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Automatic Wireless Power Hub For Electric Vehicles(EVs)

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ABSTRACT: The growing popularity of electric vehicles (EVs) calls for the creation of effective and user-friendly infrastructure for charging them. The automatic wireless power hub for EVs that is suggested in this study provides a simple and convenient charging experience. By using wireless power transfer (WPT) technology, the hub makes charging easier by doing away with the need for physical cable connections. This work proposes the design of an intelligent process-based system to generate and manage electric vehicle (EV) charging processes. Because of the limitations in electrical power distribution, charging electric vehicles needs to be done efficiently. This proposed smart electric vehicle charging station has several advanced features, such as the ability to instantly start charging a vehicle as soon as it pulls up to the spot and to automatically open and close the gate. As soon as vehicles will come on charging place, the gate will automatically close and charging will start. The charging amount will get calculate based on charging amount and user will able to see in LCD display. After charging once user will exit from charging station, user have to pay amount using smart phone. After successfully payment, the gate will automatically open and user can exit from charging station.

Keywords: Automatic wireless power transfer (AWPT), Electric vehicle (EV) charging, Wireless EV charging, Inductive charging.

I. INTRODUCTION

The transportation landscape is rapidly evolving, and electric vehicles (EVs) are at the forefront of this transformation. While EVs offer significant environmental benefits, range anxiety and charging times remain key concerns for many potential buyers. Enter the Automated Wireless Power Hub, a revolutionary technology poised to revolutionize the way we charge EVs.

No fumbling with cables or searching for charging stations. The power transfer happens automatically and seamlessly, just like charging your smart phone. EV charges efficiently while you're parked, running errands, or even at work. The Automated Wireless Power Hub makes this vision a reality. It utilizes cutting-edge wireless power transfer (WPT) technology to eliminate the need for physical connections.

Here are some of its key advantages:

Unmatched Convenience: Effortless charging experience, eliminating the need to manually plug in.

Enhanced Safety: No risk of electrical shocks associated with traditional wired charging.

Faster Charging Potential: WPT technology has the potential to significantly reduce charging times compared to traditional methods.

Space Optimization: No bulky charging stations cluttering parking spaces, allowing for more efficient land use.

Improved Weather Resistance: Eliminates exposed charging ports, potentially reducing weather-related damage and malfunctions.

The Automated Wireless Power Hub represents a significant leap forward in the future of EV adoption. It promises to alleviate user concerns about charging, ultimately paving the way for a more sustainable and convenient transportation ecosystem.sustainable powers sources emerge with develop innovation furthermore, focused on cost.

II. PROPOSED SYSTEM ARCHITECTURE

The gearbox and receiver components make up the system. The following parts are used in our project: filter, high frequency section, rectifier bridge, step-down transformer, transmitting coil, and transmitting unit.

In the transmitter section, the coil creates a magnetic field surrounding the transistor while the transistor generates high-frequency AC current across it. The coil's two sides begin to charge up as it is centre tapped. The resistor is linked to one side of the coil, and the NPN transistor's collector terminal is attached to the other. The base resiator conductsduring the charging condition, turning on the transistor in the process. After the emitter is connected to the base of the transistor, the inductor is discharge.

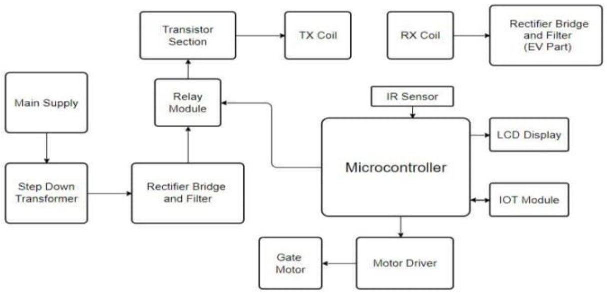

Fig 1: Block Diagram of proposed system

According to Faraday's law of induction, the magnetic field on the receiving end is transferred to the other coil, causing the receiver coil to generate an electromagnetic field (EMF) voltage that is then utilised for battery charging. The receiving coil, rectifier bridge, filter, and battery are located on the receiver unit.

The rectifier bridge and filter are used at the receiver section side to convert the power received into pure form of electricity. Putting this into a battery comes next. In order to start and stop the charging slot, we are attaching an IR sensor to a microcontroller. When the car is in front of an infrared sensor, the charging is initiated via a relay switch; when it is not, the charging is disconnected. Thus, the producing power via solar panels.

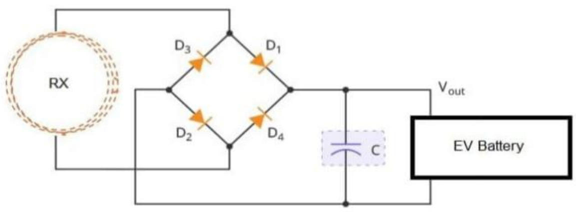

Fig 2: Bridge Rectifier

III. METHODOLOGY

1) Micro controller is main control system.
2) Once vehicle will come on charging place, the gate will automatically close and charging will start.
3) The charging amount will get calculate based on charging amount and user will able to see in LCD display.
4) After charging once user will exit from charging station, user have to pay amount using smart phone.
5) After successfully payment, the gate will automatically open and user can exit from charging station.

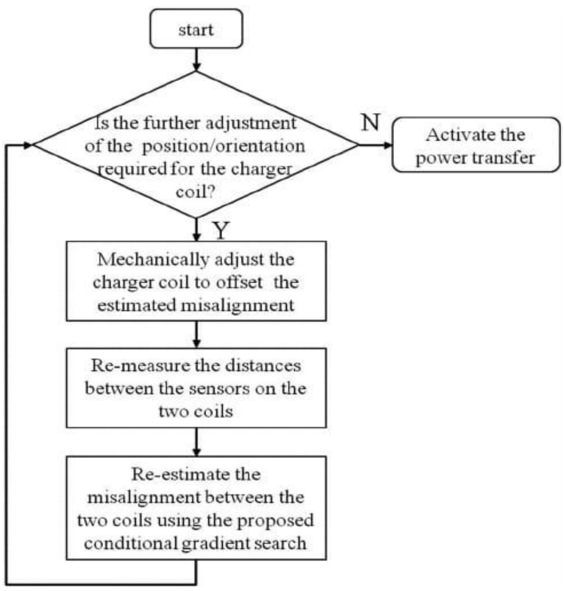

Fig 3: Flowchart of Proposed system

IV. LITERATURE SURVEY

1) Dr. K. Shivarama Krishna, Creative Research Thoughts International Journal (IJCRT). ELECTRICAL VEHICLE WIRELESS POWER TRANSMISSION. It has been built with features that integrate all of the hardware components that are used. Each module's presence has been thoughtfully considered and arranged to enhance the unit's overall performance. Second, the project has been executed successfully employing extremely sophisticated integrated circuits (ICs) made possible by developing technology. Consequently, the project's design and testing were successful. The suggested method used low values for the de link and filter capacitance, respectively, and reduced input/output voltage and current ripple.
2) International Journal of Creative Research Thoughts (IJCRT), Mohammed Aleem. Wireless Power Transmission Coupled For Electric Cars. An electric vehicle (EV) can be wirelessly charged with the help of this research.
3) International Journal of Creative Research Thoughts (IJCRT) article by Dr. V. Raveendra Reddy. Sophisticated AUTOMOBILAR CHARGING SYSTEM. One of the most practical methods for charging electric cars is wireless charging infrastructure. Researchers are drawn to it despite its high cost. Electric cars are effectively autonomous since they can travel for extended periods of time without needing to stop and recharge. The possibility of substantially smaller batteries for electric cars with wireless charging technology on the fly is perhaps the most interesting feature. Because of this, introducing electric vehicles has a smaller financial and environmental impact thanks to technology.
4) "STATIC WIRELESS CHARGING STATION FOR ELECTRIC VEHICLES," by Akash Kharpude, International Journal of Creative Research Thoughts (IJCRT). To overcome the drawbacks of conventional charging methods, this study suggests a wireless charging system for electric cars (EVs).

V. OPERATIONS

BJT Operation Modes.

- Cutoff

The BJT is electrically off in this mode, Furthermore, there isn't current flow between the collector and emitter. This state is utilized as the OFF condition for a switch application.

- Saturation

The saturation mode is effectively the opposite of cutoff. Here, maximum current flows, and the transistor appears as a short circuit.

- Active

To be utilized as an amplifier, the BJT must be in the active region between cutoff and saturation. In this mode, an IV characteristic is established by the collector current and voltage from collector to emitter, amplification can occur in addition to the characteristics between the extremes of cutoff and saturation.

BJTs, such as Toshiba's TTC5200, are appropriate for high power application and/or signal transfer and fast switching.

As stipulated in the TTC5200 is an NPN triple diffused BJT transistor. The component is recommended for audio applications, especially 100W output stages. Additionally, as a very high collector voltage rating of 230V along with other attractive specifications.

Motor Driver:

Only autonomous robotics uses motor driver integrated circuits (ICs). Moreover, the majority of microprocessors run at low voltages and with little current.

Conversely, the motors need comparatively larger voltages and currents. Therefore, the CPU is unable to provide current to the motors. The motor driver IC's is main requirement.

After receiving signals from the microprocessor, the L293D IC sends the appropriate signal to the motors. It contains two voltage pins, one for drawing current to power the L293D and the other for applying voltage to the motors.

The input that the microprocessor sends to the L293D determines how to switch its output signal.

Working Of a H-bridge:

H-bridge is given this name because it can be modelled as four switches on the corners of 'H'. The basic diagram of H-bridge is given below:

In the given diagram, the arrow on the left points to the higher potential side of the input voltage of the circuit. Now if the switches S1 & S4 are kept in a closed position while the switches S2 & S3 are kept in an open position meaning that the circuit gets shorted across the switches S1 & S4. This generates a path for the current to flow, starting from the V input to. switch S1 to the motor, then to switch S4 and then the exiting from the circuit. This flow of the current would make the motor turn in one direction.

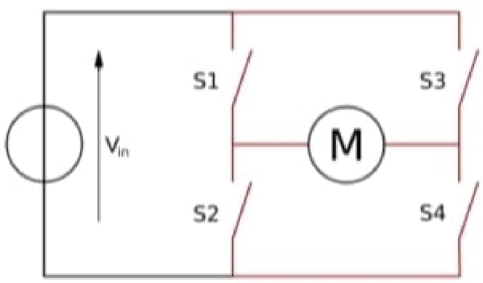

Fig 4: H-Bridge

When S1 and S3 are closed and S2 and S4 are open then the 'STALL' condition will occur (The motor will break). Stall Condition:

The motor shaft comes to a stop when the motor receives positive voltage delivered from both sides.

VI. APPLICATIONS

Public charging infrastructure:

Parking lots and garages: Wireless hubs could be installed in parking spaces at shopping malls, airports, workplaces, and other public areas, offering convenient charging options for an extensive array of EVs.

Fleet electrification: Public transportation agencies and private fleets could utilize wireless charging to efficiently manage and maintain their electric vehicles, eliminating downtime for manual charging.

Urban environments:

On-street charging: Wireless charging pads embedded in designated parking spots along streets could provide convenient charging options for residents without access to private garages.

Taxi ranks and designated pick-up/drop-off zones: Integrating wireless charging into these areas could ensure continuous operation and shorter wait times for electric taxis and ride-sharing vehicles.

Specialized applications:

Autonomous vehicles: Wireless charging could be crucial for enabling autonomous vehicles to operate continuously without human intervention for charging.

Industrial and commercial settings: Warehouses, factories, and other industrial environments could utilize wireless charging for electric forklifts, robots, and other automated vehicles, improving efficiency and productivity.

Integrated with renewable energy sources: This could create a sustainable charging ecosystem, reducing reliance on the traditional power grid.

Combined with smart charging technology: This could optimize charging based on factors like electricity demand and vehicle usage patterns, further improving efficiency and cost-effectiveness.

VII. ADVANTAGES

Convenience:

Effortless charging: Drivers simply park their EV over the charging pad, eliminating the need to fumble with cords and connectors.

Reduced wear and tear: No more plugging and unplugging, which can wear down the charging port regarding the vehicle over time.

Universal compatibility: A single charging pad possibly able to collaborate with any EV model equipped with a compatible receiver coil, eliminating the necessity of different plug types.

Safety:

Elimination of tripping hazards: No exposed power cables reduces the possible danger of tripping and electrical accidents.

Weatherproof operation: Wireless charging functions regardless of weather conditions, unlike plug-in charging it may be affected by rain, snow, or ice.

Efficiency:

Potential for higher efficiency: An apparatus for plug less charging can theoretically achieve higher efficiency compared in order to connect the plug-in systems due to reduced energy loss through connectors.

Automated charging: The apparatus is capable of automatically initiate and stop charging, preventing overcharging and potential battery damage.

Improved aesthetics: Eliminating charging stations with cables could improve the visual appeal of parking spaces and urban environments.

Potential for dynamic charging: Plug less charging could be integrated into roads, allowing for continuous charging while driving, though this electronic device is still under development.

VIII. EXPECTED OUTCOMES

Electric vehicles (EVs) can be wirelessly charged at up to 20 kW of electricity, or Level 2 charging speed. The charging speed of a 7.2 kW plug-in charger and a 7.2 kW plug-less charger is the same. This indicates that, depending on the EV, an additional 20–25 miles of range are added every hour of charging time.

While 11 to 22 kW is the typical output for private EV charging stations, 1.7 kW and 3.7 kW chargers are also frequently found. McKinsey predicts that by 2024 or 2025, a large number of OEMs will have implemented wireless charging technologies.

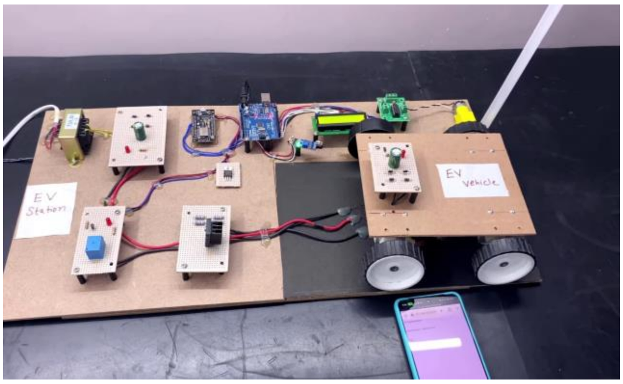

Fig 5: Result

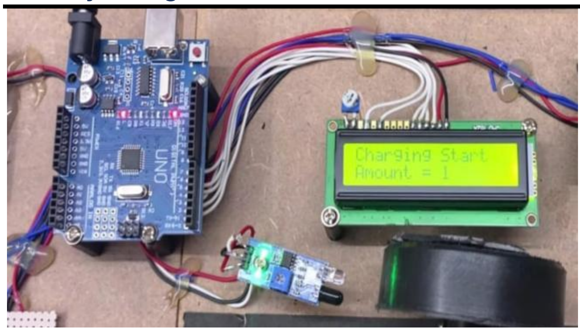

Fig 6 : Display of result in LED

IX. CONCLUSION

With substantial advantages over conventional plug-in charging techniques, automatic wireless power hubs for electric cars (EVs) present an enticing future transportation vision. Wireless charging has the ability to completely change the EV charging experience, offering increased convenience, safety, and aesthetic appeal in addition to possible efficiency advantages. But it's important to recognise that this technology is still in its infancy. Before there can be a general acceptance, issues including cost, efficiency, and standardisation must be resolved.

Research and development efforts continue to show significant promise despite these obstacles. With the advancement of technology, autonomous wireless power hubs could:

Simplify and streamline EV charging: Making the process effortless and seamless for users. Enhance the overall appeal of EVs: Contributing to wider adoption and a cleaner, more sustainable transportation future.

Unlock new applications: Enabling innovative uses of EVs in various sectors, from public transportation to autonomous vehicles.

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