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DESIGN OF WIRELESS POWER TRANSMITTING EV CHARGING ROAD

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Abstract*— Road transportation is the majorly used transportation in the entire world. Usage of the car has drastically increased and the need for petrol and diesel has increased. So recently, Electric vehicles (EVs) are becoming popular, as they decrease reliance on fossil fuels and reduce greenhouse emissions. The problem of the Electric Vehicle is nothing else but the electricity storage technology, which is the major drawback today due to its unsatisfactory energy density, limited lifetime, and high cost. So our project proposes a novel idea to charge the Electric vehicle wirelessly through the inductive power transfer principle using the transmitting and receiving coil while simultaneously decreasing the battery size and improving the convenience and without the requirement of the cable. The electric vehicle can be charged both by the static wireless power transmission (SWPT) and dynamic wireless power transmission (DWPT) method.

Keywords*—Electric Vehicle(EV), Inductive power transfer, transmitting coil, Receiving coil, Wireless power transmission (WPT).*

1. INTRODUCTION

With the development of human society, the problem of global warming caused by greenhouse gas emissions and the emission from fossil fuels has intensified accordingly, and the importance of energy conservation and emission reduction becomes more significant. As most of the industries releasing greenhouse gas emissions, the transportation industry has attracted the attention of countries all over the world. As a well-known clean energy source, electrical energy can be converted to renewable energy sources. Compared to the traditional vehicles powered by fossil fuels, Electric Vehicles, which are driven by electric energy, have a unique zero-emission advantage. That is why EVs are undoubtedly the best choice for the transportation industry to promote energy structure optimization. However, the high cost, limited capacity, and the cruising range of electric vehicle battery packs limit the further promotion of EVs. Compared to the traditional plug-in-charging method, there is no physical connection between the source and the load during the wireless power transmission (WPT) charging process, therefore the charging process is flexible and safer, which makes WPT a significant method. The Wireless power transfer technology is divided into static wireless power transmission(SWPT) and dynamic wireless power transmission (DWPT). DWPT charging is developed based on SWPT charging, which can effectively reduce the volume of the vehicle's battery pack, increases the cruising range, and further and improves the convenience of charging. The main objective of the project work area, the installation of the wireless charging path (WCP) in the Electric Vehicle Service Road (EVSR) since service roads will be easy for charging the electric vehicles wirelessly while traveling. To provide the non-cable system. To reduce the complexity of the charging process of electric vehicles. The power required to charge an electric vehicle is generated from the solar panel.

2. EXISTING SYSTEM

In the existing system, a charging module is installed under slots of parking roads in public places. The drawback of this system is that an EV can only be charged when it is parked at a dedicated location that is installed with a charging point. This creates many serious problems. First, an EV must leave the dedicated parking space immediately after being charged, so that the charging point can be used to serve another EV. This may not happen all the time. Second, with increasing EV penetration, all parking spaces may require the installation of a charging point. This will increase the cost of providing charging infrastructure which may not be utilized 100% of the time.

3. SIMULATION MODEL

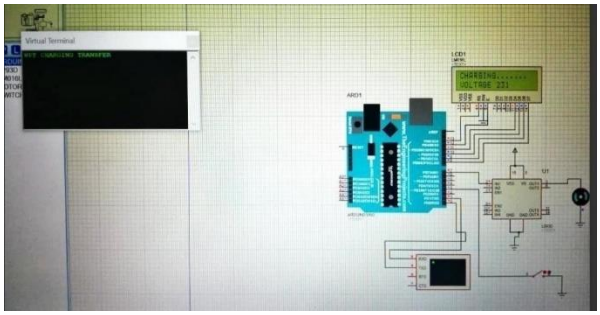
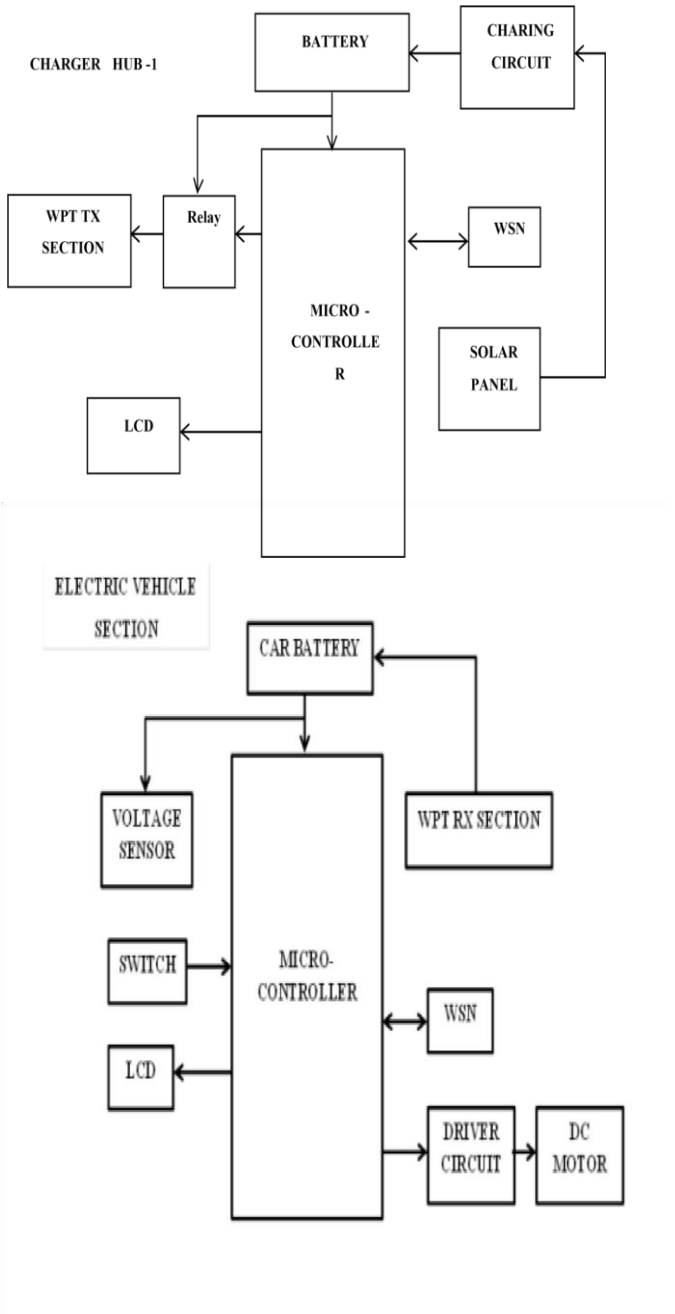


FIGURE 1: SIMULATION MODEL

4. BLOCK DIAGRAM

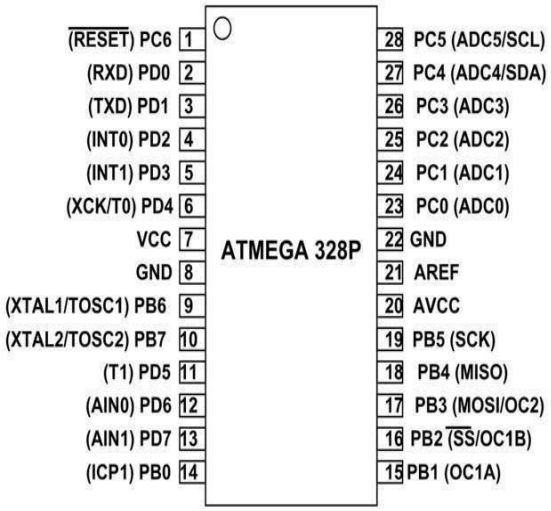


5. METHODOLOGY

A. Microcontroller:

The Arduino Uno board is used in our project to dump the codings necessary to carry out functions in the project for example to control the relay pin, to display the output in the LCD, etc. The boards are equipped with sets of analog and digital input/output (I/O) pins that may be interfaced to various expansion boards (shields) or Breadboards (other circuits on them). Arduino Uno is a microcontroller board based on ATmega328P. It has a power jack, 14 digital input/ output pins (of which 6 can be used as PWM outputs), 6 analog inputs, an ICSP header, a 16 MHz quartz crystal, a reset button, and a USB pin connection. It contains everything needed to support the microcontroller, The input voltage (7–12V) to the Arduino board when it‘s using an external power source (as opposed to 5 v from the USB connection).

The (digital I/O) on the Arduino board is used to connect the Arduino sensors, actuators, and other IC. The Arduino is used to do useful things, such as reading switch inputs, light indicators, and control the output of the relay.



B . WIRELESS SENSOR NETWORK(WSN)

Wireless Sensor Network (WSN) is used to transmit the signal wirelessly from the Electric vehicle section to the charging hub section. When the driver of an electric vehicle requests for charging the signal is sent wirelessly through the wireless sensor network(WSN) to the charging hub and the relay is closed and the power is transmitted wirelessly to the electric vehicle battery and the DC motor starts to rotate. When the driver of an electric vehicle requests for charging the signal is sent wirelessly through the wireless sensor network(WSN) to the charging hub and the relay is closed and the power is transmitted wirelessly to the electric vehicle battery and the DC motor starts to rotate Supply voltage 5V DC, Detection range (10-30m) frequency2.4 GHz

FIGURE 4: WIRELESS SENSOR NETWORK(WSN)

C.VOLTAGE SENSOR

The voltage sensor is used to sense the voltage present in the battery of the Electric vehicle. The signal is sent to the charging hub to halt the charging when the voltage sensor senses that the voltage of the battery exceeds the 100% rated capacity of the battery. Under-voltage, over-voltage, or voltage band models Powered from sensing input lines or from separate AC supply Available with time delays on pull-in and/or drop-out or with customized voltage-time trip curves The Voltage Sensors are equipped with a microcontroller that improves the sensor accuracy, precision, and consistency of the readings. They are supplied calibrated and the stored calibration (in Volts) is automatically loaded when the voltage source is connected.

FIG 5 VOLTAGE SENSOR

D. RELAY

A relay is an electromagnetic switch is operated by a small current t controlled by the Arduino Uno board by dumping the necessary Coding for the function of the relay. when the signal is sent from the Electric vehicle section to the charging hub section through the Wireless sensor network(WSN) the Pulling relay pin goes high and closes the relay and the power is transmitted to the transmitting coil. The features of the single - Channel Relay module is good in safety. In a power system, the lower current can control the higher one. The single-channel high voltage system output, meeting the needs of single-channel control Wide range of controllable voltage.

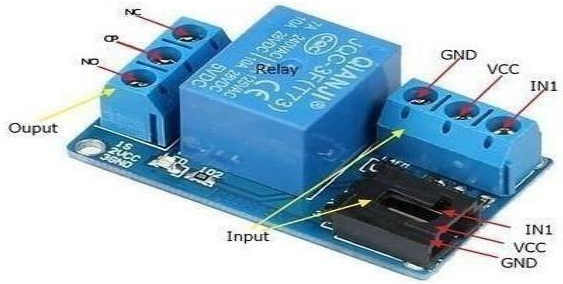


FIGURE 6: RELAY

E. 16*2 LCD

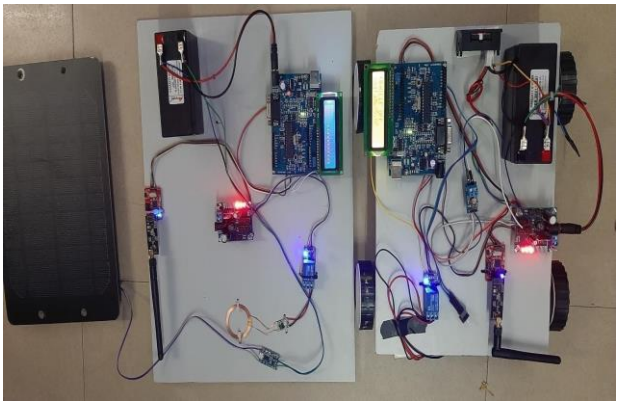
The LCD is used in our project to display the vehicle information, to display whether the vehicle is ON/OFF, the display voltage at which the Electric vehicle is charging, to display the charging status in the charging hub section. Display requires data in a serial format, which is detailed in the user guide below. The LCD requires a 5v power supply. The supply voltage should not exceed 5V, as this will cause damage to the device. The voltage of 5V is best generated from the E- blocks Multi programmer or a 5V fixed regulated power supply. The16 x 2 intelligent alphanumeric dot matrix displays are capable of displaying 224 different characters and symbols

FIGURE 7: LCD

6. WORKING

There are two sections in the block diagram of our project namely the Transmitting block and the Receiving block. The Transmitting block is the Electric vehicle charging hub and the Receiving block is the Electric vehicle section. The Electric vehicle charging hub consists of a polycrystalline solar panel for the generation of the electric power required to charge the electric vehicle. From the solar panel, the power is stored in the battery since solar energy is the renewable form of energy and the energy is not available throughout the day so it is necessary to store the power in the battery via a charging circuit. In the microcontroller, the programming is dumped necessary to carry out the functions required for our project. A Wireless Sensor Network (WSN) is used to transmit the signal wirelessly from the Electric vehicle section to the charging hub section. The LCD is used to view the vehicle information and the status of charging of the electric vehicle from the transmitting section the power is transmitted wirelessly to the receiving section by the inductive power transfer. And the power is stored in the electric vehicle section battery. The voltage sensor is used to sense the voltage in the Electric Vehicle battery. When the driver of electric vehicle requests for charging the signal is sent wirelessly through the Wireless Sensor Network (WSN) to the charging hub and the relay is closed and the power is transmitted wirelessly to the electric vehicle battery and the DC motor starts to rotate. The signal is sent to the charging hub to halt the charging when the voltage sensor senses that the voltage of the battery exceeds the 100% rated capacity of the battery. The wireless power transmission (WPT) can be both static wireless power transmission (SWPT) and dynamic wireless power transmission (DWPT). In the static wireless power transmission (SWPT) the electric vehicle is parked at the dedicated parking place for charging in this single transmission and a single receiving coil is used for charging. In the Dynamic wireless power transmission (DWPT) the charging is done when the vehicle is in motion in the multiple transmitting coils and the single receiving coil is used for charging.

7. RESULTS



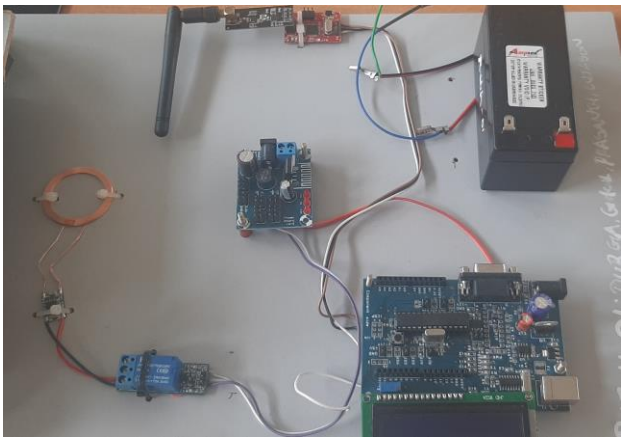


FIGURE 8: CHARGING HUB SECTION

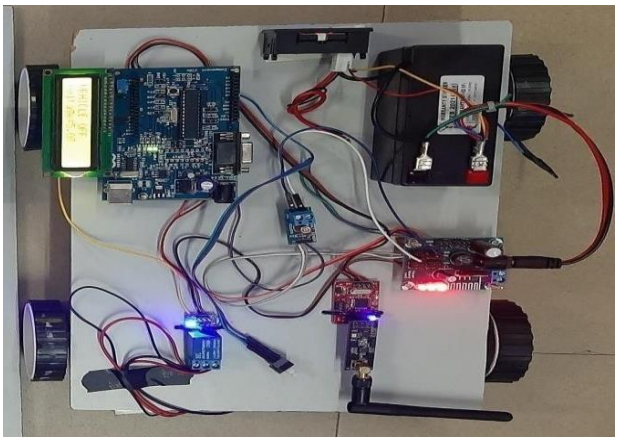


FIGURE 9: ELECTRIC VEHICLE SECTION

FIGURE 10: EV CHARGING IS PLAYED

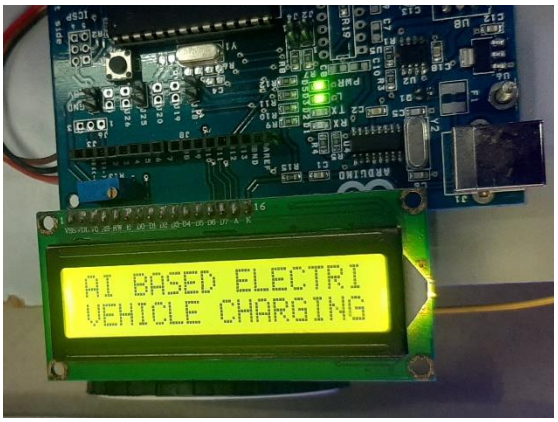


FIGURE 11: AI-BASED EV CHARGING DISPLAYED ON LCD

FIGURE 12: EV ON AND CHARGING AT 5V

8. CONCLUSION

This project presented a novel wireless charging system that comprises a wireless charging system and a wireless communication system. The wireless communication system enables the system to function as the ZigBee and provide communication without human intervention. wireless charging provides the charging of the Electric Vehicle Battery wirelessly with the help of the transmitting coil and receiving coil in the static wireless power transmission (SWPT) the electric vehicle is parked at the dedicated parking place for charging in this single transmission and single receiving coil is used for power transmission. In the Dynamic wireless power transmission DWPT) the charging is done when the vehicle is in motion in the multiple transmitting coils and the single receiving coil is used for power transmission the transmitting coil is placed beneath the road. This project **"DESIGN OF WIRELESS POWER TRANSMITTING EV CHARGING ROAD" was** designed with the hope that it is very convenient and helpful to charge the electric vehicle wirelessly without any physical connection.

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