charging (150-600 kW) timing is 3-5 minutes. These seven types of charging are used in India. The charging types are level 2 AC charge / DC charging (CCS2) and

battery swapping[23-25].

II. DRAWBACK

The most common drawbacks of EV cars are high cost, lower efficiency, alignment issues, slower charging speed, heat generation, limited infrastructure and higher energy loss.

III. OVERCOME

The drawbacks are minimised by this project; the common drawbacks are lower efficiency, alignment issues, slower charging speed and heat generation, and the overcome issues are explained below.

Lower efficiency

Lower efficiency is overcome by using proper alignment of coils in between the transmitter coil and receiver coil.

That while using an IR sensor for position monitoring, one can use a high-quality coil to reduce loss and increase the power transfer.

Then improving the resonant inductive coupling, minimising air gap distance, power control circuits, and magnetic shielding – these properties are used for reduced energy loss, increasing the speed of charging, then control circuits for adjusting voltage and frequency, and then shielding for reducing the leakage.

Alignment issues

The alignment issues are overcome by using sensors, an online monitoring system and a multiple-coil design guidance system.

We're using online monitoring systems for issues, by the way. The compounds being used are the IR sensor, the LED, and mobile monitoring, and these are implemented in the projects.

Heat generation

The heat generation will be reduced by using the cooling system and temperature sensor.

The temperature sensor is used for sensing the temperature level and cooling system and also used for reduced heat generation and efficient charging speeds. These are all improvements to our projects .

IV. BLOCK DIAGRAM

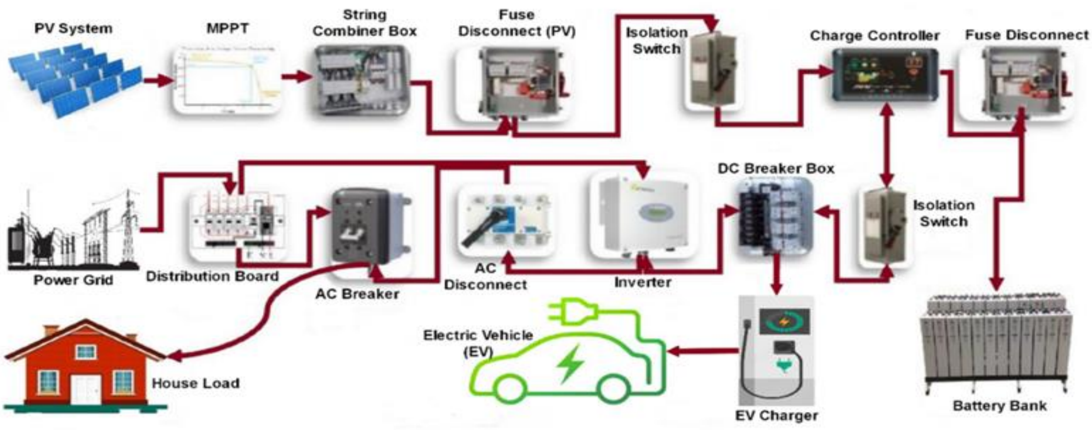

Fig .1: Existing System

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As shown in fig.1 Conductive charging, which transfers power between the charging station and the vehicle battery via physical cables and connectors, is used in the majority of traditional EV charging systems. Despite being popular, this approach has a number of drawbacks:

limitations of the existing system

1) Users find charging to be inconvenient due to bulky connectors and heavy cables, particularly in public charging stations.

2) Using connectors in damp or humid conditions increases the risk of electrical shock.

3) Frequent plugging and unplugging of charging connectors causes mechanical wear and tear.

4) Users must manually connect the charger correctly because there is no automatic alignment detection.

5) Inadequate remote monitoring makes it challenging to monitor energy consumption and charging status in real time.

Due to these restrictions, wireless EV charging systems are being investigated as a more convenient and safe option.

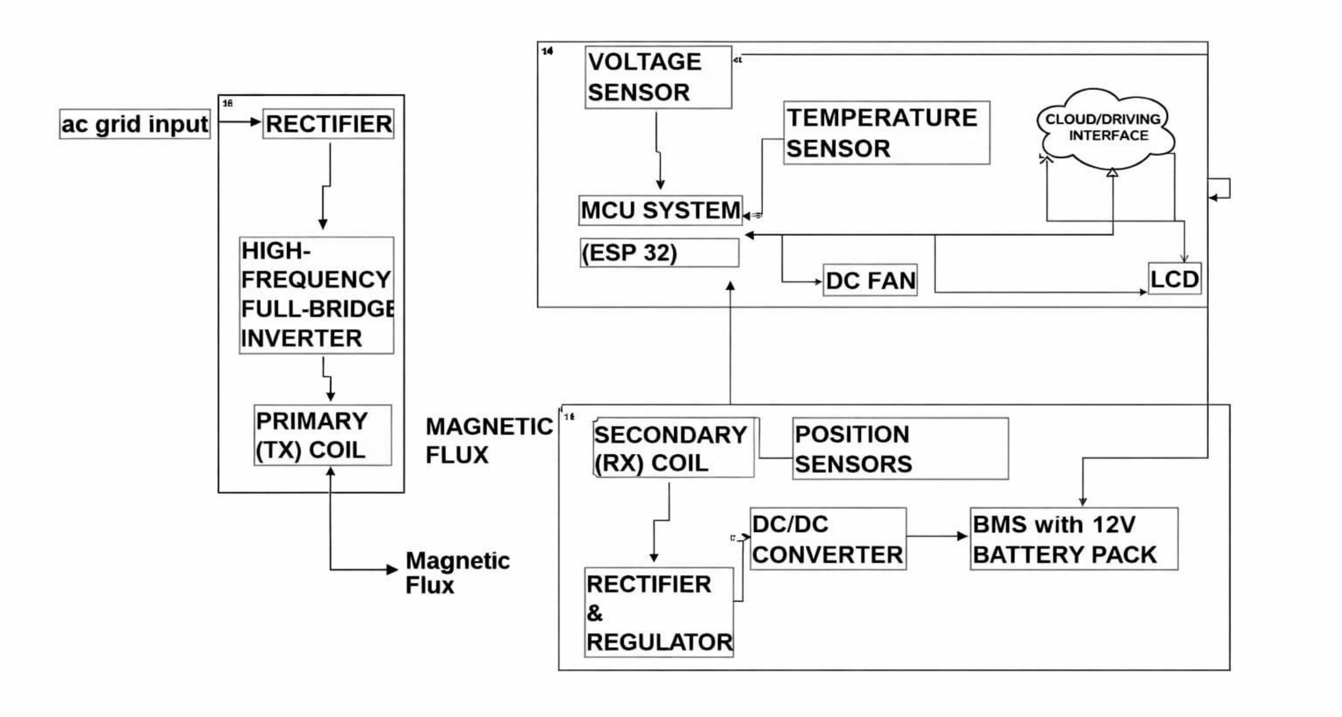

Fig .2: PROPOSED SYSTEM

1) The transmitter and receiver units, as well as an Internet of Things monitoring system, make up the two main components of the suggested system.

2) The transmitter unit consists of an IR sensor module, microcontroller, transmitter coil, inverter circuit, and DC power supply. The transmitter coil receives high-frequency AC power from the inverter, which transforms DC power.

3) A receiver coil, rectifier circuit, voltage regulator, battery charging circuit, and temperature sensor make up the receiver unit. The transmitter coil's magnetic field is captured by the receiver coil, which then transforms it back into electrical energy.

4) The IoT module gathers data in real time, including voltage, current, temperature, and charging status. Wi-Fi is used to transmit this data to the cloud platform so that a computer or mobile device can monitor. it is shown in fig.2.

Transmitter Side:

AC power supply → Rectifier → High-frequency inverter → Transmitter coil

Receiver Side:

Receiver coil → Rectifier → Voltage regulator → EV battery

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Advantages of the Proposed System

1) Convenience of wireless charging: The system makes charging simpler and more user-friendly by doing away with the need for physical cables and connectors.

2) Enhanced safety: There is less chance of electric shock and short circuits because there is no direct electrical contact, especially when it's raining.

3) Automatic vehicle alignment detection: By assisting in determining the proper vehicle position, sensors guarantee effective power transfer between the transmitter and receiver coils.

4) Real-time IoT monitoring: A cloud platform or mobile application can be used to remotely monitor charging parameters like voltage, current, temperature, and charging status.

5) Decreased mechanical wear: Repeated plugging and unplugging causes less damage when there are no physical connectors.

6) Enhanced efficiency and dependability: Energy transfer efficiency and system performance are enhanced by proper coil alignment and monitoring.

V. CIRCUIT DIAGRAM

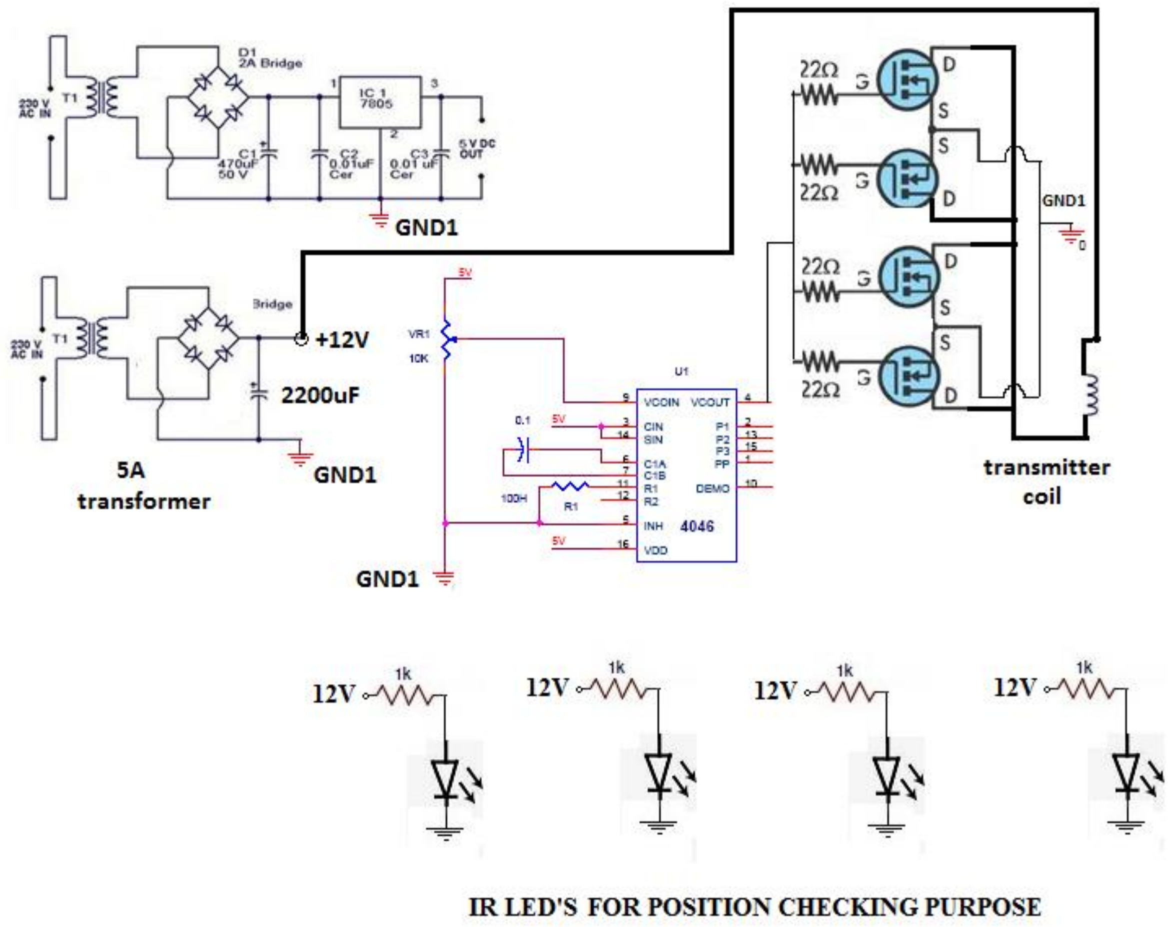

Fig .3: TRANSMISSION SIDE

DESCRIPTION

The fig .3 shown A bridge rectifier and filtering capacitor are used to convert the AC input supply into DC after it has been first stepped down using a transformer. The control circuit receives a steady 5V supply from a voltage regulator (7805).

The CD4046 IC produces a high-frequency signal by operating as a voltage-controlled oscillator. Gate resistors are used to apply the IC's output signal to the MOSFET driver stage. These MOSFETs produce an alternating current in the

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transmitter coil by switching the DC supply at a high frequency.

An alternating magnetic field created by high-frequency current flowing through the coil is used to wirelessly transfer energy to a nearby receiver coil. IR LEDs are included to aid in alignment detection and position verification.

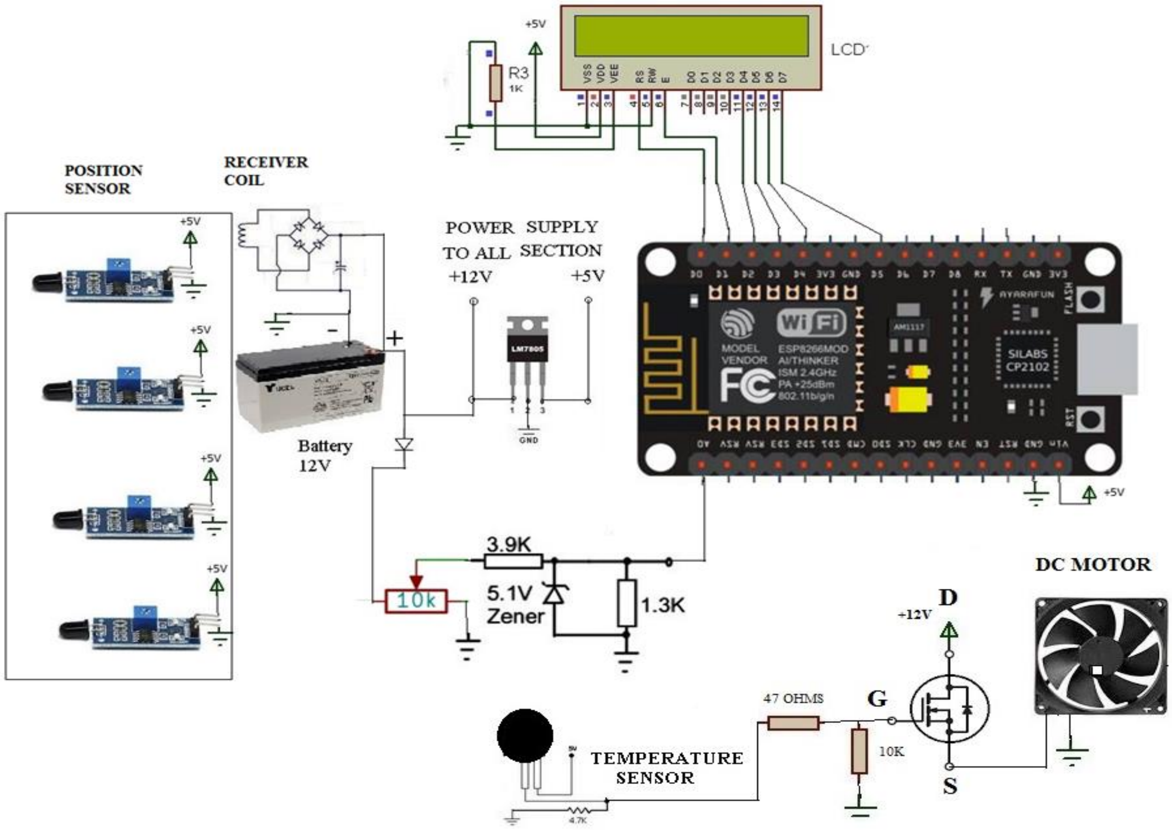

Fig .4 :RECEIVER SIDE

DESCRIPTION

The wireless energy sent from the transmitter coil must be captured by the receiver circuit and transformed into electrical power that can be used. Through electromagnetic induction, the receiver coil positioned close to the transmitter coil absorbs the magnetic energy produced by the alternating magnetic field. A rectifier circuit is then used to transform the induced AC voltage in the receiver coil into DC. The output voltage is stabilised by a voltage regulator following rectification before being supplied to the battery charging circuit. In order to keep an eye on the system temperature during charging and avoid overheating, a temperature sensor is also incorporated. Finally, the EV battery is charged using the regulated DC output, guaranteeing secure

and effective wireless power transfer.

VI. OPERATING MODE

- The diagram consisting of several modes. The several modes are explained below.

Transmitting side

**Mode 1 (input power mode)*

- The mode converter converts the AC supply to DC by using a bridge rectifier. The input is AC 230V 50Hz that is converted into DC, and also using capacitor C1 to filter the ripple and give smooth DC voltage

**Mode 2 (inverter mode)*

-Convert DC to high-frequency AC by using components for conversion, transistors a1 and a2 and an inverter. When the DC voltage mode enters the inverter circuit, A1 and A2 rapidly switch the DC to high-frequency AC.

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- While AC power only produces the EMF that, while converted into DC, to AC next mode is given below

** Mode 3 (high-frequency transformer mode)*

- The mode step up (or) isolate power when the high-frequency AC is applied on. The transformer then transfers into the primary coil side, and the primary coil induces the EMF and electric flux (or) field.

Receiver side

**Mode 4 (position detection mode)*

- This was used to check the alignment for the charging coil by using the components IR TX array and IR RX array.

- When IR TX sends infrared signals and the IR RX receives the signal and detects vehicle position. When the position is correct, the charging speed and efficiency will be maximum.

**Mode 5 (power transfer mode)*

- The power transfer is by using the medium of an air gap, and its components are the primary coil (L1) and secondary coil (L2).

- When AC current through the L1 and the L2 produced the magnetic field, it passed through air and L2 received it by electromagnetic induction

**Mode 6 (rectification mode)*

- The rectification was made using rectifier (BR2) and capacitor C2 for converting AC to DC. When the L2 coil has AC voltage that is passed on (BR2) that converts AC to DC

- The capacitor C2 that filters the DC than through the battery explain next mode

**Mode 7 (battery charging mode)*

- The filtered DC power is passed through the battery, and then the battery stores the energy for EV operation.

**mode 8 (monitoring mode)*

- This mode MCU controller and monitoring, by connecting a voltage sensor, temperature sensor, LCD display and DC fan, are connected in the MCU.

- The voltage and temperature are sensed and sent to the NodeMCU, which displays the data on the LCD, and DC fans turn on when the temperature is high.

VII. SIMULATION

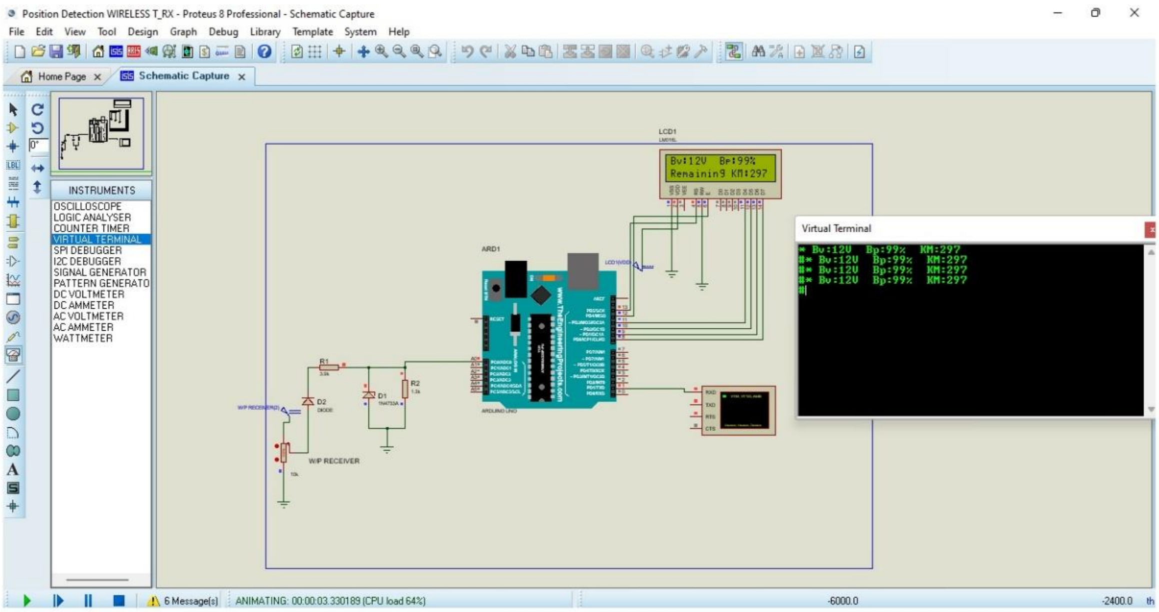

Fig .5 :simulation of circuit

The wireless EV charging project's receiver-side monitoring system is depicted in the simulation. The voltage received from the wireless power receiver circuit in this simulation is processed by an Arduino Uno microcontroller. A protection circuit made up of resistors and a Zener diode connects the receiver output to the Arduino's analogue input pin (A0), limiting voltage and shielding the microcontroller from overvoltage situations.

In order to determine battery voltage (BV), battery percentage (BP), and the estimated remaining distance (KM), the Arduino continuously reads the analogue voltage value and processes it in the program. For real-time tracking, these computed values are shown on a 16x2 LCD module.

In order to view the same data on the computer during simulation, a virtual terminal is also connected via serial

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communication. While the ESP32 with built-in Wi-Fi can be used in the actual hardware implementation to enable IoT-based cloud monitoring of charging parameters, the Arduino Uno is used in the simulation because Proteus fully supports it.

Result

This is prototype model of Arduino Uno-based control unit with integrated inductive power transfer was used to model the suggested wireless charging system. According to the LCD and virtual terminal readings, the simulation output shows a steady voltage between 11.7 – 12 V with a current of 0.8 – 1 A power transfer of roughly9 – 10 W. The system validates the fundamental operation of the wireless charging mechanism by exhibiting steady energy transfer under aligned conditions.

Battery performance:

A typical 11.7 – 12 V, 7 Ah battery is taken into consideration for evaluation based on the obtained output. There is about 30kWh of total energy capacity. The estimated charging time, based on the measured power transfer, is 8-9 hours. This suggests that the system functions in low-power charging conditions, making it appropriate for controlled environments and electric vehicle .

Range estimation

A electric vehicle's estimated driving range is 3–4 km per full charge, assuming an average energy consumption of 20–30Wh/km. This demonstrates that, as opposed to high-power commercial EV implementations, the suggested system is most appropriate for short-distance applications, experimental setups, and low-speed electric mobility solutions.

VIII. MATHEMATICAL CALCULATIONS

1. The Process of Wireless Power Transfer

Electromagnetic induction between the transmitter and receiver coils is the basis for wireless charging.

Equation for Induced Voltage

$V = -N\,(d\Phi / dt)$

Where:

V = Induced voltage in receiver coil

N = Number of turns in the coil

Φ = Magnetic flux

dΦ/dt = Rate of change of magnetic flux

Explanation:

The inverter supplies high-frequency AC current to the transmitter coil. A magnetic field that varies over time is produced by this current. According to Faraday's law of electromagnetic induction, an induced voltage is produced when the receiver coil is positioned inside this magnetic field.

The magnetic flux rises when the coils are correctly aligned, increasing the induced voltage and enhancing charging efficiency.

2. Magnetic Coupling Efficiency

The coupling coefficient between the transmitter and receiver coils determines the effectiveness of wireless power transfer.

Equation for Coupling Coefficient

$k = M / \sqrt{(L1 \times L2)}$

Where:

k = Coupling coefficient

M = Mutual inductance

L1 = Inductance of transmitter coil

L2 = Inductance of receiver coil

Explanation:

The coupling coefficient rises with proper alignment of the transmitter and receiver coils. Stronger magnetic coupling is indicated by a higher value of k, which raises the efficiency of power transfer.

The project's infrared sensor ensures maximum coupling between coils by detecting proper alignment.

3. Voltage Measurement and Conversion

The microcontroller's ADC must be used to measure the voltage generated by the receiver circuit.

Voltage Divider Equation

$Vout = Vin \times (R2 / (R1 + R2))$

Where:

Vout= Output voltage to microcontroller
Vin= Input voltage from battery
R1, R2 = Resistor values in voltage divider

Explanation

Only low voltage levels (0–3.3 V or 0–5 V) can be read by the NodeMCU or Arduino. As a result, before sending the battery voltage to the ADC input, the voltage divider lowers it to a safe level.

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4. Analog-to-Digital Conversion

The analogue voltage is transformed into a digital value by the microcontroller.

ADC Conversion Formula

V = (ADC Value × Vref) / Resolution

Where:

V =Measured voltage
ADCValue =Digital value from ADC
Vref= Reference voltage
Resolution = ADC resolution (1023 for 10-bit ADC)

Explanation

The voltage sensor's analogue signal is read by the controller, which then digitises it. This enables the battery voltage to be processed by the system and sent to them

monitoring platform or shown on the LCD.

5. Estimating the Remaining Distance

The battery percentage is used to estimate the vehicle's travel distance.

Equation

Distance=Bp × Dp

where

Bp is the battery percentage

Dp is the distance per 1% battery

Distance is the remaining distance (km).

If a 1% battery can travel three kilometres:

Bp × 3 is the distance.

6. Total Time Spent Charging

Battery capacity and charging current determine how long a charge takes.

Equation

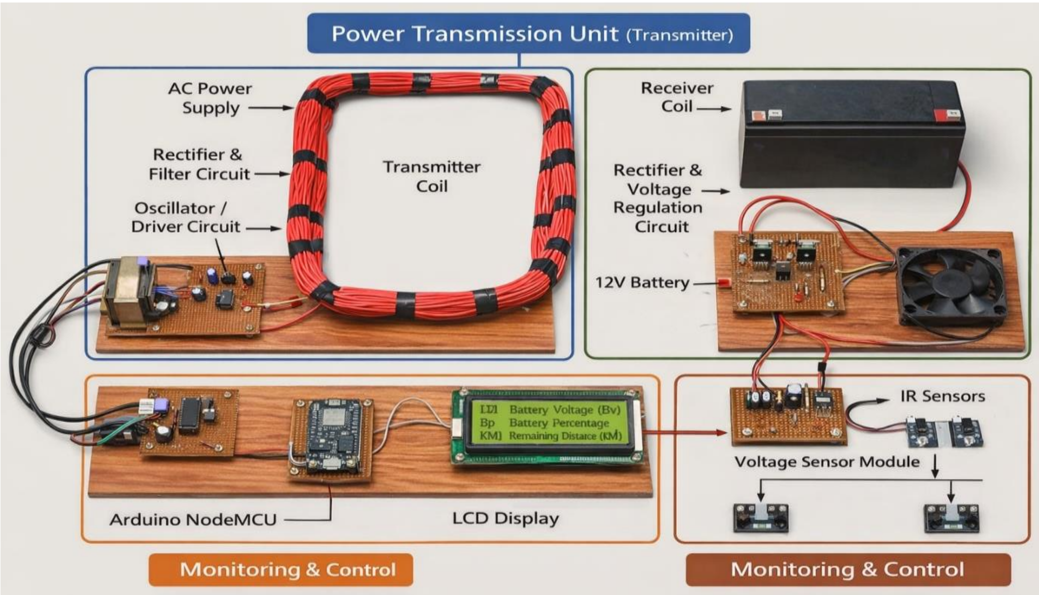
T = C / I

Where

I is the charging current (A)

T is the charging time (hours)

C is the battery capacity (Ah).



I. HARDWARE REQUIREMENTS

Fig. 6: hardware components

NodeMCU Controller (ESP8266)

The primary microcontroller that governs the system is NodeMCU. It handles communication between various components and processes the sensor data. Additionally, it offers Wi-Fi connectivity so that monitoring data can be sent to an online platform.

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LCD Display

Important system information is shown on the LCD display. In real time, it can show the user values like voltage level, charging status, or system messages.

Power Supply Unit

The electrical power needed to run the system's components is supplied by the power supply unit. It transforms the input power into a steady voltage that the controller and sensors can use.

Voltage Sensor

The battery or charging circuit's voltage level is measured by the voltage sensor. The controller receives the measured value for analysis and monitoring.

IR Sensor

Position detection is accomplished by the IR (infrared) sensor. It detects whether an object is present or aligned, and when it finds the right position, it signals the controller.

Battery

The battery provides power to the system or device by storing electrical energy. It is powered by the wireless charging system in this project.

Wireless Charging System

Without making physical contact, the wireless charging system transfers electrical power from the transmitter coil to the receiver coil. It charges the battery conveniently and safely using electromagnetic induction. every part of system shown fig.6

II. SOFTWARE

EMBEDDED C

- #include <LiquidCrystal.h>
- const int rs = 13, en = 12, d4 = 11, d5 = 10, d6 = 9, d7 = 8;
- LiquidCrystal lcd(rs, en, d4, d5, d6, d7);
- int sensorValue11=0, sensorValue12=0, sensorValue11=0,sensorValue12=0,sensorValue13 =0;
- int count=0;
- int km=0;
- void setup()
- {
- lcd.begin(16, 2);
- Serial.begin(9600);
- }
- void loop()
- {
- loop: lcd.display();
-
- sensorValue11 = analogRead(A0);
- sensorValue11= sensorValue11 * (20 / 1023.0);
- lcd.setCursor(0, 0);
- lcd.print("Bv:");lcd.print(sensorValue11);lcd.print("V ");
- count=sensorValue11*8.33;
- lcd.setCursor(8, 0);
- lcd.print("Bp:");lcd.print(count);lcd.print("% ");
- km=count*3;
- lcd.setCursor(0, 1);
- lcd.print("Remaining KM:");lcd.print(km);lcd.print(" ");
- Serial.print("*");
- Serial.print(" Bv:"); Serial.print(sensorValue11);Serial.print("V ");
- Serial.print(" Bp:"); Serial.print(count);Serial.print("% ");
- Serial.print(" KM:"); Serial.print(km);Serial.print(" ");
- Serial.println(" ");
- Serial.print("#");
- delay(1000);
- goto loop;
- }

III. BLYNK MOBILE APPLICATION

Install the necessary software tools first. Set up the Arduino IDE on your PC. Next, launch the Arduino IDE and use the library manager to install the Blynk library and the ESP8266 board package.

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After that, launch the Blynk app on your phone and start a new project. Select the NodeMCU device and Wi-Fi connection type. Blynk will email you an Auth Token once the project has been created. This token needs to be copied into the program.

Connect the hardware now. Attach GND to GND, VCC to 3.3V, and the voltage sensor output pin to NodeMCU's A0. Verify that the NodeMCU input is safe within the sensor voltage range.

Once the hardware is prepared, use the Arduino IDE to upload the following program to the NodeMCU.

programme

```
#define BLYNK_PRINT Serial

#include <ESP8266WiFi.h>

#include <BlynkSimpleEsp8266.h>

char auth[] = "YourAuthToken"; // From Blynk email

char ssid[] = "YourWiFiName"; // Your WiFi name

char pass[] = "YourWiFiPassword"; // Your WiFi password

BlynkTimer timer;

void sendVoltage()

{

int sensorValue = analogRead(A0); // Read voltage sensor

float voltage = sensorValue * (3.3 / 1023.0);

Blynk.virtualWrite(V0, voltage); // Send to Blynk

}

void setup()

{

Serial.begin(9600);

Blynk.begin(auth, ssid, pass);

timer.setInterval(1000L, sendVoltage); // Send every 1 second

}

void loop()

{

Blynk.run();

timer.run();

}
```

Open the Blynk app and add a Gauge widget once the code has been uploaded. Put V0 on the input pin. Press the Play button to begin the project. Your phone will display the voltage value in real time.

If your project has wireless charging status and infrared sensors, you can also send those values to other virtual pins, such as V1 or V2, and use Blynk's text widgets or LEDs to display them.

The NodeMCU will transmit sensor data to the Blynk server, and the mobile app will show the monitoring values in real time once everything is properly connected and Wi-Fi is turned on.

Table.1: (comparison of existing and proposed system)

No	***Comparison Aspect***	***Existing System***	***Proposed System***
1	Charging Technique	This system use wired conductive charging	This system use wireless inductive power transfer
2	Energy Transmission Principle	electrical conduction	Electromagnetic induction
3	Data Tracking	No real-time monitoring	Real-time monitoring using ESP8266
4	System Awareness	manual operation done by human	Smart control done by microcontroller

No	*Comparison Aspect*	*Existing System*	*Proposed System*
5	Battery Condition Indicator	Battery level not show accurately	LCD shows voltage and battery percentage perfectly
6	Vehicle Identification	none	IR sensor detects vehicle position when parking
7	User Engagement	user feedback	Visual feedback
8	System Automation	Manual plug-in charging done by human	Semi-automatic charging detection and monitoring comments by human
9	Mathematical Energy Relationship	simple power transfer	Voltage calculation and efficiency calculation needed to estimate charging process
10	Efficiency Regulation During charging	No efficiency monitoring	Real-time efficiency monitoring
11	Voltage Assessment	External tools needed	No tools are needed
12	Information Analysis	No analysis are taken	ESP3266 processes sensor data and analysis data
13	Safety Degree	Cable may damage dependant on uses	Reduce cable dependant and improve safety
14	System Flexibility	Difficult to add any monitoring system	ESP3266 allows IoT and real-time monitoring
15	Range of Applications	Only used station	Can be used in any smart EV infrastructure
16	Potential for Future Expansion	Less improvement are possible	Can integrate IoT, many other system can be added

IV. ANALYSIS

Analysis of Current Trend Position detection and online monitoring systems are widely used in modern automation and smart systems. Industries now require systems that can detect the position of objects and monitor them in real time. With the development of sensors, microcontrollers, and wireless communication, it has become easier to build accurate and low-cost monitoring systems. Many industries use these systems for machine monitoring, vehicle tracking, industrial automation, and security systems. Real-time monitoring helps operators quickly detect faults or abnormal movement. Data can also be accessed remotely through computers or mobile devices. Today, most monitoring systems are connected to IoT platforms, allowing data to be stored and analysed online. This improves system efficiency and reduces manual inspection.

V. CONCLUSION

A useful method for locating objects and keeping an eye on them from a distance is the position detection with online monitoring system. The system lessens human labour while increasing accuracy.

The system can transmit position data to an online monitoring platform through the use of sensors and communication modules. This enables users to monitor system status in real time and act fast in the event of an issue.

All things considered, the system is dependable, affordable, and appropriate for a wide range of industrial and monitoring applications.

VI. FUTURE SCOPE

IoT cloud platforms can be added to the system in the future to enhance data storage and remote monitoring. Predicting

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system errors can be aided by integration with AI or data analysis tools.

Accuracy and monitoring range can also be improved by more sophisticated sensors and communication technologies.

The system can be used in asset tracking, smart city systems, transportation monitoring, and smart factories.

VII. REFERENCES

[1] A. Ahmad, M. S. Alam, and R. Chabaan, "A complete overview of wireless charging methods for electric vehicles," *IEEE Transactions on Transportation Electrification*, 2018.

[2] S. Habib, M. Kamran, and U. Rashid, "A comprehensive study of implemented international standards, technical challenges, impacts and prospects for electric vehicles," *Renewable and Sustainable Energy Reviews*, 2018.

[3] A. Ramezani and M. Narimani, "Optimized wireless chargers for electric vehicles with low sensitivity to misalignment," *IEEE Transactions on Power Electronics*, 2020.

[4] C. Shuwei, L. Chenglin, and W. Lifang, "Research on positioning technique for wireless power transfer systems in electric vehicles," *IEEE Conference Proceedings*, 2014.

[5] A. Triviño, J. González, and J. Aguado, "Wireless power transfer technologies applied to electric vehicles: A review," *Renewable and Sustainable Energy Reviews*, 2021.

[6] E. Aydin, M. K. Kazimierczuk, and S. Choi, "Inductive power transfer for electric vehicle charging applications: A comprehensive review," *IEEE Access*, 2022.

[7] M. Zhang et al., "Advances in EV wireless charging technology: A systematic review and future trends," *Energy Reports*, 2024.

[8] W. Xue, "Overview of wireless charging technology for electric vehicles," *Journal of Electrical Engineering*, 2023.

[9] J. Chevinly et al., "Gallium nitride-based high-power multilevel H-bridge inverter for wireless electric vehicle charging," *IEEE Transactions on Power Electronics*.

[10] S. Li and C. C. Mi, "Wireless power transfer for electric vehicle applications," *IEEE Journal of Emerging and Selected Topics in Power Electronics*, 2015.

[11] Z. Bi et al., "Review of compensation topologies for wireless power transfer systems in electric vehicle charging," *IEEE Transactions on Power Electronics*.

[12] J. Miller et al., "Magnetic resonant coupling for electric vehicle charging," *IEEE Transactions on Industrial Electronics*.

[13] R. Agnihotri and A. Chaurasia, "Electric road systems for smart cities: A dynamic wireless charging approach," *Sustainable Cities and Society*.

[14] C. Panchal et al., "Dynamic wireless power transfer for electric vehicles," *IEEE PELS Workshop on Emerging Technologies*, 2018.

[15] L. C. Das et al., "LSTM-based adaptive control of vehicle position for dynamic wireless charging," *IEEE Access*.

[16] T. Bianchi et al., "Secure and efficient wireless charging for electric vehicles using dynamic power transfer," *IEEE Transactions on Smart Grid*.

[17] H. He, R. Xiong, and J. Fan, "Battery management systems for electric vehicles: A review," *Renewable and Sustainable Energy Reviews*, 2012.

[18] X. Hu, S. Li, and H. Peng, "A comparative study of equivalent circuit models for lithium-ion batteries," *Journal of Power Sources*, 2012.

[19] K. Park et al., "IoT-based battery monitoring system for electric vehicles," *IEEE Internet of Things Journal*.

[20] M. Al-Fuqaha et al., "Internet of Things: A survey on enabling technologies and applications," *IEEE Communications Surveys & Tutorials*, 2015.

[21] R. Kumar et al., "IoT-based smart electric vehicle charging monitoring system," *International Journal of Engineering Research & Technology*, 2021.

[22] J. Zhang et al., "Wireless sensor networks for EV battery monitoring," *IEEE Sensors Journal*.

[23] A. Patel et al., "Smart charging station for electric vehicles using microcontroller," *International Journal of Electrical Engineering Research*.

[24] Y. Chen et al., "Design of contactless electric vehicle charging system with embedded monitoring," *IEEE Transactions on Industrial Electronics*.

[25] S. Li et al., "Wireless power transfer for electric vehicle battery charging systems," *IEEE Transactions on Power Electronics*.