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Electrical Vehicle Wireless Power Transfer System Application

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Abstract

Electric vehicles (EVs) are a substitute for fossil fuels in the road transportation system and can aid in lowering fossil fuel use. However, the battery's low capacity limits how often EVs may be used. WPT, or wireless power transfer, can by charging EVs while they are moving along a wireless charging lane embedded in a road, you may extend the operating range of electric vehicles. A charging lane can only provide a certain amount of electricity at once. One issue here is how to effectively divide the power among the various EV penetration levels when a lot of EVs pass a charging lane? Nevertheless, no prior studies have been conducted to address this problem. In order to address this issue, we suggest a method to balance the The fog computing center plans the power distribution and gathers data from EVs. Instead of using clouds closer to cars, we employ fog to lessen the lag in communication. The power allotted to each EV is scheduled by the power scheduling model. To mitigate network congestion caused by EVs and fog, we let vehicles to select their preferred communication channel for interacting with local controllers.

Keywords- electric vehicle; charging system; reliability; bibliometric analysis.

I. INTRODUCTION

Electric vehicles are a suitable substitute for residential combustion engines due to the decrease in the use of fossil fuels and the requirement to lessen pollution in cities. Vehicle-to-home (V2H) and other technologies enable electric vehicles to function as energy sources. car-to-grid (V2G) functionalities. Vehicles can function as mobile storage devices that add stored energy to the grid thanks to V2G functionality [3]. Active power regulation, reactive power support, load modulation, flow harmonic filtering, and peak charge correction are all made possible by the V2G capability. These elements give the power grid functions like voltage and frequency control and spinning reserves [4]. In addition to the previously mentioned advantages, electric cars can take part in electricity markets and offer their owner and the power system numerous financial advantages via It's crucial to remember that the economic advantages of V2G capability rely on how electric cars are charged and disposed of. The charging time periods will coincide with the peak load time of the device if the charging process is not managed. distribution system, raising peak load in the process. As a result, the distribution system experiences issues like overload, excessive power outages, and voltage violations. Consequently, charging schedules must to be created in a way that encourages customers to move their charge times to off-peak times. Many publications have looked into the impacts of having plug-in hybrid electric vehicles (PHEVs). This research proposes several techniques for electric vehicle parking with V2G capability that coordinate the charging and discharging of plug-in hybrid electric vehicles (PHEVs). Among the suggested tactics are limitations on the quantity of power exchange the distribution system in addition to the erratic and random character of quantity. Lastly, an analysis is done on how each method affects the parking dividend amount.

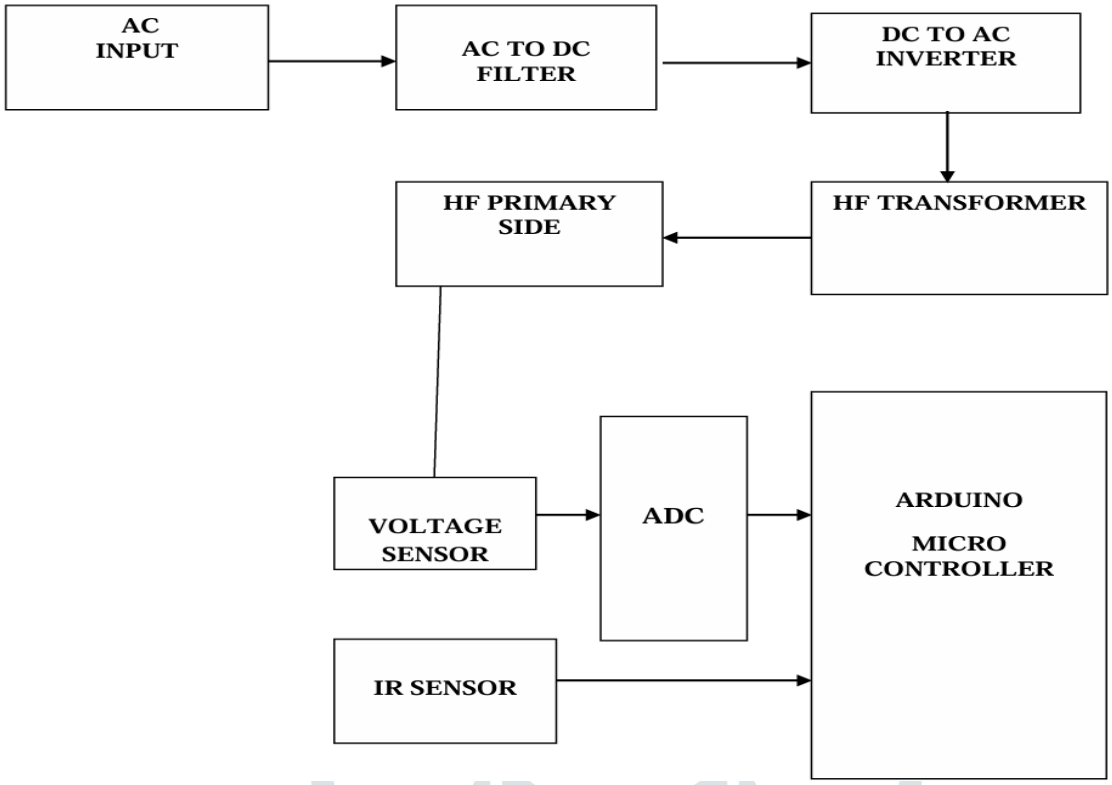

Figure1. Block diagram of Transmitter

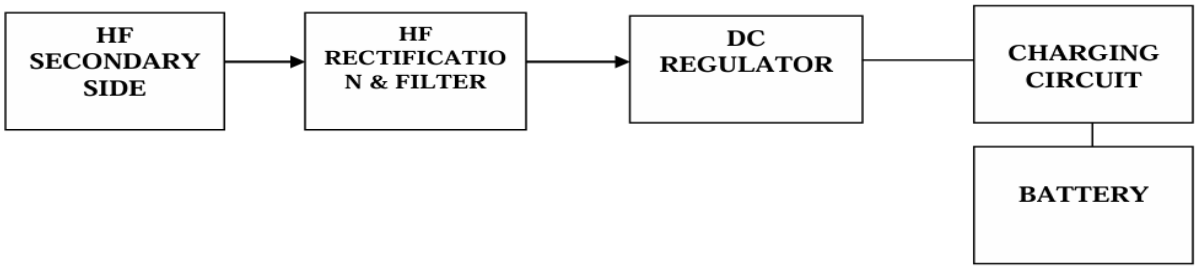

Figure 2. Block diagram of Receiver

EXISTING SYSTEM

• The effective vehicle-to-fog communication protocol, which addresses the drawbacks of the DSRC protocol's current CSMA/CA approach.

• The study problems rely on current technologies and potential long-term effects. Why When the number of EVs rises, the average packet drop rate in the channel allocation technique is higher than in our channel allocation technique.

SYSTEM PROPOSED:

Compared to the other two approaches, our suggested power scheduling technique in BSoC can better balance the SOC of EVs. The wireless power transfer system in an online electric car can limit electromagnetic field leakage by implementing passive metallic plate shield and active shield.

II.MODULE DESCRIPTION:

1. SENSOR INTERFACING:

This type of signal conditioning combines filtering, amplification, and other techniques. as well as the conversion of analog to digital. Even if your microcontroller has an analog-to-digital converter (ADC), the sensor's input must be made compatible with the ADC.

2. POWER SUPPLY UNIT PREP

The internal parts of a controller are powered by low-voltage regulated DC, which is produced by a power supply unit, or PSU, from mains AC. Using a power supply, 240 volts AC of mains electricity is reduced to something more usable, such 12 volts DC. Switch mode and linear power supplies are the two varieties. A linear power supply uses a transformer to reduce the voltage. The AC signal undergoes regulation and correction to generate A form of external power supply known by several names such as AC adapter, AC/DC adapter, or AC/DC converter is typically housed in a casing resembling an AC plug. One way to refer to adapters for battery-powered devices is as chargers or rechargers (see additionally a battery charger). When using electrical devices that need electricity but lack internal components to extract the necessary voltage and power from main power, AC adapters are utilized. An internal or built-in power supply's internal circuitry is extremely similar to that of an external power source.

Programming of Microcontrollers

A microcontroller is an integrated circuit (IC) that may be programmed to perform a variety of tasks. There are numerous varieties of microcontrollers available that provide a extensive functional range. The microcontroller is one of the most potent instruments in contemporary design because of its adaptability. The fundamentals of microcontrollers and their programming will be covered in this tutorial.

ANALOG DATA READING

An analog-to-digital converter, or ADC, is a circuit inside the board's microcontroller that reads this fluctuating voltage and transforms it to a number. from 0 to 1023. The input value is zero and there are no voltages applied to the pin when the shaft is fully twisted in a single direction. The input value is 1023 and there are 5 volts going to the pin when the shaft is fully twisted in the other direction. Between, analog Read() provides a value proportional to the voltage applied to the pin, ranging from 0 to 1023.

Examine and debug

Verifying proper behavior is what testing entails. All phases of module development, including requirements analysis, interface and algorithm design, implementation, and module integration, are amenable to testing. We will focus on implementation testing in the following. Testing for implementation is not limited to testing for execution. As explained below, correctness proofs, code tracing, and peer reviews can also be used to test an implementation. Code repair and execution testing are cyclical aspects of debugging. The goal of testing while debugging is not the same as that of testing the final module. The goal of final module testing is to prove correctness, although testing during the main goal of debugging is to find errors. The selection of testing methodologies is significantly impacted by this distinction.

III.The Arduino is the hardware description.

Creating single-board microcontrollers and microcontroller kits for the construction of digital devices and interactive things that can sense and control objects in the real world is the mission of Arduino, an open source computer hardware and software company, project, and user community.The open-source electronics platform Arduino is built on user-friendly hardware and software. Arduino boards have the ability to take inputs, such as a light from a sensor, a finger pressing a button, or a message from Twitter, and convert them into outputs, such as starting a motor, turning on an LED, or posting content to the internet. A microcontroller board based on the ATmega328 is called the Arduino Uno (datasheet). It includes 6 analog inputs, a 16 MHz crystal oscillator, 14 digital input/output pins (six of which can be used as PWM outputs), a USB port, and a power button for resetting, an ICSP header, and a jack.

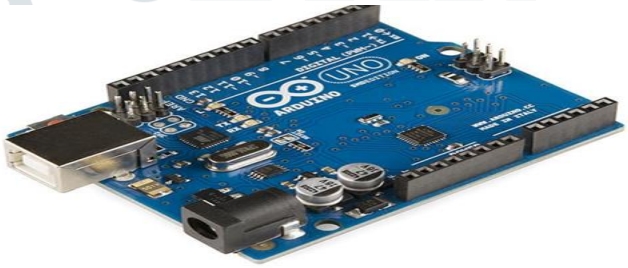

Figure 3. Arduino UNO

The Arduino UNO

The open-source Arduino project produced kits based on microcontrollers for constructing interactive objects and digital devices with sense and control. tangible objects. The project is based on microcontroller board designs made using different microcontrollers by many suppliers. These systems offer sets of input/output (I/O) pins, both digital and analog, that may interface with different expansion boards (also known as shields) and other circuits. The boards provide serial communication interfaces that allow users to load software from personal computers, including Universal Serial Bus (USB) on certain variants. The Arduino project offers an integrated development environment (IDE) based on the Processing programming language, which is compatible with C and C++, for programming the microcontrollers.

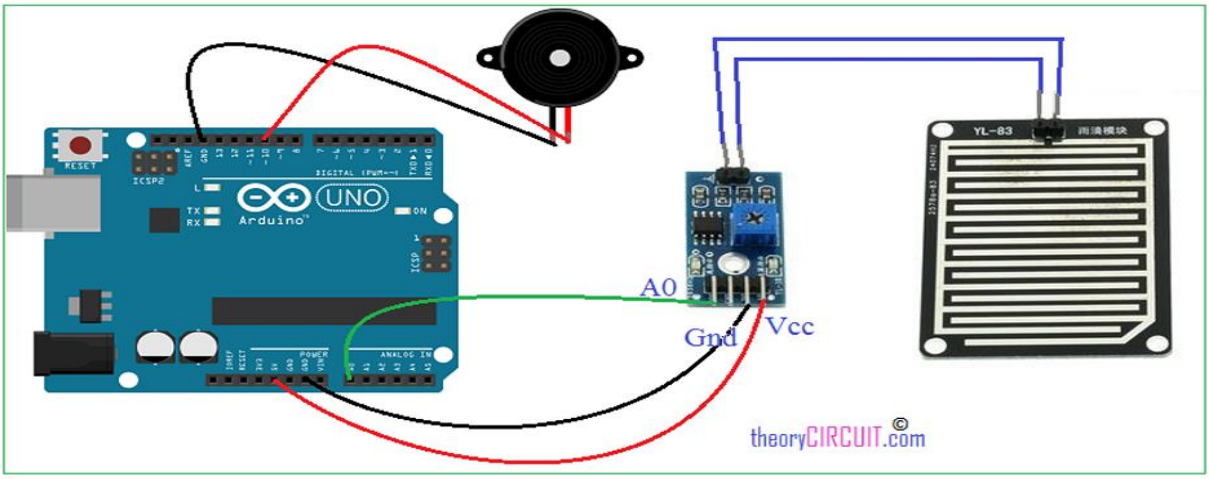

Figure 4. Arduino UNO Interface with Sensor & Buzzer

An ATmega328P-based microcontroller board is the Arduino Uno. It contains a 16 MHz quartz crystal, 6 analog inputs, 14 digital input/output pins (six of which can be used as PWM outputs), a USB port, a power jack, and an ICSP header. as well as a reset button. It comes with everything required to support the microcontroller; all you have to do is use an AC-to-DC adapter or a USB cable to connect it to a computer. The Arduino Uno includes several features that allow it to communicate with other microcontrollers, computers, and other Arduino boards.

IV.WIRELESS POWER TRANSFER DESCRIPTION

The transmission of electrical energy without the use of cables is known as wireless power transfer (WPT), wireless power transmission, wireless energy transmission, or electromagnetic power transfer. Technologies for wireless power transmission make advantage of time-varying fields that are electromagnetic, magnetic, or electric. Inductive charging is typically referred to as "wireless charging." With this technology, an alternating magnetic field is produced by a charging station. When positioned close

to the field, a device equipped with the appropriate induction coil will absorb energy from it, enabling it to obtain power without requiring a physical connection. Reducing the amount of potentially harmful electromagnetic fields that people and other living things are exposed to is a crucial concern for all wireless power systems. The process of sending AC electricity from a power source to an electrical load wirelessly—that is, without the usage.

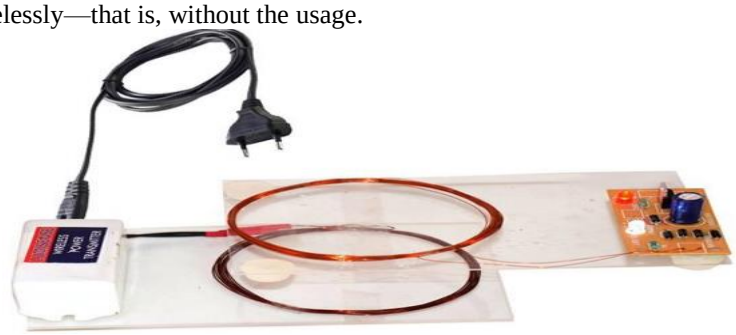

Figure 5. WPT Module

WPT PACKAGES

Electronic devices that are frequently used can be close wirelessly charged with the Wireless Power Transfer and Charging Module. This section transfers electric energy between a transmitter circuit and a receiver circuit via an electromagnetic field.

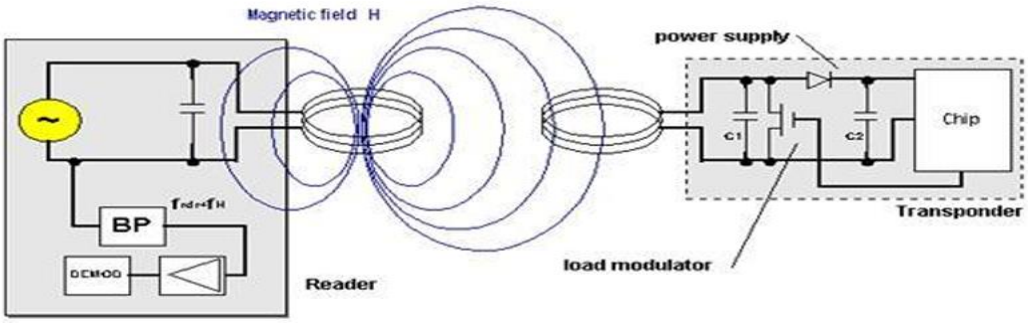

Figure 6.Circuit diagram

ELECTRICAL DIAGRAM

An induction coil that is driven by 12 volts inside the transmitter circuit produces an alternating electromagnetic field. Power is used by the second induction coil. transforms it back into AC current for the receiver circuit from the electromagnetic field. Increase the number of turns of the receiver coil to increase the transmission distance, when low current is suitable in your application. As distance increase current capacity of receiver will drop.

VOLTAGE SENSOR DESCRIPTION

The voltage supply can be ascertained, monitored, and measured by a voltage sensor. After that, it can take those measurements and convert them into a signal that can be read. Usually, the signal is recorded using a specialized electrical instrument, but occasionally, a human observer is present to manually examine the sensor output.

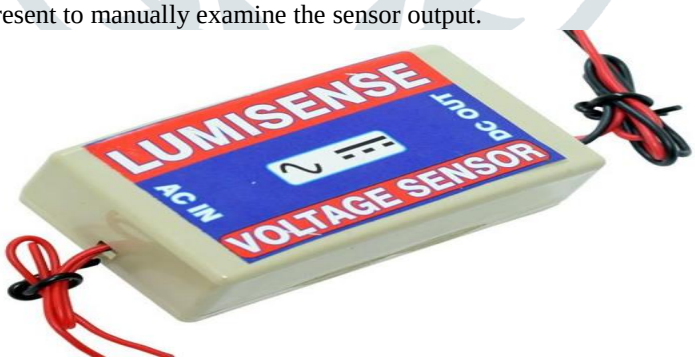

Figure 7.AC Voltage Sensor

AC VOLTAGE SENSOR

The Voltage Sensor block is an example of an ideal voltage sensor, which is a device that produces a physical signal proportionate to the voltage from the voltage measured between two locations in an electrical circuit. The links + and - are The sensor is connected to the circuit via ports that save electricity. The physical signal port that outputs the measurement result is called connection V. The purpose of an AC voltage sensor is to measure AC voltage and it operates based on magnetic modulation. This sensor's output signal is proportionate to the AC voltage input. It can be applied to the system's on going ac voltage monitoring.

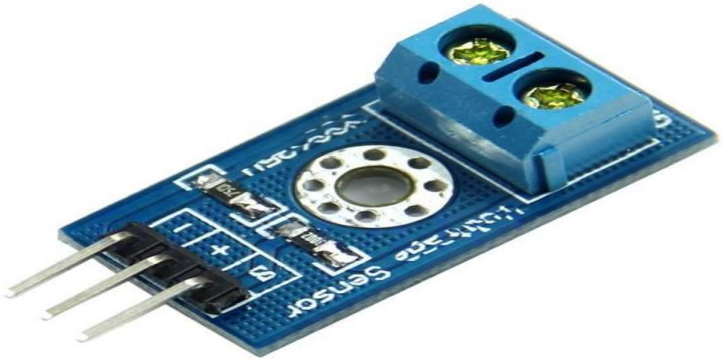

Figure 8.DC Voltage Sensor

DC VOLTAGE SENSOR

An electrical component's potential difference between its ends can be measured using a DC voltage sensor. This can be used to gauge the circuits' DC voltage. Soldering the secondary circuit fixes the sensor mechanically. the PCB's pins. The sensor itself may incorporate the main connector. galvanic insulation separating the primary and secondary circuits and pulsating voltage. When a voltage exceeds a threshold, the voltage detector signals its existence. A micro controller built inside the voltage sensors significantly increases the sensor's accuracy, precision, and reading consistency. They come already calibrated, and when the Voltage Sensor is connected, the stored calibration (in volts) is instantly imported.

The voltage supply can be ascertained, monitored, and measured by a DC voltage sensor. After that, it can take those measurements and convert them into a signal that can be read. Frequently, the signal will enter a specific electronic recording equipment, however occasionally an observer will be present to manually interpret the sensor's data. If more than one voltage sensor is being utilized in a circuit, make sure they share an earth for accuracy's sake. The DC voltage sensor is intended for measuring DC voltage and operates based on magnetic modulation. This sensor's output signal is proportionate to the DC voltage input. It is suitable for DC voltage that is continuous.

SINGLE CHANEL RELAY DESCRIPTION

An electrically powered device is called a relay. It has two systems: a controlled system (also known as an output circuit or output cont actor) and a control system (also known as an input circuit or input contactor). It is often utilized in circuits for automatic control. Relays are switches that have the ability to electronically or electromechanically open and close circuits. Relays operate by opening and closing contacts in another electrical circuit to regulate one of those circuits. When a relay contact is marked as Normally Closed (NC), the relay is not activated and has a closed contact.

Figure 9.Single Chanel Relay.

Relays are basic switches that can be turned on and off physically or electrically. An electromagnet and a set of contacts make up a relay. The electromagnet assists in the operation of the switching mechanism. The primary Relays are employed in situations where a circuit can only be controlled by a low-power signal. It is also employed in locations where numerous circuits can be controlled by a single signal. They served the purpose of changing the signal's destination from one source to another. Relays used in high-end applications need to be powered by electric motors and other sources of high power. Contactors are the name for such relays.

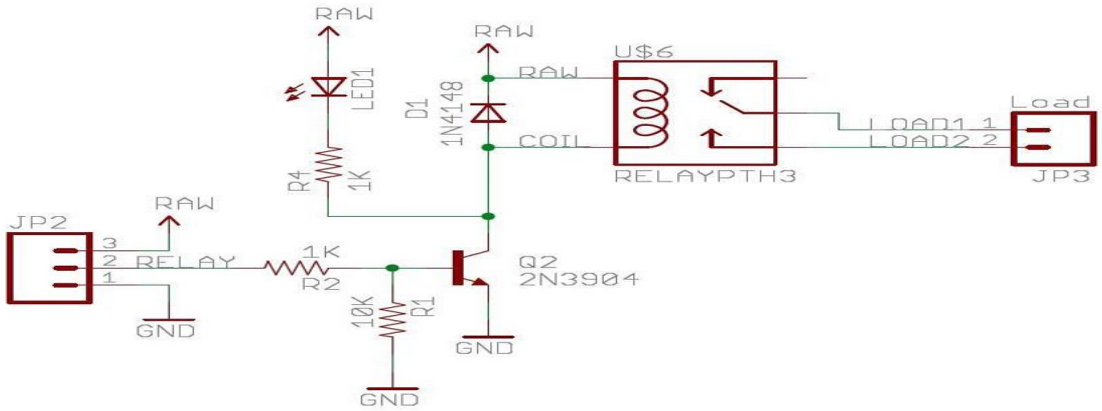

Figure 10.Circuit Diagram.

An electric current is required to operate an electromechanical switch, such as a relay. A driver circuit, a power supply circuit, and an isolation circuit are all present in a single relay board configuration. That circuit is assembled with a relay. The circuit for the driver includes transistors used in switching processes. The relay is switched via the transistor. Relay reverse voltage is prevented by an isolation circuit, shielding the transistor and controller from harm. The microcontroller unit provides the input pulse required to flip the transistor. It is employed to switch just one device.

IR SENSOR DESCRIPTION

An electrical gadget called an infrared sensor emits light in order to detect certain elements of its environment. In addition to detecting motion, an infrared sensor may measure an object's temperature. Only infrared radiation is measured by these kinds of sensors. an infrared sensor that is passive, as opposed to emitting it.

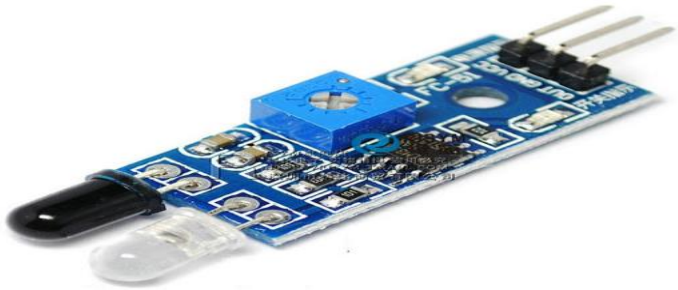

Figure 11.IR Sensor

An electrical gadget called an infrared sensor emits light in order to detect certain elements of its environment. In addition to detecting motion, an infrared sensor may measure an object's temperature. These sensors solely detect infrared radiation; instead instead of emitting it, which is known as a passive infrared sensor. Typically, all items emit some kind of thermal radiation in the infrared range. Although these radiations are undetectable to the human eye, an infrared sensor can detect them.An IR LED (Light Emitting Diode) serves as the emitter, and an IR photodiode that is sensitive to IR light with the same wavelength as the IR LED serves as the detector when infrared light strikes.

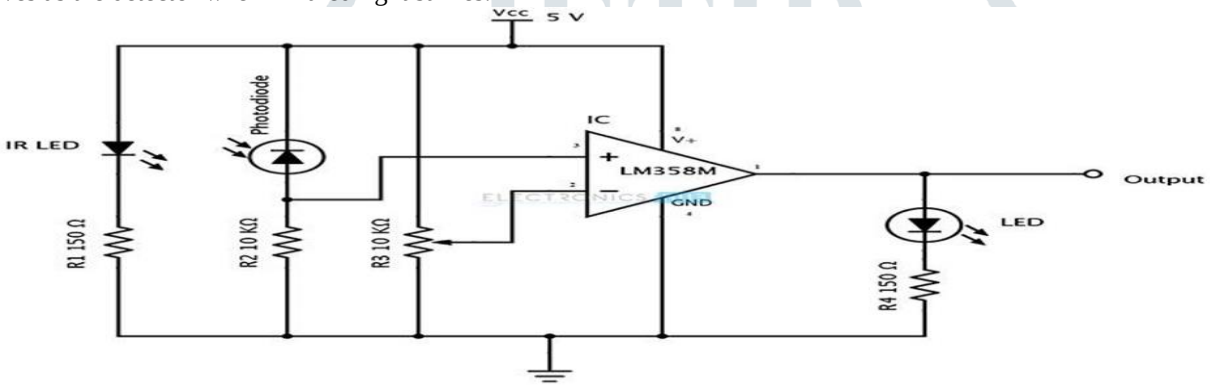

Figure 12.Circuit Diagram

BATTERY(12 V) DESCRIPTION

A battery is a grouping of one or more cells that work together chemically to produce an electron flow within a circuit. Three essential parts make up every battery: an anode (the "-" side), a cathode (the "+" side), and some type of The material known as the electrolyte interacts chemically with the cathode and anode. A chemical reaction occurs between the anode and the electrolyte when a battery's cathode and anode are linked to a circuit. Electrons from this process move through the circuit and back into the cathode, where they are involved in yet another chemical reaction. The battery is unable to generate power when the material in the cathode or anode is depleted or cannot be utilized in the reaction. The most popular 12-volt battery was first introduced for the first transistor radios. It features a polarized snap connector at the top and a rectangular prism form with rounded sides. Walkie talkies frequently employ this kind. smoke detectors and clocks. Additionally, they serve as a backup power source for some electronic clocks. This format is widely accessible in primary lithium iron disulfide, primary carbon-zinc and alkaline chemistry, as well as in rechargeable forms for nickel cadmium, nickel-metal hydride, and lithium-ion. Since they contain mercury, mercury oxide batteries have not been produced in this form for many years. The 12V battery features a polarized snap connector at the top and is shaped like a rectangular prism with rounded sides. A dry cell battery that produces a voltage of 1.5 volts between a zinc metal electrode and a zinc carbon (6F22) battery carbon rod resulting from an electrochemical reaction mediated by an appropriate electrolyte between manganese dioxide and zinc. It was first made available for early transistor radios. It is typically neatly packaged in a zinc can, which doubles as the positive cathode and anode with a negative potential when combined with an inert carbon rod. One benefit is that larger voltages can be achieved by connecting multiple nine-volt batteries in series with one another.

LCD DISPLAY DESCRIPTION

The technology used for screens in notebooks and other smaller computers is called LCD (liquid crystal display). Similar to gas-plasma and light-emitting diode (LED) technology, LCDs enable far thinner displays than cathode ray tubes (CRT) technology. level screen The operation of LCD and plasma screens differs greatly. Every pixel in a plasma screen is a tiny fluorescent bulb that is electronically turned on and off. Liquid crystals rotate polarized light to electronically turn on and off the pixels of an LCD display.

Figure 13. 16X2 LCD Display

Liquid crystal display is referred to as LCD. They are available in a variety of sizes, including 8x1, 8x2, 10x2, 16x1, 16x2, 16x4, 20x2, 20x4, 24x2, 30x2, 32x2, 40x2, and so on. Numerous international corporations, such as Philips Hitachi Panasonic, create their own unique type of LCDs that will be utilized in their goods. The functions of all LCDs are the same (display characters, numerals, special characters, ASCII characters, etc.).They all have the same 16 or 14 pins (0 to 15) and the same programming (0 to 13). Numerous devices, such as cell phones, word processors, photocopiers, point-of-sale terminals, palmtop computers, and medical equipment, use alphanumeric displays.

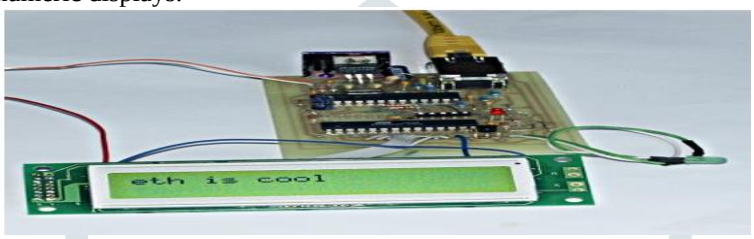

Figure 14. LCD Interface with Microcontroller

This LCD display is intended to be used with E-blocks. It is an alphanumeric LCD display with 16 characters and 2 lines that is linked to a single 9-way D-type connector. As a result, the device can be linked to the majority of E-Block I/O ports. The LCD panel needs data in a serial format; the user manual is provided below for more information on this. A 24V power supply is also needed for the display. Please be careful not to exceed 5V since this can harm the gadget. The E-blocks Multiprogrammer or a 24V fixed regulated power supply are the ideal sources for producing the 24V. With a single power supply of +24V, the 24 x 8 inch intelligent alphanumeric dot matrix displays can display up to 224 different characters and symbols. The booklet provides all the technical specifications for connecting the unit, and pages 7–8 list all of the characters and symbols (note that these can vary depending on the brand of LCD used).

LCD INTERFACE BOARD DESCRIPTION

An LCD board is made specifically to interface with an Arduino. There are two areas on this board: the data portion and the control section. A potentiometer is included with this board so that the LCD can be adjusted. The board's supply voltage is specified. either directly from the controller or another source.

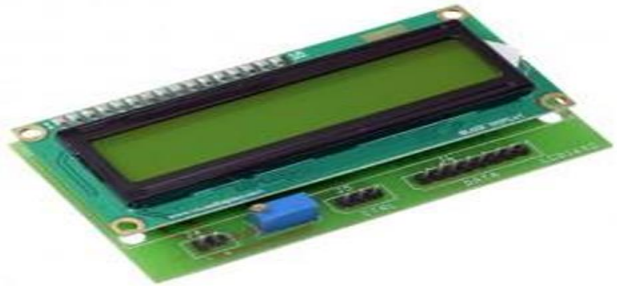

Figure 15. LCD Interface Board

Along with a variety of pinouts and communication features, the communication extension board also has an external power connector. For use as an extension board with the Hitex LPC2478-Stick or the Hitex LPC3250-Stick, the LCD-Board is perfect. LCD module [STM32F4DIS-LCD] is made up of a driver board and 3.5 inch LCD. The Embest STM32F4DIS-BB board is intended for use with this module.

SOFTWARE DESCRIPTION: ARDUINO IDE:

The Arduino Software (IDE), also known as the Arduino Integrated Development Environment, has a text editor for writing code, a message box, a text console, a toolbar with buttons for frequently used tasks, and a number of menus. It links to the Hardware from Arduino and Genuino can be used to upload applications and interact with them. Sketches are programs created with the Arduino Software (IDE). These sketches are saved as files with the.ino extension and are created in a text editor. The editor offers tools for searching through and replacing text as well as cutting and pasting. The message section shows issues and provides feedback during exporting and saving. Complete error warnings and other text output from the Arduino Software (IDE) are displayed in the console. The configured board and serial port are shown in the window's lower right corner. You may create, open, and save sketches, validate and upload programs, and access the serial monitor using the toolbar buttons. You must choose the appropriate options from the Tools > Board and Tools > Port menus before uploading your sketch. Below is a description of the boards. The serial port on the Mac is most likely dev/tty.usbmodem241 (for an Uno or For a Duemilanove or older USB board, use /dev/tty.usbserial-1B1; for a serial board linked with a Keyspan USB-to-Serial converter, use /dev/tty.USA19QW1b1P1.1. Mega2560 or Leonardo). If it's a USB board, it's most likely COM4, COM5, COM7, or higher on Windows; to find out, look for USB serial device in the ports area of the Windows Device Manager. Alternatively, it might be COM1 or COM2 for a serial board. It should be /dev/ttyACMx, /dev/ttyUSBx, or something similar on Linux. Click the upload button after making the appropriate serial port and board selections. The upload will start immediately when the current Arduino

boards reset. Older boards (pre-Diecimila) will not automatically reset, so you will need to push the board's reset button right before launching the file upload. The RX and TX LEDs on most boards will blink while the sketch is uploaded. When the upload is finished, the Arduino Software (IDE) will either show a message or an error. The Arduino bootloader is a tiny program that has been loaded onto your board's microcontroller when you upload a sketch. You can upload code with it without requiring any further hardware. There is an active bootloader for a Following a brief reset, the device launches the most recent sketch that was uploaded to the microcontroller. When the bootloader starts, or the board resets, it will cause the on-board (pin 13) LED to blink.

EMBEDDED C

The C Standards Committee created Embedded C as a set of language extensions for the C programming language to solve commonality problems with Cextensions for various embedded devices. The C Standards Committee created Embedded C, a set of language extensions for the C programming language, to solve concerns of commonality between C extensions for various embedded devices. Historically, in order to implement exotic features like fixed-point arithmetic, many different memory banks, and basic I/O operations, embedded C programming required nonstandard modifications to the C language. An embedded system is a computer system that has a specific purpose inside a bigger or electrical system, frequently with limitations on real-time computing. It is integrated into a full device, frequently with mechanical and hardware components. A large number of modern gadgets are managed by embedded systems. The majority of microprocessors, about 98% of them, are produced as parts of embedded systems.When compared to their general-purpose equivalents, typical embedded computers have characteristics like low power consumption, small size, tough working ranges, and low cost per unit. This comes with a restricted pricing. processing resources, which considerably increases the difficulty of programming and interacting with them. But by adding intelligence mechanisms to the hardware, making use of potentially available sensors, and having a network of embedded units, one can provide augmented functions that go well beyond what is already possible while also managing resources at the unit and network levels in an optimal manner. For instance, smart methods can be developed to control embedded systems' power usage.

Microcontrollers, or CPUs with integrated memory or peripheral interfaces, form the foundation of many modern embedded systems; however, regular microprocessors, which use external chips for memory and peripheral interface circuits, are also widely used. particularly in more intricate systems. In any scenario, the processor or processors being utilized could be general-purpose, specialized for a particular class of computations, or even specially made for the task at hand. Digital signal processors are a typical standard class of specialized processors (DSP). Due to the embedded system's specialization, design engineers can optimize it to lower the product's size and cost while boosting its performance and dependability. Due to economies of scale, some embedded systems are manufactured in large quantities. Digital watches, MP3 players, and other portable electronics are examples of embedded systems. Large, fixed installations like traffic lights and industrial controllers are also examples of embedded systems, as are highly complicated ones like avionics, hybrid cars, and MRIs. Intricacy ranges from extremely high, comprising several units, peripherals, and networks arranged inside a sizable chassis or container, to low, with only one microcontroller chip.

Conclusion

We are introducing the Wireless Power Transmission in this system. As the number of electric vehicles on the market rises. Our cars can be charged via the wireless charging technology. This system demonstrates the effectiveness and the charging station's integration with upcoming technologies. In order to prevent congestion at the station, this report also discusses future technologies including self-service entry and exit gates and RFID tag payment. Researchers working in the topic of wireless power transmission will find this useful. Additionally, a lot of people invented other amazing inventions, such as wireless charging for smartphones and other electronic devices. This may be the direction that charging station development will go in the future as demand for electric vehicles rises.

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