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Movable Solar Based Wireless EV Charging Station

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Abstract - Wireless power transfer (WPT) using magnetic resonance is the technology which could set human free from the annoying wires. In fact, the WPT adopts the same basic theory which has already been developed for at least 30 years with the term inductive power transfer. WPT technology is developing rapidly in recent years. At kilowatts power level, the transfer distance increases from several millimeters to several hundred millimeters with a grid to load efficiency above 90%. The advances make the WPT very attractive to the electric vehicle (EV) charging applications in both stationary and dynamic charging scenarios.
For energy, environment, and many other reasons, the electrification for transportation has been carrying out for many years. In railway systems, the electric locomotives have already been well developed for many years. A train runs on a fixed track. It is easy to get electric power from a conductor rail using pantograph sliders. However, for electric vehicles (EVs), the high flexibility makes it not easy to get power in a similar way. Instead, a high power and large capacity battery pack is usually equipped as an energy storage unit to make an EV to operate for a satisfactory distance. Until now, the EVs are not so attractive to consumers even with many government incentive programs. Government subsidy and tax incentives are one key to increase the market share of EV today. The problem for an electric vehicle is nothing else but the electricity storage technology, which requires a battery which is the bottleneck today due to its unsatisfactory energy density, limited lifetime

1. INTRODUCTION

Contactless Power Transfer (CPT) systems are applicable for charging electric vehicles (EVs) without any physical interconnection. These systems can be installed on roadways in order to charge the vehicles while driving. The implementation of such on-road charging systems in order to extend the driving range and decrease the EV battery size is investigated in this paper. The percentage of road that should be covered and the power transfer capability of the system are estimated. Some design considerations, such as the distribution and the length of the CPT segments over the road, are explained. Finally, the total power demand for all the passing-by vehicles using the system is calculated and the possibility of powering the EVs directly from renewable energy sources is discussed.

This system based on Contactless Power Transfer (CPT), it is assumed that the vehicle can be powered while driving. The CPT systems can be installed on the main traffic lanes. The car will get energy supplied by the on-road CPT system and therefore a greater driving range can be achieved. Moreover, a smaller battery can be an installed to the car providing the same of even greater driving range. As a result, such systems can be a pathway to overcome the main bottlenecks of electric mobility i.e. the limited driving range and the high cost, which are both related to the technology and the specifications
of today's batteries. A Contactless Power Transfer

System (CPT) refers to a system where power can be transferred electro-magnetically with no physical contact. The system consists basically of an air-core transformer with two windings. The efficiency of such a transformer depends on the parameters of the primary and the secondary winding, coupling factor, as well as on the load and the operating frequency.

PROBLEM DEFINITION:

- To design for minimize use of wired charger because a transformer is replaced by a set of loosely couple coils.
- To implement system for charging of electrical vehicle is based on principal of contactless power transfer
- To design system in which we implement CPT system for charging electric vehicle. It has pick-up winding installed below the chassis and is aligned with a primary winding connected to power source.

OBJECTIVES

- To design wireless power transmission system.
- To design wireless vehicle charging, as it name suggest wireless means purposed system transfer power wirelessly.
- To maximize energy consumption.
- To design for when the coils are placed close to each other with coinciding axes, which indicates high coupling between the coils and expected to have maximum power transfer in contactless systems.

2. LITERATURE REVIEW

2.1 Literature survey:

1. Wireless Power Transfer For Electric Vehicle Applications
   Author :- Siqi Li, Member, IEEE, and Chunting Chris Mi, Fellow, IEEE
   Wireless power transfer (WPT) using magnetic resonance is the technology which could set human free from the annoying wires. In fact, the WPT adopts the same basic theory which has already been developed for at least 30 years with the term inductive power transfer. WPT technology is developing rapidly in recent years. At kilowatts power level, the transfer distance increases from several millimeters to several hundred millimeters with a grid to load efficiency above 90%. The advances make the WPT very attractive to the electric vehicle (EV) charging applications in both stationary and dynamic charging scenarios. This paper reviewed the technologies in the WPT area applicable to EV wireless charging. By introducing WPT in EVs, the obstacles of charging time, range, and cost can be easily mitigated. Battery technology is no longer relevant in the mass market penetration of EVs. It is hoped that researchers could be encouraged by the state- of-the-art achievements, and push forward the further development of WPT as well as the expansion of EV.

2. Wireless Power Transfer System via Magnetic Resonant Coupling at Fixed

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Resonance Frequency Power Transfer System Based on Impedance Matching Author:- TeckChuan Beh1, Masaki Kato1, Takehiro Imura1, Yoichi Hori1

To increase the usage of electric vehicles (EV), a safe and convenient method to charge the vehicles is essential. Recently, an efficient mid range wireless power transfer that uses magnetic resonant coupling, WiTricity, was proposed, and has received much attention due to its practical range and efficiency. Studies show that the resonance frequency of the antennas changes as the gap between the antennas change. However, when this technology is applied in the MHz range (which allows small sized antennas), the usable frequency is bounded by the Industrial, Science, Medical (ISM) band. Therefore, to achieve maximum power transmission efficiency, the resonance frequency must be fixed within the ISM band. In this paper, the possibility of using impedance matching (IM) networks to adjust the resonance frequency of a pair of antennas at a certain distance to 13.56MHz is studied. The simulations and experiments show that the IM circuits can change the frequency to
13.56MHz for different air gaps, improving the power transfer efficiency. Experiments also show that IM can be achieved just by observing and
minimizing the reflected wave.

3. Modeling And Analysis of Wireless Power Transmission System For Inspection Robot Author:- Mingbo Yang, Guodong Yang, En Li, Zize Liang, Hao Lin

A wireless power transmission technique based robotic power management system for prolonging continuous working time of one transmission line inspection robot is introduced in this paper. Magnetic resonance coupled WPT (wireless power transmission) unit is designed and analyzed in form of electrical circuit mode theory. Impedance matching is introduced and a special matching method for four coils resonance coupled based WPT is given. The output power of WPT unit is modeled and relationship between coupled coefficient, angular frequency and amount of output power is given and energy consumption of each unit in power management system is quantified. Experiment shows that models can precisely describe the character ofvWPT system and it performs to be applicable for charging the inspection robot wirelessly

4. Wireless Power Transfer (WPT) for Electric Vehicles (EVs)—Present and Future Trends
Author :- D.M. Vilathgamuwa and J.P.K. Sampath

100 year old gasoline engine technology vehicles have now become one of the major contributors of greenhouse gases. Plug-in Electric Vehicles (PEVs) have been proposed to achieve environmental friendly transportation. Even though the PEV usage is currently increasing, a technology breakthrough would be required to overcome

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battery related drawbacks. Although battery technology is evolving, drawbacks inherited with batteries such as; cost, size, weight, slower charging characteristic and low energy density would still be dominating constrains for development of EVs. Furthermore, PEVs have not been accepted as preferred choice by many consumers due to charging related issues. To address battery related limitations, the concept of dynamic Wireless Power Transfer (WPT) enabled EVs have been proposed in which EV is being charged while it is in motion. WPT enabled infrastructure has to be employed to achieve dynamic EV charging concept.

5. Safe Wireless Power Transfer to Moving Vehicles: Design of Radiation less Antenna
Author :- Dr. Sven Beiker, Dr. Richard Sassoon, Sunil Sandhu
This project aims at the feasibility of wirelessly charging the electric vehicles cruising on the high way. We explored a wireless power transfer mechanism utilizing high quality magnetic resonances. We demonstrated numerically and experimentally that the energy could be transferred efficiently between two magnetically coupled resonating coils in a complex electromagnetic environment.

3. SYSTEM DESIGN

3.1 BLOCK DIAGRAM

2 BLOCK DIAGRAM DISCRIPTION

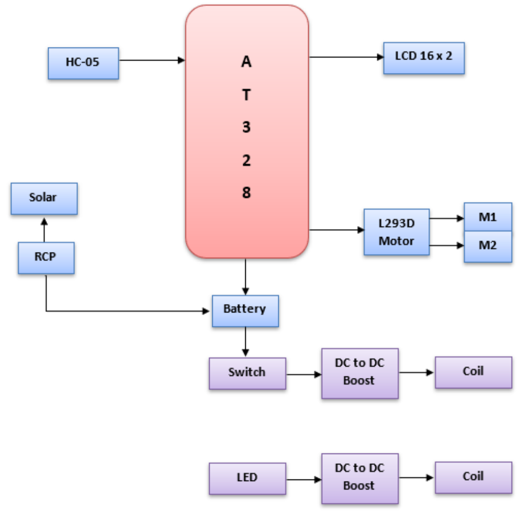

Fig. 3.1 Block Diagram

The DC voltage can be stored in the battery bank by a charge controller. An inverter is employed to convert the DC voltage from the battery bank to 110-volt AC at 60 Hz frequency that is identical to the power from the electric outlet. This project will address the fundamental concepts of designing and developing charging systems for charging electrical vehicles.
Commands will be transmitted through Bluetooth APP and commands are read, by microcontroller.
With that Commands, the movement will happen with the help of L293D motor driver of two DC motors.
Vehicle motion will happen with two wheels & One 360 rotating wheel. (Right / Left/ forward / backward)
With the help of magnetic coil charge transmission will happen wirelessly
Those should be two magnetic coils

- Transmitter Coil
- Receiver Coil.

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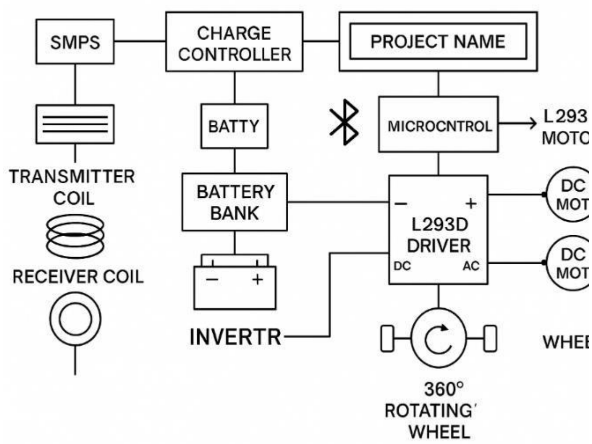
Whatever Battery voltage is there that will be displayed on LCD Display.
After switch on project name will be shown on LCD Display.
We will use SMPS as grid, main power source to charge battery.

2 BLOCK DIAGRAM DISCRIPTION



4. HARDWARE AND SOFTWARE REQUIREMENTS

4.1 HARDWARE REQUIREMENTS

MICROCONTROLLER:

Arduino was born at the Ivrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IoT applications, wearable, 3D printing, and embedded environments.

Arduino is a single-board microcontroller to make using electronics in multidisciplinary projects more accessible.
The hardware consists of a simple open source hardware board designed around an 8- bit Atmel AVR microcontroller, or a 32-bit Atmel ARM. The software consists of a standard programming language compiler and a bootloader that executes on the microcontroller.

Microcontroller:

ATmega328

• Operating Voltage: 5V

• Input Voltage(recommended):7-12V

• Input Voltage (limits): 6-20V

• Digital I/O Pins: 14 (of which 6 provide PWM output)

• Analog Input Pins: 6

• DC Current per I/O Pin: 40mA

• DC Current for 3.3V Pin: 50mA

• Flash Memory: 32 KB(ATmega328)

• SRAM: 2 KB (ATmega328)

• EEPROM: 1 KB (ATmega328)

• Clock Speed: 16 MHz

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has

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14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB- to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter. "Uno" means "One" in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform.

Arduino microcontroller is a small computer board which is easy to use besides is something come with open-source, which means hardware is reasonably priced and development software is free. With Arduino, ones can write programs and freely creating an interface circuits to read switches and other sensor, and also controlling motors and lights with a very simple steps.

In its simplest form, an Arduino is a tiny computer that you can program to process inputs and outputs going into and from the chip. The Arduino is what is known as a Physical or Embedded Computing platform, which means that it is an interactive system, that through the use of hardware and
software can interact with its environment.

For example, a simple use of the Arduino would be to turn a light on for a set period of time, let's say 30 seconds, after a button has been pressed (we will build this very same project later in the book). In this example, the Arduino would have a lamp connected to it as well as a button. The Arduino would sit patiently waiting for the button to be pressed. When you press the button it would then turn the lamp on and start counting. Once it had counted 30 seconds it would then turn the lamp off and then carry on sitting there waiting for another button press. You could use this set-up to control a lamp in an under- stair's cupboard for example. You could extend this example to sense when the cupboard door was opened and automatically turn the light on, turning it off after a set period of time.

The Arduino can be used to develop stand-alone interactive objects, or it can be connected to a computer to retrieve or send data to the Arduino and then act on that data (e.g. Send sensor data out to the internet). The Arduino can be connected to LED's. Dot Matrix displays, LED displays, buttons, switches, motors, temperature sensors, pressure sensors, distance sensors, webcams, printers, GPS receivers, Ethernet modules. The Arduino board is made of an Atmel AVR Microprocessor, a crystal or oscillator (basically a crude clock that sends time pulses to the microcontroller to enable it to operate at the correct speed) and a 5-volt linear regulator. Depending on what type of
Arduino you have, you may also have a USB

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connector to enable it to be connected to a PC or Mac to upload or retrieve data. The board exposes the microcontroller's I/O (Input/Output) pins to enable you to connect those pins to other circuits or to sensors, etc. To program the Arduino (make it do what you want it to) you also use the Arduino IDE (Integrated Development Environment), which is a piece of free software, that enables you to program in the language that the Arduino understands. In the case of the Arduino the language is C. The IDE enables you to write a computer program, which is a set of step-by step instructions that you then upload to the Arduino. Then your Arduino will carry out those instructions and interact with the world outside. In the Arduino world, programs are known as sketches.

LCD stands for Liquid Crystal Display. LCD is finding widespread use replacing LEDs (seven segment LEDs or other multi segment LEDs) because of the following reasons:

1. The declining prices of LCDs.

2. The ability to display numbers, characters and graphics. This contrasts with LEDs, which are limited to numbers and a few characters.

3. Incorporation of a refreshing controller into the LCD, thereby relieving the CPU of the task of refreshing the LCD. In contrast, the LED must be refreshed by the CPU to keep displaying the data.

4. Ease of programming for characters and graphics.

These components are "specialized" for being used with the microcontrollers, which means that they cannot be activated by standard IC circuits. They are used for writing different messages on a miniature LCD.

Fig LCD Display

POWER SUPPLY:

The input to the circuit is applied from the regulated power supply. The a.c. input i.e., 230V from the mains supply is step down by the transformer to 12V and is fed to a rectifier. The output obtained from the rectifier is a pulsating d.c voltage. So, in order to get a pure d.c voltage, the output voltage from the rectifier is fed to a filter to remove any a.c components present even after rectification. Now, this voltage is given to a voltage regulator to obtain a pure constant dc voltage.

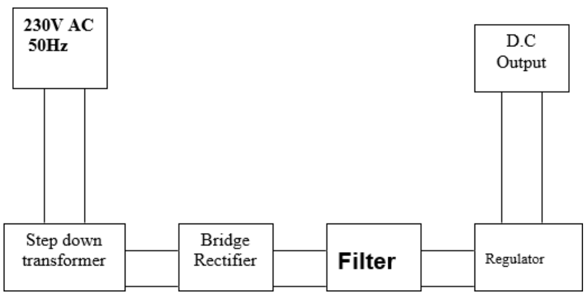

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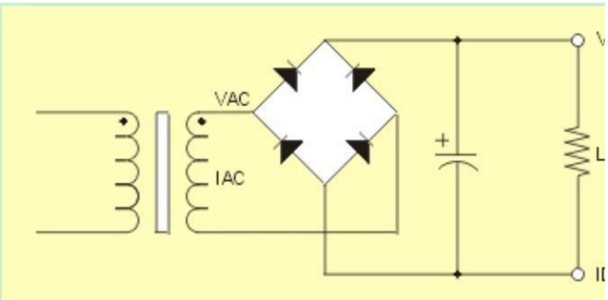
Fig: Power supply

TRANSFORMER:

Usually, DC voltages are required to operate various electronic equipment and these voltages are 5V, 9V or 12V. But these voltages cannot be obtained directly. Thus, the a.c input available at the mains supply i.e., 230V is to be brought down to the required voltage level. This is done by a transformer. Thus, a step-down transformer is employed to decrease the voltage to a required level.

RECTIFIER:

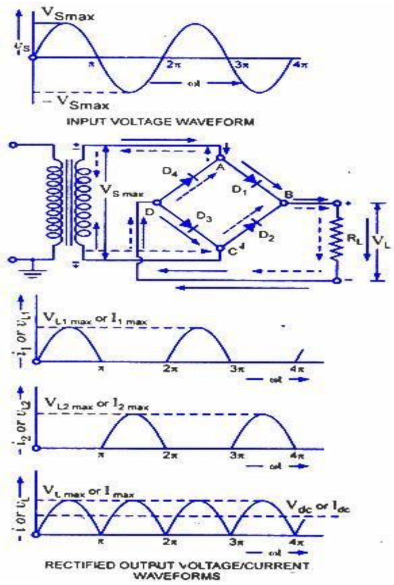
The output from the transformer is fed to the rectifier. It converts A.C. into pulsating D.C. The rectifier may be a half wave or a full wave rectifier. In this project, a bridge rectifier is used because of its merits like good stability and full wave rectification.



The Bridge rectifier is a circuit, which converts an ac voltage to dc voltage using both half cycles of the input ac voltage. The Bridge rectifier circuit is shown in the figure. The circuit has four diodes connected to form a bridge. The ac input voltage is applied to the diagonally opposite ends of the bridge. The load resistance is connected between the
other two ends of the bridge.

For the positive half cycle of the input ac voltage, diodes D1 and D3 conduct, whereas diodes D2 and D4 remain in the OFF state. The conducting diodes will be in series with the load resistance RL and hence the load current flows through RL.

For the negative half cycle of the input ac voltage, diodes D2 and D4 conduct whereas, D1 and D3 remain OFF. The conducting diodes D2 and D4 will be in series with the load resistance RL and hence the current flows through RL in the same direction as in the previous half cycle. Thus, a bi-directional wave is converted into a unidirectional wave.



Bridge Rectifier

FILTER:

Capacitive filter is used in this project. It removes the ripples from the output of rectifier and smoothens the D.C. Output received from this filter is constant until the mains voltage and load is maintained constant. However, if either of the two is varied, D.C. voltage received at this point changes. Therefore, a regulator is applied at the output stage.

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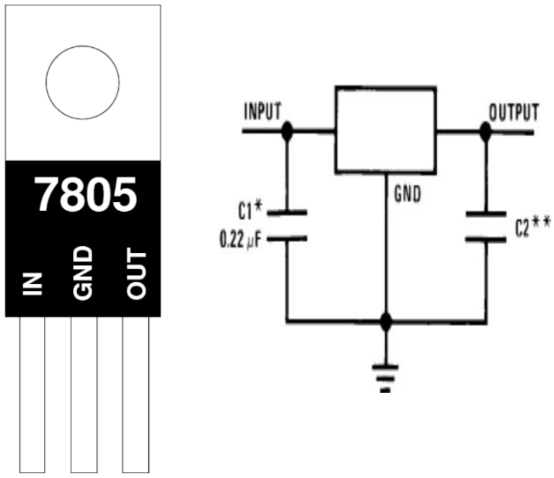
VOLTAGE REGULATOR:

As the name itself implies, it regulates the input applied to it. A voltage regulator is an electrical regulator designed to automatically maintain a constant voltage level. In this project, power supply of 5V and 12V are required. In order to obtain these voltage levels, 7805 and 7812 voltage regulators are to be used. The first number 78 represents positive supply and the numbers 05, 12 represent the required output voltage levels. The L78xx series of three-terminal positive regulators is available in TO-220, TO- 220FP, TO-3, D2PAK and DPAK packages and several fixed output voltages, making it useful in a wide range of applications. These regulators can provide local on-card regulation, eliminating the distribution problems associated with single point regulation. Each type employs internal current limiting, thermal shut-down and safe area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1 A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltage and currents.



DC MOTOR

An electric motor is a machine which converts electrical energy into mechanical energy.

Principles of operation

In any electric motor, operation is based on simple electromagnetism. A current-carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field. As you are well aware of from playing with magnets as a kid, opposite (North and South) polarities attract, while like polarities (North and North, South and South) repel. The internal configuration of a DC motor is designed to harness the magnetic interaction between a current-carrying conductor and an external magnetic field to generate rotational motion.

4.2 SOFTWARE REQUIREMENTS

ARDUINO software is used

HOW TO START WITH ARDUINO SOFTWARE

1. | Get an Arduino or Genuino board and USB cable. ...
2. | Download and install the Arduino Software (IDE) ...
3. | Connect the board. ...
4. | Install the board drivers. ...
5. | Launch the Arduino Software (IDE) ...
6. | Open the blink example. ...
7. | Select your board. ...
8. | Select your serial port.

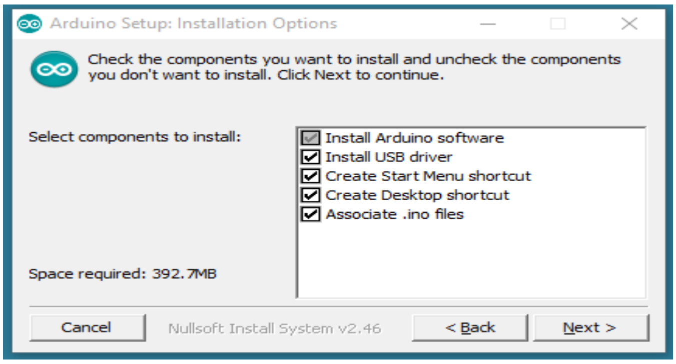
1. Get an Arduino or Genuino board and USB cable

In this tutorial, we assume you're using an Arduino or Genuino Uno or an Arduino or Genuino Mega 2560. If you are using a retired board as Arduino Duemilanove, Nano or Diecimila please refer to the driver installation instructions end of this document. If you have another board, read the corresponding page linked in the main getting started page.

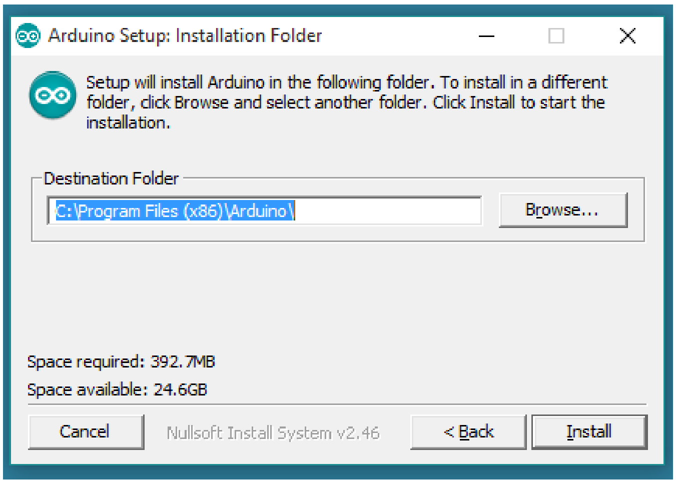
2. Download and install the Arduino Software (IDE)

Get the latest version from the download page. You can choose between the Installer (.exe) and the Zip packages. We suggest you use the first one that installs directly everything you need to use the Arduino Software (IDE), including the drivers. With the Zip package you need to install the drivers manually.

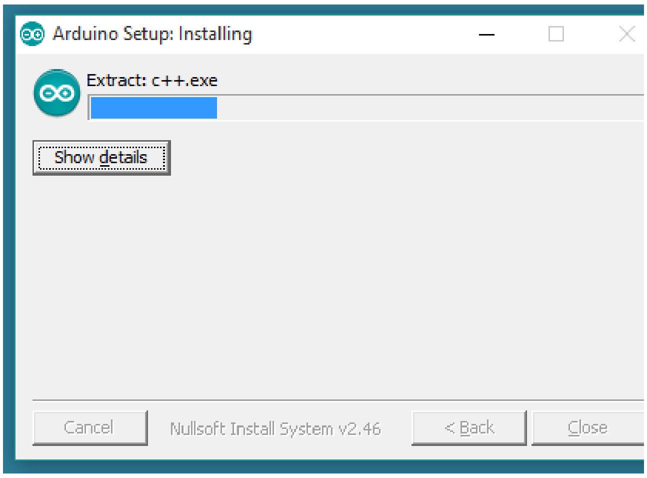
When the download finishes, proceed with the installation and please allow the driver installation process.



Choose the components to install



Choose the installation directory (we suggest to keep the default one)



The process will extract and install all the required files to execute properly the Arduino Software (IDE)

3. Connect the board

The USB connection with the PC is necessary to program the board and not just to power it up. The Uno and Mega automatically draw power from either the USB or an external power supply. Connect the board to your computer using the USB cable. The green power LED (labelled PWR) should go on.

4. Install the board drivers

If you used the Installer, Windows - from XP up to 10 - will install drivers automatically as soon as you connect your board.

If you downloaded and expanded the Zip package or, for some reason, the board wasn't properly recognized, please follow the procedure below.

- Click on the Start Menu, and open up the Control Panel.
- While in the Control Panel, navigate to System and Security. Next, click on System. Once the System window is up, open the Device Manager.
- Look under Ports (COM & LPT). You should see an open port named "Arduino UNO (COMxx)". If there is no COM & LPT section, look under "Other Devices" for "Unknown Device".
- Right click on the "Arduino UNO (COmxx)" port and choose the "Update Driver Software" option.
- Next, choose the "Browse my computer for Driver software" option.
- Finally, navigate to and s
- elect the driver file named "arduino.inf", located in the "Drivers" folder of the Arduino Software download (not the "FTDI USB Drivers" sub-directory). If you are using an old version of the IDE (1.0.3 or older), choose the Uno driver file named "Arduino UNO.inf"

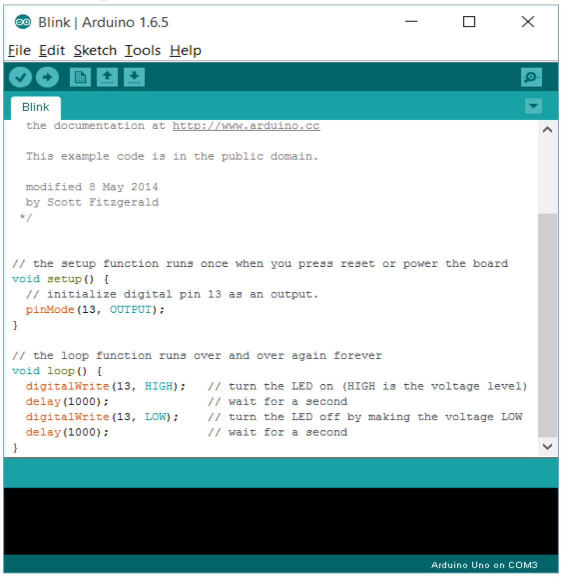
- Windows will finish up the driver installation from there.

5. Launch the Arduino Software (IDE)

Double-click the Arduino icon (arduino.exe) created by the installation process. (Note: if the Arduino Software loads in the wrong language, you can change it in the preferences dialog.

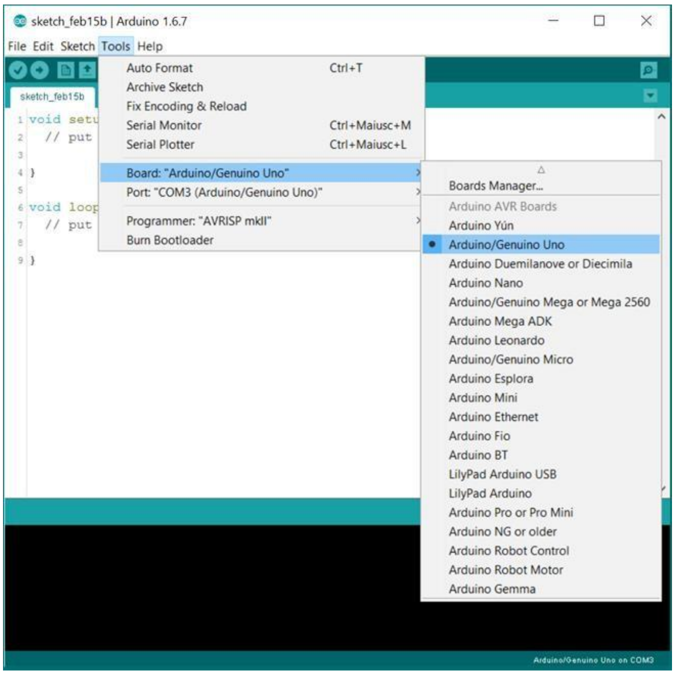
6. Open the blink example

Open the LED blink example sketch: File > Examples >01.Basics > Blink.



7. Select your board

You'll need to select the entry in the Tools > Board menu that corresponds to your Arduino or Genuino board.



8. Select your serial port

Select the serial device of the board from the Tools | Serial Port menu. This is likely to be COM3 or higher (COM1 andCOM2 are usually reserved for hardware serial ports). To find out, you can disconnect your board and re-open the menu; the entry that disappears should be the Arduino or Genuino board.
Reconnect the board and select that serial port.

9. Upload the program

Now, simply click the "Upload" button in the environment. Wait a few seconds - you should see the RX and TX leds on the board flashing. If the upload is successful, the message "Done uploading." will appear in the status bar.

A few seconds after the upload finishes, you should see the pin 13 (L) LED on the board start to blink (in orange). If it does, congratulations! You've gotten Arduino or Genuino up-and-running.

PROTEUS

What Is Proteus??

Basically, PROTEUS is also a simulating software, but it helps you attach many components with the Arduino. Like resistors, capacitors, LEDs, LCDs, keypads, ICs etc. and these are just few that I have named in general. It has a complete library, and you will find everything that you will ever need. You can design your complete circuit and then simulate it to view the final output. This means that after perfecting your project on the programming side in KEIL, you'll need to simulate it on PROTEUS to determine the output of the hardware components and change it if need be. This will completely ensure your project's success.

USING PROTEUS

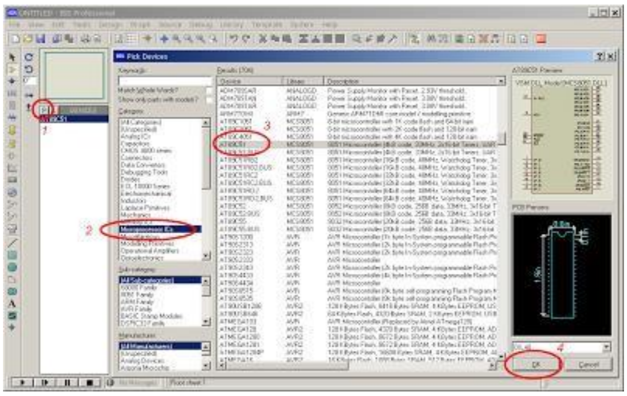
PROTEUS is designed to be user-friendly, and you will get the hold of it instantly. There is no need to worry about some complex configuration / settings prior to simulation. Here are the basic steps.

- Place your components from the library
- Connect them accordingly
- Load HEX file (if Arduino is involved)
- Simulate the circuit

UNDERSTAND EACH STEP IN DETAIL

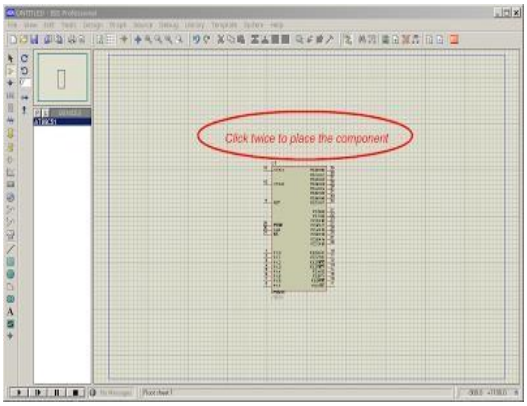
1. **PLACING COMPONENTS**

- Click the "Pick from library (P)" button as shown in the figure
- Select any category
- Select item from the list
- Click OK



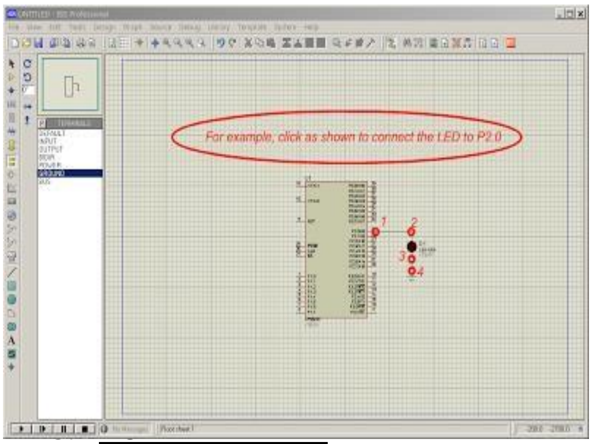
- After selecting component, click anywhere in the design area to select it and then click again to place it

2. CONNECTING COMPONENTS



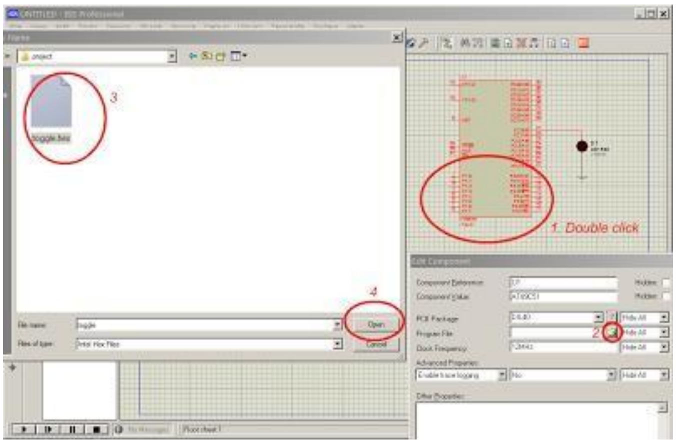
- Place all the required components

- Connect the desired nodes by clicking at starting and ending points



- Double click the Arduino component to open its properties

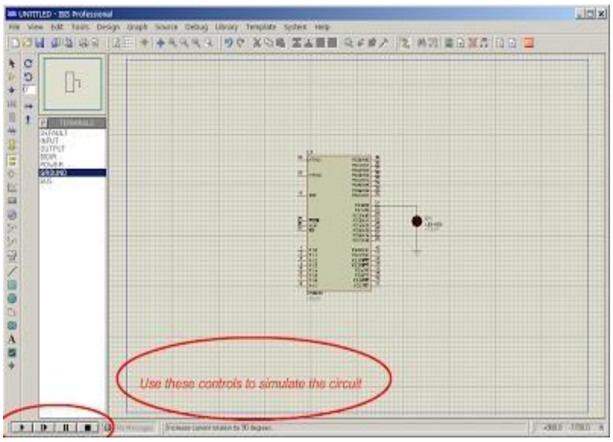
- Browse for the HEX file as shown and select it



And don't worry, in PROTEUS, there is no need to provide the RESET circuit or crystal oscillator to the Atmega 328. It will work just fine even without it. The frequency can be adjusted in the properties window as well.

4. SIMULATING THE CIRCUIT

- The controls at the left-bottom corner will help you simulate the circuit in real time



The above picture is the complete circuitry for testing an LED on P2.0 like toggling (ON / OFF) through programming but we will get to that part later on. At this point, you will just see the LED glow if you have programmed it to be always ON.

Like this developer done design on Proteus before starts working on Hardware.

PCB DESIGN

A **printed circuit board** (**PCB**) mechanically supports and electrically connects electronic components using conductive tracks, pads and other features etched from copper sheets laminated onto a non- conductive substrate. Components – capacitors, resistors or active devices – are generally soldered on the PCB. Advanced PCBs may contain components embedded in the substrate.

PCBs can be single sided (one copper layer), double sided (two copper layers) or multi-layer (outer and inner layers).
Conductors on different layers are connected with vias. Multi-layer PCBs allow for much higher component density.

FR-4 glass epoxy is the primary insulating substrate. A basic building block of the PCB is an FR-4 panel with a thin layer of copper foil laminated to one or both sides. In multi-layer boards multiple layers of material are laminated together.

Printed circuit boards are used in all but the simplest electronic products. Alternatives to PCBs include wire wrap and point-to-point construction. PCBs require the additional design effort to lay out the circuit, but manufacturing and assembly can be automated. Manufacturing circuits with PCBs is cheaper and faster than with other wiring methods as components are mounted and wired with one single part. A minimal PCB with a single component used for easier modeling is called breakout board.

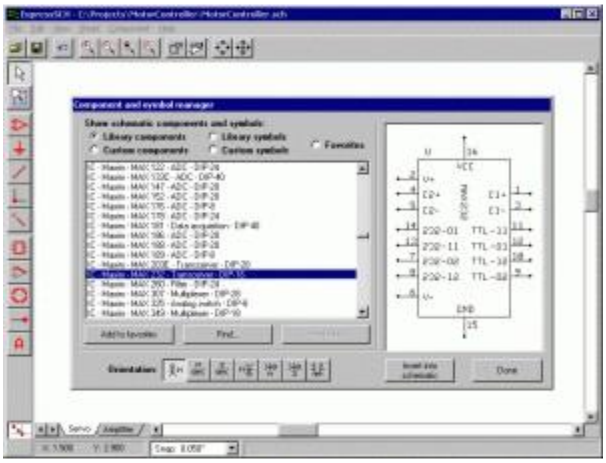
When the board has no embedded components, it is more correctly called a printed wiring board (PWB) or etched wiring board. However, the term printed wiring board has fallen into disuse. A PCB populated with electronic components is called a printed circuit assembly (PCA), printed circuit board assembly or PCB assembly (PCBA).

The IPC preferred term for assembled boards is circuit card assembly (CCA),[2] and for assembled backplanes it is backplane assemblies. The term PCB is used informally both for bare and assembled boards.

Express PCB is a free CAD software, specially designed to help us to create printed circuit board. Express PCB is the program that will be used to design printed circuits boards and Express SCH is a program that can be used do design a circuit diagram (to draw circuits) ..

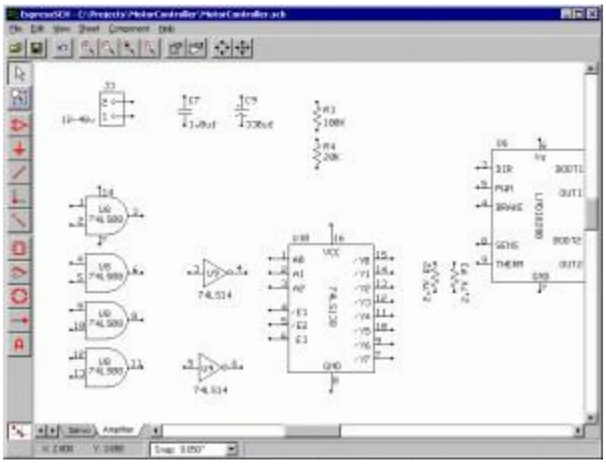
Steps To Start With Express SCH

Step 1- Select the Components



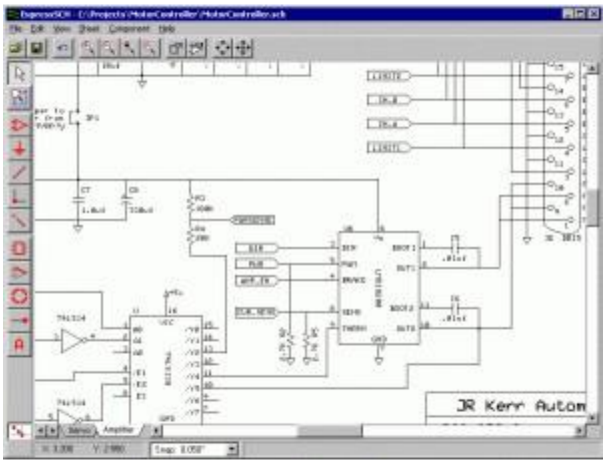
Begin your schematic by placing the components. Select the parts from the *Component Manager* dialog box. *Express SCH* includes a large library with hundreds of component symbols (ICs, resistors, capacitors…) that you can use to draw your electronic circuits.

Step 2- Position the Components



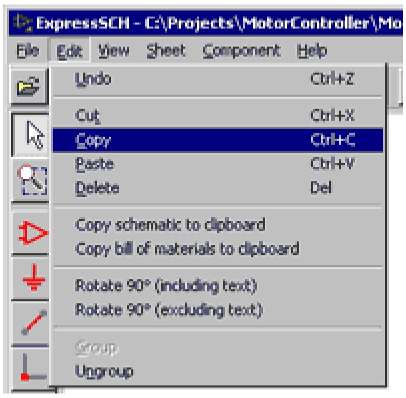
Drag each component to the desired location on the page. The Snap to grid feature makes it easy to neatly align the symbols. If all of the components do not fit on a single page, add additional sheets. All the sheets of a schematic are linked together and saved in one file.

Step 3- Add the Wires



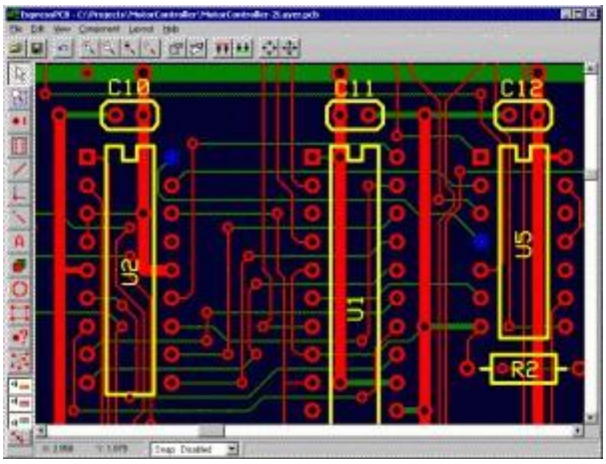
Now draw the wires to connect the parts together. Add each wire by clicking on a component's pin, then dragging the wire to the pin it connects to.

Step 4- Edit the Schematic



Making changes to a schematic is simple using standard commands such as Copy, Cut and Paste. Rearranging the components is easy by dragging them with the mouse. Wires always stay connected to their pins, even when you move things around.

Step 5- Link the Schematic and PCB

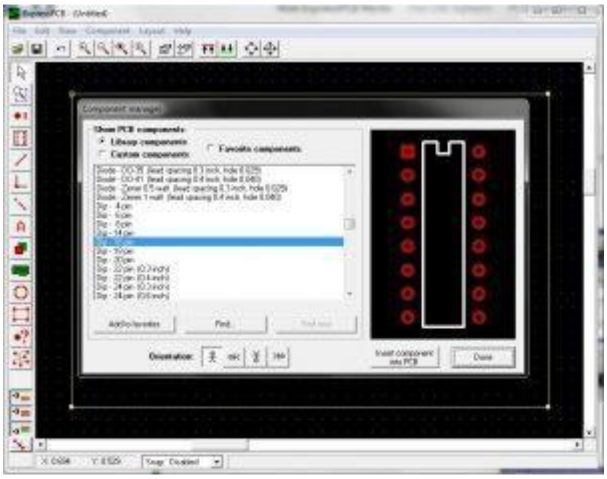


After you complete your schematic, it can be

linked to your circuit board layout file.This image of the ExpressPCB layout program shows how it guides you in designing your board by highlighting in blue the pins that should be wired together.

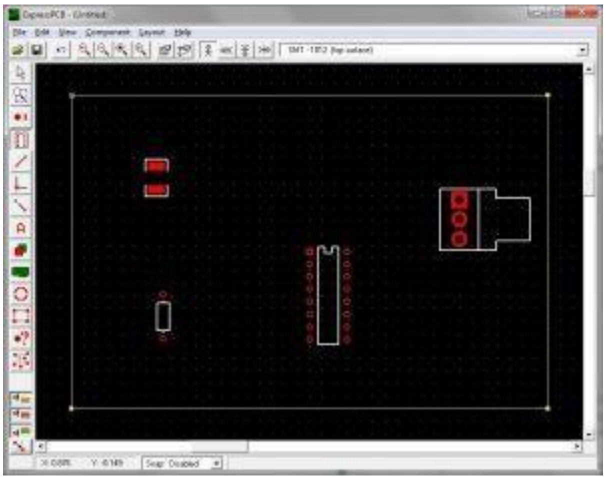
Steps To Start With Express PCB

Step 1- Select the Components



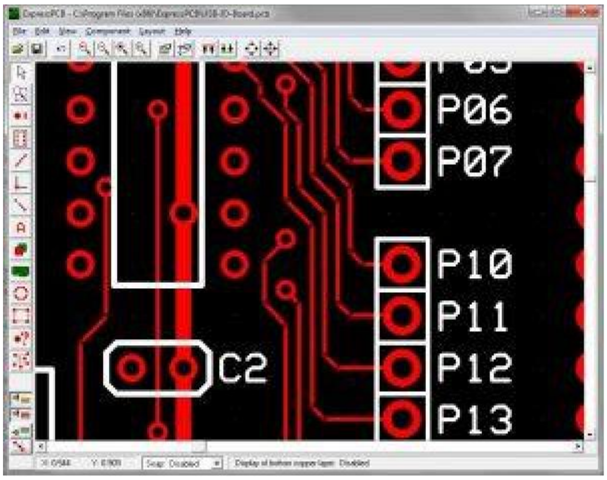
Begin your layout by adding the components. Select the parts from the Component Manager dialog box. Many components (such as connectors) include Digi-key part numbers to make ordering easy.

Step 2:- Position the Components



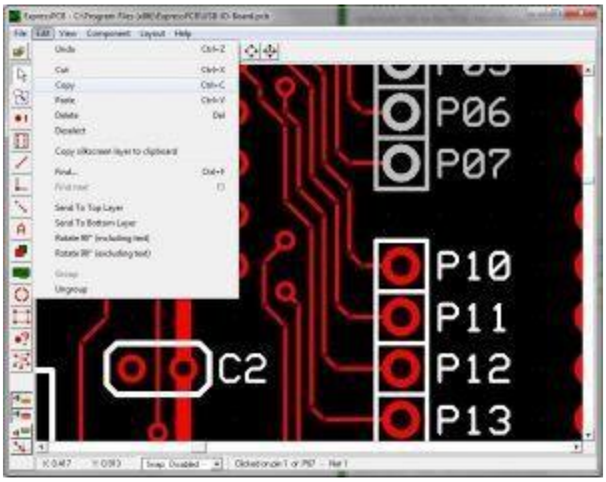
Drag each component to the desired location on your board. The *Snap to grid* feature makes it easy to neatly align the parts.

Step 3 :-Add the Traces



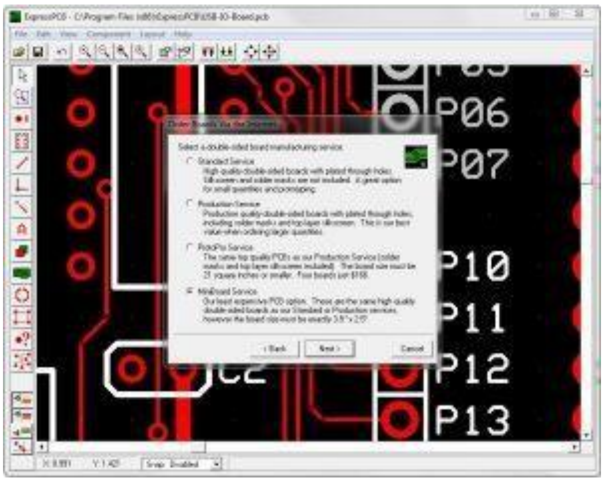
Now add each trace by clicking on the pin of a component and dragging the trace to another pin. If you link your schematic file to the PCB, then the Express PCB program highlights the pins that should be wired together in blue.

Step 4- Edit the Layout



Making changes is simple using standard commands such as Copy, Cut and Paste. Rearrange the parts by dragging them with the mouse. Traces always stay connected to their pins, even when you move things around. You can set the properties of items in your layout by double-clicking on them. For example, double-click on a trace to change its layer or width.

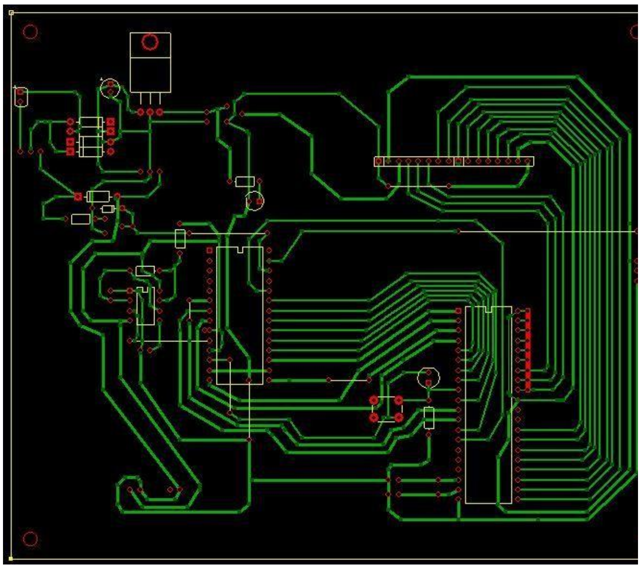
Step 5:-



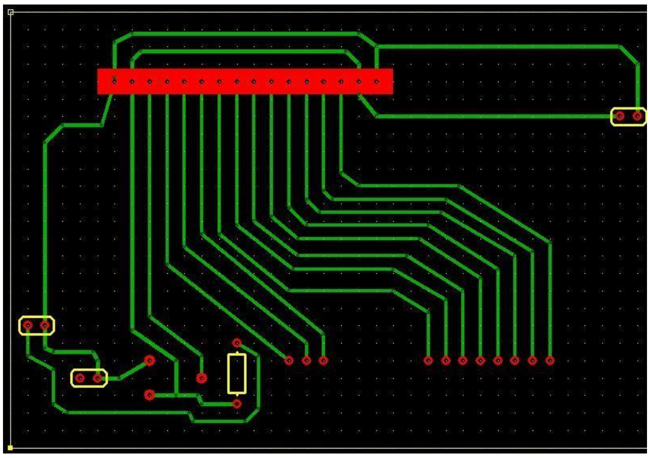
Completing PCB layout in Express PCB.

BOARD LAYOUT

1. **Arduino development Board**



1. **LCD Display**



5. SIMULATION

5.1 CIRCUIT DIAGRAM

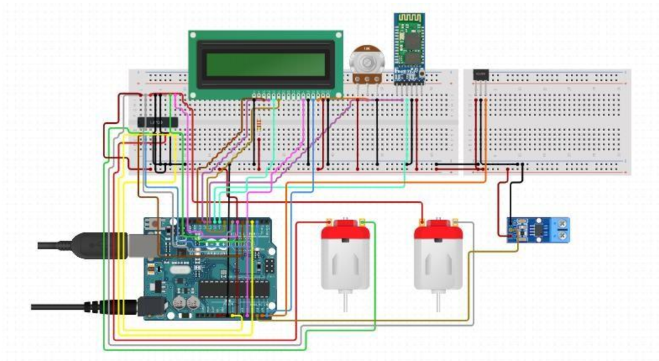


Fig 5.1 Circuit Diagram

6. OTHER SPECIFICATIONS

6.1 APPLICATIONS

- These charging stations can be installed in the parking lots of shopping centers,

  offices, restaurants, gyms, rest stops along highways, parks, among others, making it easy for the public to charge their vehicles and reduce range anxiety.

-

6.2 ADVANTAGES AND DISADVANTAGES:

✅ Advantages of Movable Solar-Based Wireless EV Charging Station

🔆 Renewable Energy Source:

Utilizes solar power, reducing dependency on grid electricity and lowering carbon emissions.

🚛 Mobility and Flexibility:

Can be relocated easily to serve different areas or during emergencies, events, or remote locations.

🔌 Wireless Convenience:

Offers contactless charging, eliminating the need for physical cables and enhancing user convenience.

💡 Off-Grid Operation:

Capable of functioning in off-grid locations where traditional EV infrastructure is unavailable.

🌍 Environmentally Friendly:

Promotes sustainable transportation by combining clean energy with electric vehicle use.

🛠 Easy Deployment:

Does not require permanent infrastructure, making it faster and cheaper to deploy in temporary or pilot scenarios.

📉 Disadvantages of Movable Solar-Based Wireless EV Charging Station

⚡ Low Efficiency: Wireless charging has higher energy losses compared to wired charging, reducing overall system efficiency.

⛅ Limited Solar Power Generation:

Portable units can only carry a small number of solar panels, restricting energy output.

☁ Weather Dependency:

Charging capability is affected by sunlight availability, requiring expensive batteries for energy storage during cloudy days or at night.

🎯 Alignment Issues:

Wireless systems need precise alignment between transmitter and receiver, which is hard to maintain on a movable base.

💰 High Cost & Complexity:

Integrating solar panels, wireless technology, batteries, and mobility increases setup cost and maintenance requirements.

🚗 Limited EV Compatibility:

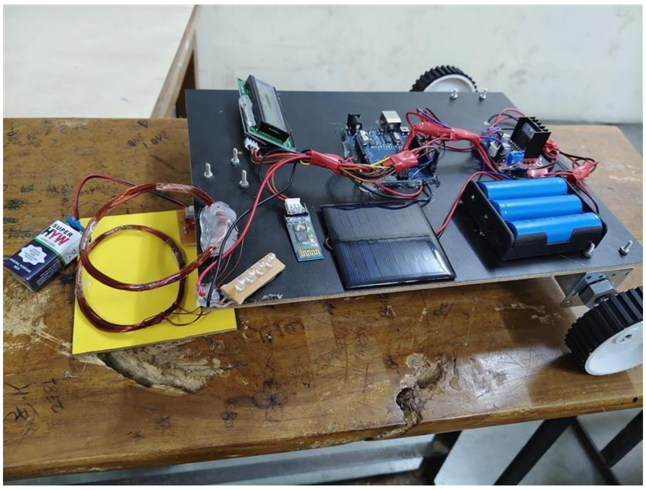
Many EVs don’t yet support wireless charging, reducing practicality and market readiness.

7. RESULTS AND DISCUSSION
8. The system makes use of a solar panel, battery, transformer, regulator circuitry, copper coils, AC to DC converter, Atmega controller and LCD display to develop the system. The system demonstrates how electric vehicles can be charged while

moving on the road, eliminating the need to stop for charging. The solar panel is used to power the battery through a charge controller. The battery is charged and stores dc power. The DC power now needs to be converted to AC for transmission. For this purpose, we here use a transformer.

The power is converted to AC using a transformer and regulated using regulator circuitry. This power is now used to power the copper coils that are used for wireless energy transmission. A copper coil is also mounted underneath the electric vehicle. When the vehicle is driven over the coil's energy is transmitted from the transmitter coil to ev coil. Please note the energy is still DC current that is induced into this coil. Now we convert this to DC again so that it can be used to charge the EV battery. We use AC to DC conversion circuitry to convert it back to DC current. Now we also measure the input voltage using an Atmega microcontroller and display this on an LCD display. Thus, the system demonstrates a solar powered wireless charging system for electric vehicles that can be integrated in the road.

The following figure shows the hardware setup of the project:



8. CONCLUSION

The development of the Charging system for batteries project comprised of various disciplines like electrical, electronics, and mechanical engineering technologies. This project attempted to provide a framework for the battery charging station. The proposed charging system will be one of the initiatives taken to achieve a Green campus. It is clearly evident that the proposed battery charging system is better than the existing electrical charging system both in terms of operation and economical aspects. Researchers work on this project get a basic idea of the design and building of systems for several useful applications such as electrical vehicle system.