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Electric Vehicle Wireless Charging using Home as a Charging Station

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Abstract **–** *Electric vehicles are becoming increasingly popular due to their Eco – friendly and energy efficient nature. A new approach to EV charging is the wireless charging system, which eliminates need for the cables and plugs. The system allows Electric vehicle owners to transform their home into energy station. The system utilizes wireless power transfer technology to enable efficient charging of Electric vehicles without irritating wires. It also includes a bidirectional power flow feature that allows the EV battery to discharge excess energy back to the home, creating a efficient energy ecosystem. The beneficiary part includes increased convenience, reduced reliance on traditional power grids. The system integrates renewable energy sources such as solar panel or wind turbines, with wireless charging technology for electric vehicle. This technology is now being adapted for home use, allowing household to become their own energy station. Main concern with EVs is charging. The concept of WPT allows the vehicle to be charged portably, creating a clean and more sustainable future for all.*

Key Words: Electric Vehicle [EV], Wireless Power Transfer [WPT], Renewable Sources, Wireless Charging System [WCS], Charging Station, Solar Panel.

INTRODUCTION

The world is increasingly getting smarter and looking for secure, intelligent and smart solutions for resource optimization to improve quality of life. India is becoming urbanized, with sustainable economic growth and faster development. Electricity consumption in Indian household has increased at a tripled rate since 2000. The concept of electric vehicle wireless charging has been in development from ages. humans have been using vehicles for transportation. Internal combustion (IC) engines are used to drive it. As the vehicle population is increased there is a vast increase in the environmental pollution rate. In future days, the concept of pollution free transportation will be of focus. Due to increasing greenhouse gas radiation, and scarcity of petroleum products for upcoming year's efficient use of electric vehicles and recharging them portably becomes important. Electric vehicle does not need petroleum products as fuel and the level of pollution caused is negligible when compared to regular vehicle. Hence, electric vehicles and efficient recharging process becomes the major concern. The major principle behind electric vehicle wireless charging is Electromagnetic Induction, where an alternating current (AC) is passed through a coil, creating a magnetic field that induces a current in the receiving coil of vehicle, which then charges the battery.

AIM AND OBJECTIVES

The Aim is to Design a cordless charging system for electrically powered vehicle with home as energy station. The goal is to put in place a system for EV wireless charging. i.e., to transport power across a certain space via an electromagnetic field. Electric Vehicles are a superior solution for reducing current pollution. To achieve improved reliability, the battery charging procedure must be modified. Wireless power transfer is a technique used and is capable of charging an Electric Vehicle battery.

PROBLEM DEFINITION

One important goal is the transportation sector consumes around 33% of all primary energy, reducing primary energy demand and increasing the use of renewable sources are two key objectives of the climate pledge. The government is being exhausted just as the world's resources. In order to cut carbon emissions and combat climate change, agencies and NGOs promote a greener option through the use of solar and wind energy sources for transportation and electric power generation.

SIGNIFICANCE OF THE STUDY

India emits 1087kg of carbon dioxide per kWh of electricity generation and yet electricity shortage is a major issue in

many rural areas and experience 10-15hrs of the blackout. Although the power sector is growing 7% every year this problem persists. So, our work emphasizes usage of renewable sources like solar energy and wind source in order to reduce global warming and meet the electricity demands of our country. In this work, we are designing a working prototype of an intelligent power module where the appliances switch to different modes (power, eco, hybrid, and emergency) based on the electricity consumption, notifies the user about the real-time electricity consumption and generates an E-bill.

LITERATURE SURVEY

1. **Manoj D. Patil is an assistant professor in the Ashtadistrict of Maharashtra.**

It accommodates more than one device and use solar energy to charge the battery. As a result, it gains more advantages.Utilizing cables for power transmission results in a 25–30% power loss and numerous accidents. WPT, however, is perfectly safe for people. As a result, it has become safer than traditional cars for the environment and the climate. The methods used now for wireless power transfer are more dependable and effective.

2. **IEEE Applied Power Electronics Conference and Exposition (APEC), twenty-seventh annual, Fangcheng Liu, 10.1109/APEC.2012.6166113.**

An environmentally friendly attributes has increasingly focused on electrical cars. The battery technology, which serves as the foundation for electrical vehicles, has an impact on how they are developed. The hybrid energy storage system may minimize the power consumption, improve intensity, durability is high, increased use of resources to reduce size and reduce complexity, and extends the batteryservice life.

3. **Luis M. Fernández-Ramrez, Francisco Llorens, and Carlos A. Garca-Vázquez**

A 7.3-kilometer stretch of the A-381 Highway in Cádiz, Spain, has a single lane with a dynamic wireless power transfer system for charging electric vehicles. Here, a typical EV light car (Nissan Leaf) and an average workday are used to determine the power and energy requirements. The DWPT system's primary premise is that it can supply the motors, charge the battery, and increase vehicle autonomy in addition to acting as a battery charger.

4. **H.C. Lin Journal: 2016 IEEE International Symposium on Computer, Consumer, and Control**

A battery charging system for lead-acid batteries that acts like a load battery, utilizing an ideal multi-state strategy to drive a consistent current and voltage. This innovative charger is designed to provide a predefined constant current for both charging and holding currents, while also featuring a battery equalization circuit to ensure all batteries in the system are brought to the same voltage and current level prior to charging.

METHODOLOGY

The nation's rapid economic upsurge and energy consumption escalation will be leading for endless quest for energy in the country. The purpose of this project is to use maximum power generated from the solar and thereby reducing the usage of electricity from the grid. The cost of energy is hiking day by day because most of the energy supply is from fossil fuels which are depleting, thus there is an increase in the cost. Rapid economic growth and rising energy demand will fuel the nation's never-ending search for energy. However, this problem arises when we consume more, leading to wastage, and also due to the busy and hectic life schedule, people tend to leave several appliances unattended.

Objective 1:

To survey on existing technologies and to find the best one of it.

Method for objective 1:

- Literature survey on existing methodologies on energy management system has to be done.
- Review of various techniques and components used, its advantages and drawbacks have to be performed.

Objective 2:

To recognize a specific sensor, processor and controller for the required application.

Method for objective 2:

- Depending on the application and the cost, a specific current sensor is to be selected for measurement of current.
- Specific microcontrollers like Arduino are to be selected for processing data.

Objective 3:

To manage and control electricity consumption.

Method for objective 3:

- To manage electricity consumption and to provide it to electric vehicles by utilizing the maximum energy generated from solar.
- The current sensor values are to be collected and processed later in the controller.

- Arduino should be programmed intelligently such that it calculates power consumption and switches automatically to different modes.

Objective 4:

To test and demonstrate the responses of the built system against the existing system.

Method for objective 4:

- The performance of the proposed system will be compared with current systems and conclusions will bedrawn based on results.

ARCHITECTURE FLOW

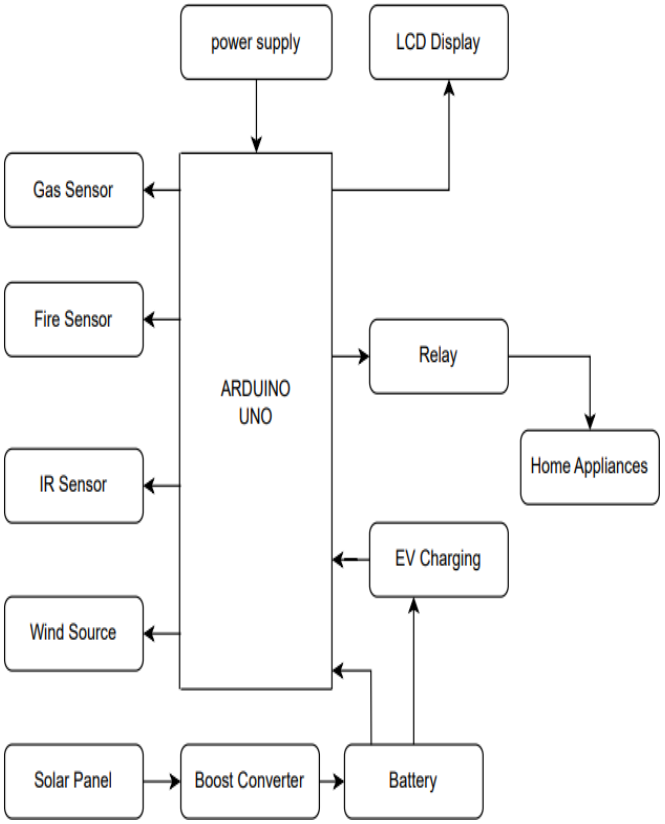


Fig 1: System Architecture

The system architecture for the Electric vehicle wireless charging system using home as a energy station typically involves several components such as Arduino Uno, battery, sensors, LCD display, relay, boost converter, solar panel, wind source, power supply, transmitter and receiver coil, and home appliances working together to enable convenient and efficient charging of an EV at home.

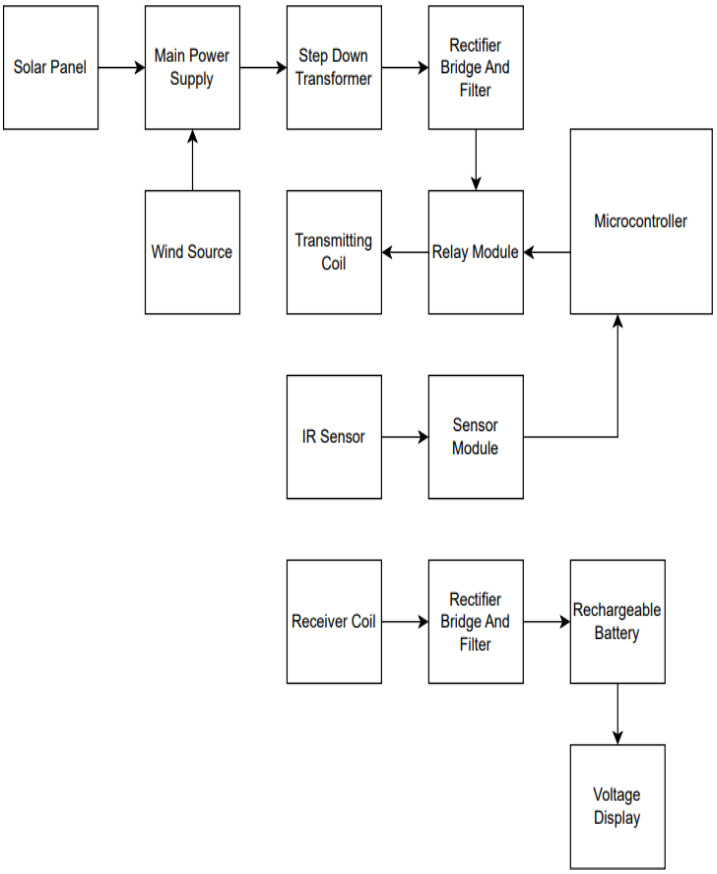


Fig 2: Hardware Architecture

The structure has appeared in the above Fig. The essential principle of the system is the deduction of client charging beginning time and charger unplugging time of the vehicle will be thought of and if any bewilder, by then the notice is sent to the concerned power and the association office, just as the client and there the subtleties of the installment, can be checked through perception.

The input of the vehicle charger may contain an energy from the power source or from the solar power plant itself that will be based on the availability of source will get automatically switch.

The charging docking cable contains relay based magnetic sensing circuit which will automatically detects the charging plugged in or plugged out and once if the user connects the charging cable in then the framework will come out of sleep mode and starts charging timer by getting user credential's. The Solar energy stored to the battery the battery voltage can be reading continuously if any extra power present in the battery after vehicle charging the same power can be used for home appliances.

Sensor monitoring continuously fire and Gas Sensor in case of fire or gas system will Turnoff automatically. The transmitter and receiver coil are responsible for charging of vehicle through Electromagnetic Induction by Air.

The circuit utilizes a step-down transformer to reduce the input voltage from 230 volts to 12 volts, followed by a bridge rectifier consisting of 4 diodes to convert the AC input to pulsating DC. Despite the input DC voltage ranging from 7Vto 15V, the filtered DC output is unregulated, leading to theutilization of the LM7805 IC to maintain a constant 5V DC output at pin number 3. Variations in the input AC voltage from 160V to 270V result in fluctuations in the V2 secondary voltage, which is directly proportional to VI as long as the N1/N2 turns ratio remains constant. For instance, if the transformer produces 8.72V at 160V input, it will similarlyproduce 14.72V at 270V input.

Despite the AC voltage ranging from 160V to 270V, the output of the regulator remains stable at 5V, ensuring consistent performance even with input voltage fluctuations from around 8V to 15V. A 10F 20 tiny electrolytic capacitor is utilized for additional noise filtering of the regulated 5V DC output. To indicate the presence of a 5V power source, an LED is connected in series with a 330-ohm current-limiting resistor from the 5V point to ground. The unregulated 12V point is available for other potential uses as required. The system of hardware works in the above flow of system. The operation of system follows the steps above using all the mentioned components and voltages.

WORKING OF HARDWARERELAY

Relays are electrical switches that are operated by an electromagnetic coil. When a current flows through the coil, it generates a magnetic field that pulls a lever and changes the position of the switch contacts. Most relays have two switch positions and double-throw(changeover) contacts, as the coil current can be either on or off. This allows a single circuit to control another circuit that may be completely independent. For example, a relay can be used to switch a 230V AC mains circuit using a low voltage battery circuit. Inside the relay, the two circuits are connected mechanically and magnetically, but there is no direct electrical connection between them."

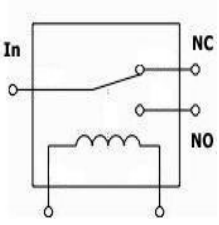


Fig 3: Relay Block

The temperature sensor which shows the present room temperature. and IR sensor will sense the object or humans in home if it sense then only the bulb will ON or else OFF. The Fire sensor will sense the any sparks in the home if it sense the power will be cut OFF.

We are sending extra power to KEB or government to solve the power problem in society also this project we are done to solve the power problem in India.

ARDUINO

It is a low-cost, simple-to-use technology is made available to engineers, artists, designers, and anybody else who tinkers with technology via Arduino interface boards, allowing them to make practical projects, innovative interactive items, and more. Now, a completely new class of projects that can be managed by a computer can be constructed. A microcontroller board, flexible, user-friendly software, and a development environment for creating software for the board make up the open-source electronics prototyping platform known as Arduino.

Fig 4: Arduino Microcontroller

Arduino is a compact microcontroller board equipped with a USB plug for computer connectivity and multiple connection sockets for interfacing with external electronics, such as motors, relays, sensors, diodes, speakers, and microphones. It can be powered via the USB connection or a 9V battery, and controlled or programmed from a computer before being disconnected and operated independently.

The Arduino software is user-friendly and freely available for Windows, Mac, and LINUX computers without any cost. The Arduino Uno we have received is a microcontroller board that utilizes the Atmega328 chip at its core. Arduino stands out from other microcontroller boards due to its reliable circuit hardware and user-friendly programming interface, making it easy to use and program.

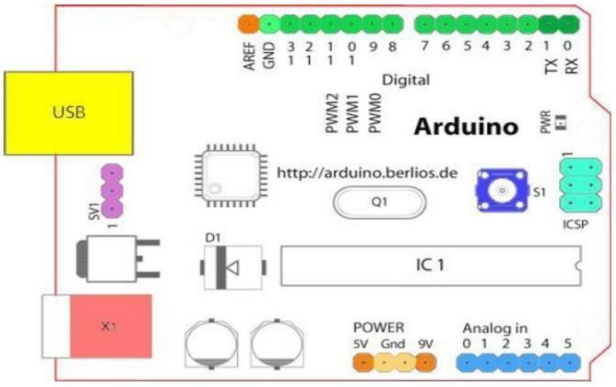


Fig 5: Arduino Layout

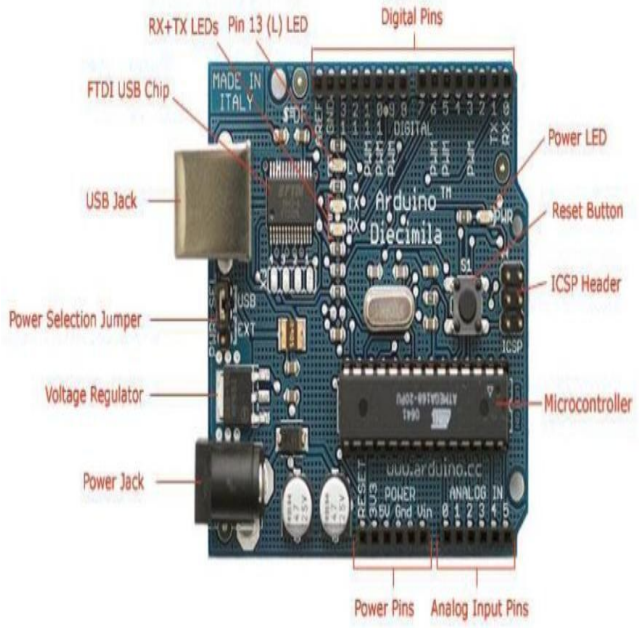


Fig 6: Pin Diagram

ATmega8(MICROCONTROLLER)

- 16MHz
- 8 Kbyte Flash RAM (the boot loader consumes 1 K)
- 1 KB RAM (for auto/local variables and the stack)
- 14 ports for digital input and output

Fig 7: ATmega8

LIQUID CRYSTAL DISPLAY(LCD)

The character-based LCD module that uses the Hitachi HD44780 controller chip is the subject of this. These modules are far from being "phased out," but they are not quite as advanced as the most recent full-size, full-color, backlit models found in laptop computers today. Where the display needs are relatively straightforward, character-based LCDs are still widely utilized in commercial and industrial equipment. There are still many different shapes and sizes possible, even when restricted to character-based modules. Standard character lengths for lines are 8, 16, 2, 024, 32, and 40 in variations of one, two, and four lines.

In recent years, LCDs have replaced LEDs in many applications. The following factors account for this

LCD prices are coming down.

being able to display figures, characters, and others..

The only characters and numbers that LEDs can display are numbers.

By adding a refreshing controller to the LCD, the CPU is freed from having to perform LCD refreshes. Contrarily, for the LCD to continue showing the data, the CPU must refresh it.

Fig 8: LCD Display

The basic LCD format typically has a 16-pin interface, and the pinouts are generally standardized across different manufacturers. Here is a brief description of the pinouts of a basic 16x2 LCD format:

Vss: Ground pin for the LCD display.

Vcc: Power supply pin for the LCD display.

Vee: LCD contrast control pin. The voltage level on this pin determines the contrast of the display.

RW (Read/Write): This pin selects between read mode (1) and write mode (0) for the LCD controller.

RS (Register Select): This pin selects between instruction mode (0) and data mode (1) for the LCD controller.

E (Enable): This pin enables the LCD controller to read data from the data pins.

7-14. D0-D7: These are the pins for data transmission to the LCD controller.

A (Anode): Backlight positive pin.

K (cathode): Backlight negative pin.

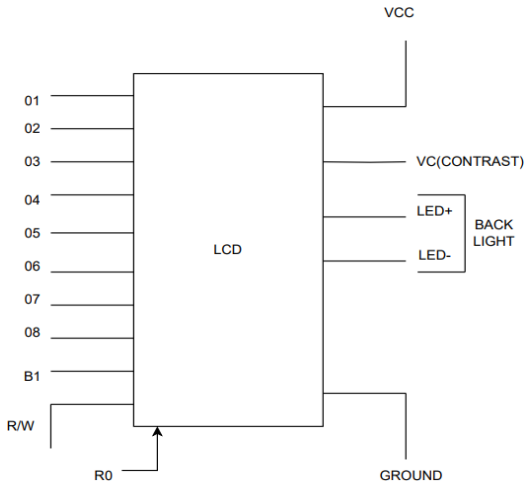


Fig 9: Pin Details on an LCD Module

The LCD controller uses the RS and RW pins to select between instruction and data, respectively. When the LCD controller is in instruction mode, it interprets the information on the data pins as a command to carry out, such as clearing the display or moving the pointer. When in data mode, the LCD screen displays the data that is present on the data pins. The LCD controller's ability to read data from the data pins is enabled via the E pin. When the E pin is high, the controller reads the data on the data pins and executes the command or displays the data, depending on the RS and RW pins. The Vss, Vcc, and Vee pins are used to provide power and ground to the LCD display. The Vee pin controls the contrast of the display, and adjusting the voltage on this pin can improve the legibility of the displayed text. Finally, the A and K pins are used to provide power to the backlight of the LCD display. By connecting these pins to a voltage source, the backlight can be turned on or off, providing additional visibility in low-light environments. the pinouts of the basic LCD format are designed to provide a flexible and easy-to-use interface for displaying information on an LCD screen. By controlling the data and signals sent to the LCD display using these pins, electronic devices can display useful information and provide visual feedback to the user.

PIN	NAME	FUNCTION
1	Vss	Gnd
2	Vdd	→ve Supply
3	Vee	Contrast
4	RS	Register Select
5	R/W	Read/Write
6	E	Enable
7	D0	Data bit0
8	D1	Data bit1
9	D2	Data bit2
10	D3	Data bit3
11	D4	Data bit4
12	D5	Data bit5
13	D6	Data bit6
14	D7	Data bit7

Fig 10: Pin out functions for all LCD types

LCD PIN DESCRIPTION

PIN	SYMBOL	I/O	DESCRIPTION
1	Vss	-	Ground
2	Vcc	-	+5V Power Supply
3	Vee	-	Power Supply to Contrast
4	RS	I	RS = 0 to Select Command Register
5	R/W	I	RS = 1 to Select Data Register
6	EN	I/O	Enable
7 to 14	D0 to D8	I/O	8 Bit Data Bus

Fig 11: LCD Pin Description

LCD COMMAND CODES

CODE(HEX)	COMMAND to LCD INSTRUCTION REGSTER
1	Clear Display Screen
2	Return Home
4	Decrement Cursor (Shift Cursor to Left)
6	Increment Cursor (Shift Cursor to Right)
80	Front Cursor to the Beginning of First Line
C0	Force Cursor to the Beginning of Second Line
38	2 Lines and 5*7 Matrix

Fig 12: LCD Command Code

FLOW CHART FOR LCD

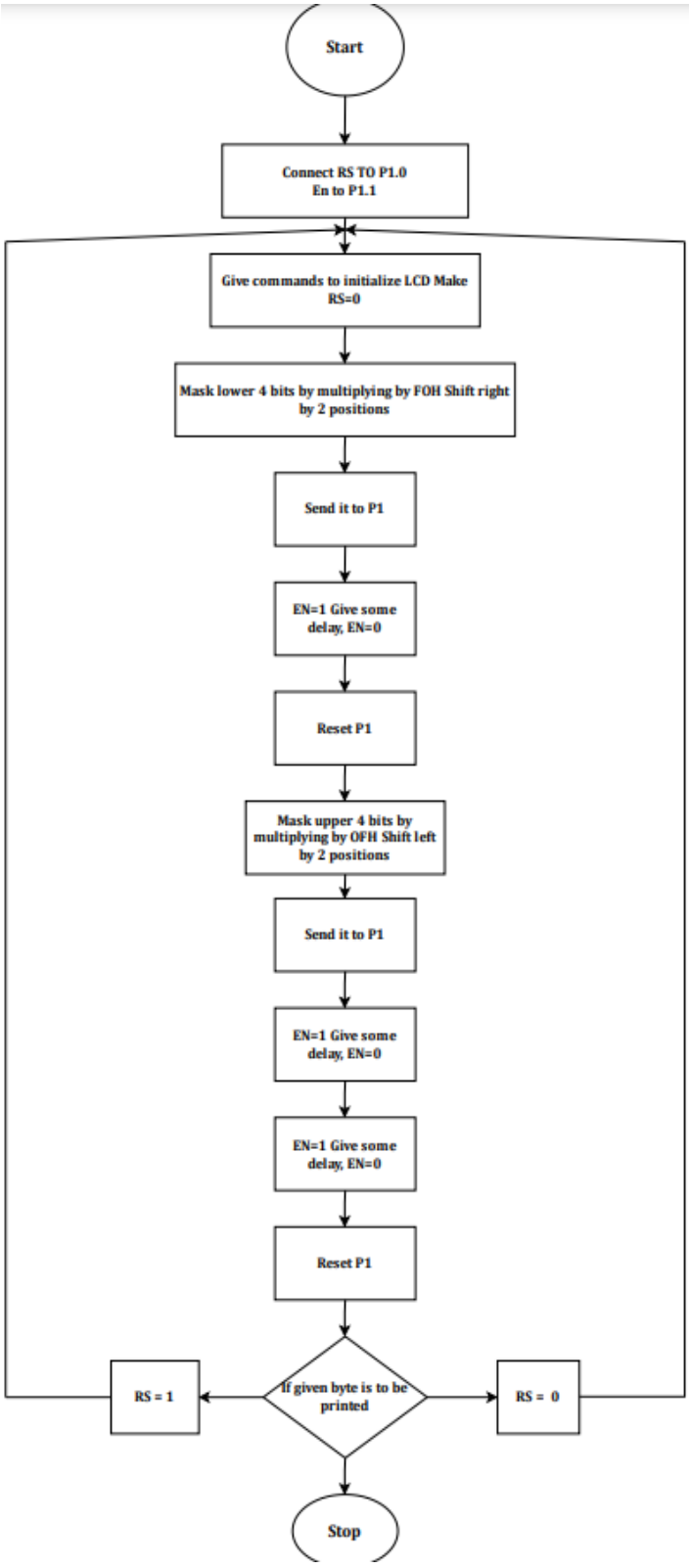


Fig 13: Flow Diagram of LCD Display

POWER SUPPLY UNIT

An electrical device or circuit known as a power supply is used to transform an input voltage from a power source into a steady output voltage that may be utilised to power various electronic devices or circuits. A transformer,rectifier, and voltage regulator are a few of the parts that make up a standard power supply.

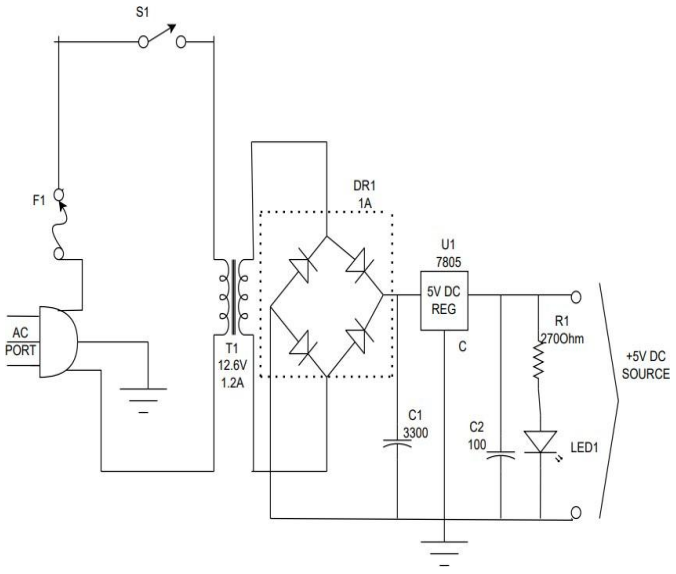


Fig 14: Typical Power Supply

TRANSFORMER

An element that is used to step-up or step-down the input voltage to a desired level is a transformer. It consists of a shared magnetic core and two wire coils, known as the primary and secondary windings. When an AC voltage is applied to the primary winding, it generates a magnetic field in the core. This magnetic field then induces a voltage in the secondary winding. By adjusting the number of turns in the primary and secondary windings, the transformer can either step up or step down the input voltage.

RECTIFIER

The rectifier is responsible for converting the output from the transformer, which is in AC form, into pulsating DC. In this project, a bridge rectifier is used due to its advantages such as excellent stability and full-wave rectification, as compared to half-wave or full-wave rectifiers.

VOLTAGE REGULATOR

Voltage regulators can provide a stable and constant output voltage, which is crucial for the safe and efficient charging of EVs. Fluctuations or spikes in voltage from the home's power grid can potentially damage the wireless charging system or the EV's battery. A voltage regulator can regulate and

stabilize the voltage to provide a consistent and safe charging experience. A voltage regulator can also protect against overvoltage or undervoltage conditions, which can occur in the home's power grid due to various factors such as power surges, grid fluctuations, or load changes. Overvoltage or undervoltage can potentially damage the wireless charging system or the EV's battery. A voltage regulator can monitor the incoming voltage and regulate it to ensure it stays within the safe operating range. Wireless charging systems for EVs can be designed to support grid connection, which allows them to not only charge the EV but also to feed excess energy back into the home's power grid. A voltage regulator can help facilitate this bidirectional power flow, regulating the voltage to ensure compatibility with the home's power grid and enabling efficient grid connection. We use an LM7805 voltage regulator IC to provide a 5 volt power supply.

ELECTRICAL CHARACTERISTICS OF LM7805

Parameter	Symbol	Conditions		MC7805/LM7805 Min.	Typ.	Max.	Unit
Output Voltage	V_O	T_J =+25 °C		4.8	5.0	5.2	V
		5.0mA ≤ I_O ≤ 1.0A, P_O ≤ 15W V_I = 7V to 20V		4.75	5.0	5.25	
Line Regulation (Note1)	Regline	T_J=+25 °C	V_O = 7V to 25V	-	4.0	100	mV
			V_I = 8V to 12V	-	1.6	50	
Load Regulation (Note1)	Regload	T_J=+25 °C	I_O = 5.0mA to1.5A	-	9	100	mV
			I_O =250mA to 750mA	-	4	50	
Quiescent Current	I_Q	T_J =+25 °C		-	5.0	8.0	mA
Quiescent Current Change	ΔI_Q	I_O = 5mA to 1.0A		-	0.03	0.5	mA
		V_I= 7V to 25V		-	0.3	1.3	
Output Voltage Drift	$\Delta V_O/\Delta T$	I_O= 5mA		-	-0.8	-	mV/ °C
Output Noise Voltage	V_N	f = 10Hz to 100KHz, T_A=+25 °C		-	42	-	µV/Vo
Ripple Rejection	RR	f = 120Hz V_O = 8V to 18V		62	73	-	dB
Dropout Voltage	V_{Drop}	I_O = 1A, T_J =+25 °C		-	2	-	V
Output Resistance	rO	f = 1KHz		-	15	-	mΩ
Short Circuit Current	I_{SC}	V_I = 35V, T_A =+25 °C		-	230	-	mA
Peak Current	I_{PK}	T_J =+25 °C		-	2.2	-	A

Fig 15: Electrical characteristics of LM7805

SENSORS

LIGHT DEPENDENT RESISTOR

It a type of semiconductor device that exhibits a change in resistance based on the intensity of light falling on it. While LDRs are commonly used in applications such as light sensing and control. Wireless charging systems for EVs typically use a combination of coils, resonant circuits, and power electronics to transfer energy wirelessly from a charging station to the vehicle's onboard charger, which then charges the EV's battery. The primary coil, located in the charging station, is connected to an AC power source, while the secondary coil, located in the EV, is connected to the onboard charger. When the charging station is energized, The first coil produces an alternating magnetic field, and by electromagnetic coupling, this field causes a voltage to be induced in the secondary coil. This voltage is then converted to DC and used to charge the EV's battery. Light-Dependent Resistors (LDRs) are not commonly used in wireless charging systems for electric vehicles (EVs) directly, they could potentially be used as part of a home energy management system (HEMS) in conjunction with wireless EV charging. It typically includes components such as solar panels, energy storage systems (such as batteries), smart meters, and energy management software. the context of wireless charging for EVs, an LDR could be used in a HEMS to monitor the availability of solar power or grid power at a particular time. This information could then be used by the energy management software to make decisions on when to initiate wireless charging for the EV.

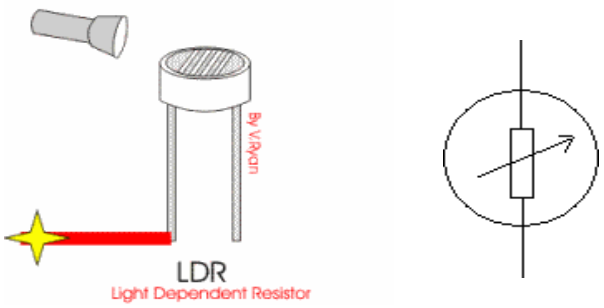


Fig 16: LDR

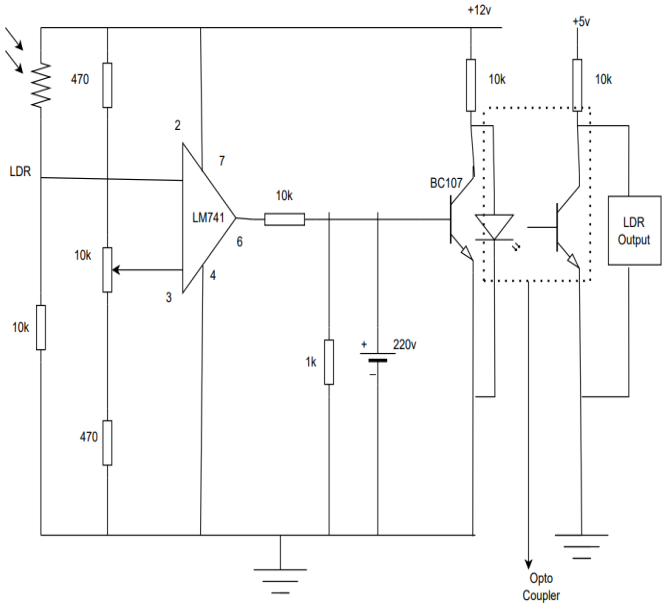


Fig 17: LDR Circuit Diagram

SOLAR PANEL

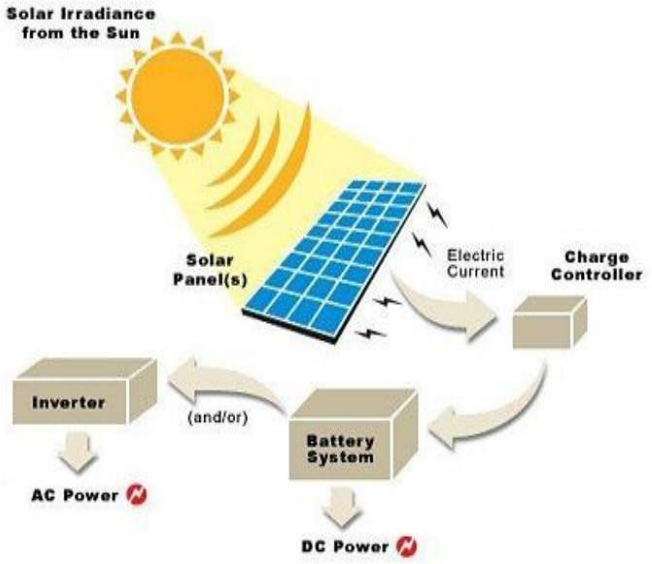


Fig 18: Working of Solar Panel

The basic working of a solar panel involves converting the energy from the Electric vehicles (EVs) can be powered by solar energy, which is converted into electrical energy. In an EV wireless charging system that uses a home as a charging station, The house's roof has solar panels that can be utilised to produce electricity. Direct current (DC) electricity from the solar panels is routed to an inverter, which transforms it into alternating current (AC) electricity that may be used to power the wireless charging system. The AC electricity is then sent to a charging station, which is installed in the parking of the home.

The electricity from the charging station is transferred to the EV's battery by the wireless charging technology using a charging coil that is linked to the charging station. Magnetic induction is used by the charging coil to generate a magnetic field that wirelessly transmits electricity to the EV battery. The magnetic field produced by the charging coil when the EV is parked over it produces a current in the coil, which in turn charges the battery of the EV. Until the battery is fully charged or the charging is stopped, the process of charging continues.

This helps to reduce the carbon footprint of the EV charging process and promotes sustainable energy practices.

WIND SOURCE

Electric vehicles (EVs) uses wind energy instead of solar energy in any of climate changes, but it would require some changes in the charging infrastructure.

To use wind energy for wireless charging, we need a wind turbine to generate electricity. The wind turbine would need to be connected to a battery storage system, which would store the electricity until it's needed for charging the EVs. When an EV drives over the wireless charging pad, the receiver on the EV would communicate with the charging station to initiate the charging process. The charging station would then draw electricity from the battery storage system powered by the wind turbine, and wirelessly transmit it to the receiver on the EV to charge the battery.

To use a home as a charging station, you would need to install a wireless charging pad on your driveway or garage floor. The wind turbine and battery storage system could be installed on your property as well, or could be connected to a nearby wind farm if available.

It's worth that wind energy is typically less predictable than solar energy, which could lead to some challenges in ensuring that the charging stations have a steady supply of electricity. However, with an appropriate planning and infrastructure, it's possible to use wind energy for wireless EV charging at home.

INVERTER

Electric vehicle (EV) wireless charging system that uses a home as a charging station, The inverter plays a crucial role as a component in the system, converting the direct current (DC) voltage from solar panels or batteries into alternating current (AC) voltage, which is necessary for powering the wireless charging system and charging the electric vehicle's (EV) battery.

The working of an inverter with volts is explained as follows: The voltage from the solar panels or battery is typically in the range of 12V to 48V DC, depending on the system's configuration. The inverter takes the DC voltage as input and converts it into AC voltage, typically at 110V or 220V, depending on the country's electrical standard.

The inverter uses a series of electronic components, such as transistors or MOSFETs, to switch the DC voltage on and off rapidly, creating a square wave or a sine wave. The inverter's control circuitry ensures that the output voltage and frequency are stable and match the requirements of the wireless charging system and the EV's battery.

The inverter may also include safety features, such as overvoltage and overcurrent protection, to ensure that the charging process is safe and reliable. The output voltage from the inverter is then sent to the wireless charging coil, which uses an electromagnetic field to Wirelessly supply power to the EV's battery. The wireless charging system's power needs as well as the EV's battery will determine the inverter's size and capacity. A larger inverter may be

required for a high-power charging system, while a smaller inverter may be sufficient for a lower-power system.

WORKING OF SOFTWARE

The Arduino runs the Arduino IDE software. An electric vehicle (EV) wireless charging system's numerous component can be managed using the Arduino microcontroller platform.

Arduino software could be used in a wireless charging system that uses a home as a charging station.

The wireless charging coil would be connected to an Arduino board, which would control the charging process. The Arduino board would be programmed to detect when an EV is parked over the charging coil. This could be done using sensors or other means of detecting the presence of the EV. Once the Arduino board detects the presence of the EV, it would initiate the charging process. This could involve activating the electromagnetic field that transfers energy wirelessly from the charging pad to the EV's battery.

The Arduino board would monitor the charging process to ensure that the EV's battery is charged safely and efficiently. It could adjust the charging rate or voltage if needed to avoid damaging the battery. Once the EV's battery is fully charged, the Arduino board would stop the charging process.

The Arduino board could also be used to monitor the energy consumption of the charging system and to send data to a monitoring system that could be accessed remotely. In addition to controlling the charging process, Arduino software could be used to provide additional functionality to the wireless charging system. For example, it could be used to control the lighting or ventilation in the charging station, or to communicate with other smart home systems. The "Wiring" C/C++ library, from the project of the same name, is included with the Arduino IDE and simplifies a number of common input/output functions. Although users simply need to define two functions to create a runnable programme, Arduino programmes are written in C/C++. **setup()** is a function that is called just once at the beginning of a programme to initialise settings.

loop() is a function that is continuously called until the board turns off.

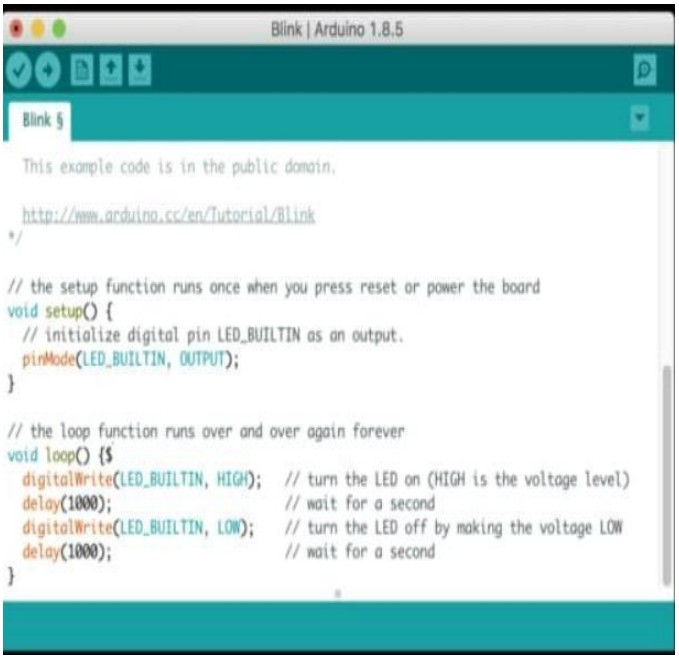


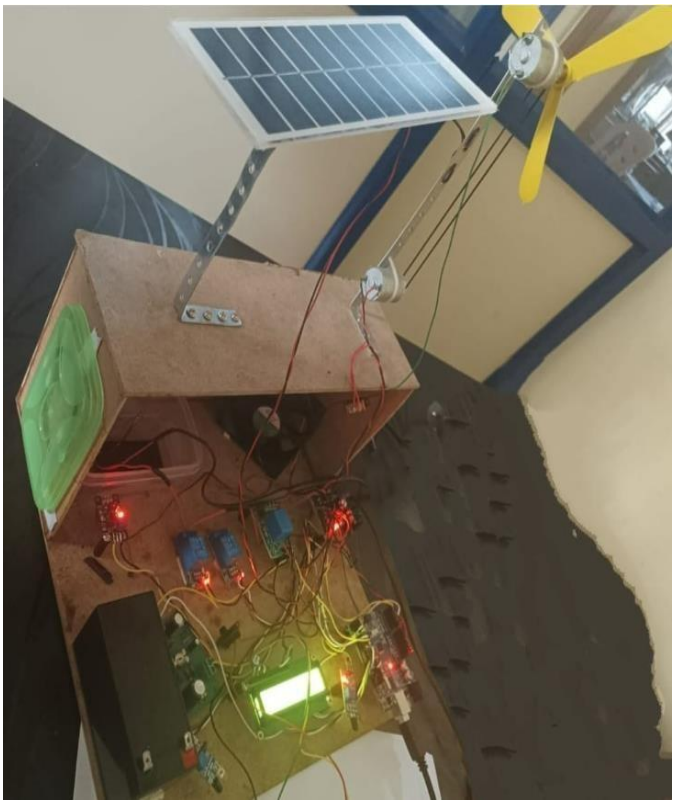
Fig 19: Arduino IDE showing "Blink" program

CONCLUSION

Wireless charging technology has been steadily advancing, and EV wireless charging is becoming a more feasible option for electric vehicle owners. Using the home as a charging station has the potential to simplify the charging process. There are several benefits to using wireless charging at home, including the ability to charge without having to physically plug in the vehicle, reducing wear and tear on the charging port, and potentially increasing the lifespan of the vehicle's battery. Additionally, home wireless charging can reduce the need for public charging infrastructure. However, there are also some challenges that need to be addressed for widespread adoption of wireless charging technology, including the need for standardization and interoperability between different charging systems, as well as concerns about safety and efficiency.

EV wireless charging using the home as a charging station shows promise as a convenient and accessible charging option for electric vehicle owners, but further research and development are needed to address the challenges and fully realize the potential of this technology.

MODEL IMPLEMENTATION



RESULTS AND OUTCOMES

The results and outcomes of using EV wireless charging systems at home are still being studied, as this technology is still relatively new and undergoing ongoing development. there are some potential benefits and challenges to consider. One potential benefit of using home-based wireless charging is the convenience factor. With wireless charging, electric vehicle owners would not have to manually connect their vehicles to a charging station, which could save time and make the charging process more accessible and reduce the need for public charging infrastructure, which could help to reduce the cost and complexity of charging for EV owners. Another potential benefit is the reduction in wear and tear on the vehicle's charging port. Wireless charging eliminates the need for physical plugging and unplugging of the vehicle, reducing the risk of wear and damage to the charging port over time, making it convenient and hassle-free charging option. Wireless charging eliminates the need for physical plugging and unplugging of the vehicle, another challenge is ensuring the safety and efficiency of wireless charging technology. Ongoing research and development will be needed to ensure that this technology is safe, efficient, and accessible for electric vehicle owners.

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