VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"Jnana Sangama", Machhe, Belagavi, Karnataka-590018

Mini Project Report

On

"Solar Wireless electric vehicle charging System"

Submitted for the partial fulfillment of the requirements for the award of the degree of

BACHELOR OF ENGINEERING

In

ELECTRICAL & ELECTRONICS ENGINEERING

Submitted By

MANJUSHREE A R

Under the guidance of

SHILPASHRI V N

Assistant professor

Department of EEE

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

(B.E (E&E) Program Accredited by NBA, New Delhi, Validity from 01.07.2024 to 30.06.2027)

GSSS INSTITUTE OF ENGINEERING & TECHNOLOGY FOR WOMEN

(Affiliated to VTU, Belagavi, Approved by AICTE, New Delhi & Govt. of Karnataka)

K.R.S Road, METAGALLI, MYSURU-570016, KARNATAKA

Accredited with Grade "A" by NAAC

2024-25

Geetha Shishu Shikshana Sangha (R)

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This is to Certify that the Mini Project work entitled “Solar Wireless electric vehicle charging System” is a bonafide work carried out by MANJUSHREE A R(4GW22EE031), in the fulfillment towards fifth semester of Bachelor of Engineering in Electrical and Electronics Engineering of the Visvesvaraya Technological University, Belagavi, during the year 2024-25. Mini Project has been approved as it satisfies the academic requirements with respect to the Mini Project prescribed for Bachelor of Engineering Degree.

Signature of Guide	Signature of HOD	Signature of Principal
SHILPASHRI V N	Dr. G Sreeramulu Mahesh	Dr. Shivakumar M
Assistant Professor	Professor and Head	Principal
Department of EEE	Department of EEE	GSSSIETW

ACKNOWLEDGEMENT

The joy and satisfaction that accompany the successful completion of any task would be incomplete without the mentioning the people who made it possible.

First and foremost we offer our sincere phrases of thanks to Late Smt. Vanaja B Pandit, Former Honorary Secretary, GSSS(R), Mysuru for the blessings and support. We would like to dedicate our Mini project to the founder of GSSS(R) Late. Professor B S Pandit.

We offer our sincere thanks to Smt. Anupama B Pandit, Secretary, GSSS(R) and the Management of GSSSIETW, Mysuru for providing help and support to carry out the project.

We would like to express our gratitude to our Principal, Dr. Shivakumar M for providing us a congenial environment for engineering studies and also for having showed us the way to carry out the seminar.

We consider it is a privilege and honour to express our sincere thanks to Dr. G. Sreeramulu Mahesh, Professor and Head, Department of Electrical and Electronics Engineering for his support and invaluable guidance throughout the tenure of this Project.

We would like to thank our Guide Ms. Shilpashri V N, Assistant Professor, Department of Electrical and Electronics Engineering for his/her support, guidance, motivation, encouragement for the successful completion of this seminar.

We would like to thank our Mini Project Co-ordinator Ms. Apoorvashree H L, Assistant Professor, Department of Electrical and Electronics Engineering for her constant monitoring, guidance & motivation throughout the tenure of this project work.

We intend to thank all the teaching and non teaching staffs of Electrical & Electronics Engineering for their immense help and co-operation.

Finally we would like to express gratitude to our parents and friends who always helped to complete this work successfully.

Manjushree A R

Subject Name: Mini Project / (BEE586)
Semester: 5th Semester, Odd 2024-25

COURSE OUTCOMES

At the end of Mini Project, Students will be able to:

- Identify the problem statement and formulation of objectives.
- Inculcate the habit of research through literature review on current technology.
- Able to function effectively as an individual and in team in multidisciplinary settings to communicate effectively with engineering society.
- Design and implementation by modern tool usage, documentation and presentation.

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ABSTRACT

This project details the planning and design of a solar-powered charging for electric vehicles, a solution to the dual problems of expensive gasoline and harmful emissions. The number of countries with electric vehicles on the road is steadily rising. In addition to helping the environment, electric vehicles have proven useful in cutting down on transportation costs by substituting expensive fuel with much more affordable power. Here, we create a novel and effective answer to this problem by designing an electric vehicle charging infrastructure. There is no need to stop for charging because the EV can do so while it is in motion; the system is powered by solar energy; and there is no need for an additional power source. For its construction, the system employs a solar panel, battery, relay switch, buck converter, copper coils, IR sensor, Arduino nano, and LCD display. This technology follows the ideology that charging electric vehicles can be done without having to pull over to a charging station. So, the technology proves the viability of a road integrated, solar-powered wireless charging system for EVs.

Chapter-01: INTRODUCTION

1.1 General Introduction

Electric vehicles are viewed as a major element in the establishment of this lengthy transport network. They are, on average, significantly more energy efficient than fossil fuelpowered vehicles. The increased demand of electric vehicles can result in global warming and other air polluting materials, such as No and particle matter (PM), and so improve the surrounding air and protect the environment. Also, the popularity of these cars demands greater power output to charge their storage batteries, hence the averted carbon dioxide production would be partially set off by additional discharges generated by producing more power. Furthermore, these future cars will require a storage battery as a space to store the produced energy in order to go a considerable distance. When compared to gasoline (approximately 12,000 Wh/kg), LI-ion batteries have an energy concentration of just 89- 110 Wh/kg.

As a result, lithium-ion battery-powered electric vehicles can only run about 300 miles before recharging t battery. Streets are a huge piece of transportation framework, helping as a spine to help better developm for individuals and products. Since the streets extraordinarily sway the financial development and advancement of the networks, best in class research has zeroed in on arranging, planning, and building str to lessen natural effect, increment maintainability, and improve the productivity of transport stream. Notwithstanding, because of progressively enormous requests for decreased driver stress, autonomous versatility for people who cannot drive, and expanded security and entertainment features in vehicle, furth examination is called for on the advancement of smart streets which will adjust for upcoming generation c vehicles like auto-piloting vehicles.

Aside from the low energy concentration, modern battery equipment have the disadvantages of a lon recharging phase, a bulky size and load, a short lifespan, and a high price. Alternative charging solutions based on renewable energy sources and highways must be designed to eliminate these obstacles. Curren there have been three types of EV stationary charging systems. Type 1 charging positions use a regular out and a 120 VAC connection to provide 3-5 miles per hour. Type 2 EV recharging stops are needed both fo residential and commercial purposes. These recharge at a frequency of 10- 20 miles per hour using only 260 V (for residential) or 198 V (for commercial) supply. Type 3 recharging points, also referred as Direct Current quick recharges, use a 198 V (for business) connection or a 480 V 3-ϕ alternating current supply recharge electric vehicle battery to 80% capacity in 20-30 minutes. WPT charging and solar automobile have been offered as alternatives to fixed charge stations. Magnetic resonance has been used to establish area among a ground recharging coil and a cu coil implanted in a car, allowing WPT for electric vehicles. Fo the charging of electric vehicles without depending totally on batteries.

However, the concept is feasible only when sunlight is available; all throughout night, the car must be char from a traditional source. Furthermore, due to several technical and manufacturing limitations in the field c current solar cell expertise, also engineering adjustment among budget and energy transfiguration efficien solar-powered EVs are still not practical to be commercially available to the people. As more people becor aware of the environmental advantages of utilizing electric vehicles as opposed to conventional petrol vehicles, the popularity of electric vehicles (EVs) is rising.

Unfortunately, a shortage of infrastructure for charging EVs prevents their broad adoption. Researchers ar striving to create wireless electric car charging systems that can offer more practical and effective chargir methods to solve this problem. The use of wireless charging devices has the potential to transform how EV are charged by making the procedure quicker and more practical. The most recent innovation in EV chargir is wireless electric vehicle (EV) charging systems, sometimes referred to as inductive power transfer (IPT systems. Wireless EV charging systems transmit electricity between the charging station and the EV's onboard receiver using an electromagnetic field, in contrast to conventional EV charging systems that requ cables and plugs. As there is no longer a requirement for physical connections, it is more practical, secur and effective.

A promising innovation, wireless EV charging systems have several benefits, including easier access tc charging stations, less maintenance, and better user experiences. Wireless EV charging systems are gaini popularity as the demand for electric vehicles rises because they provide a more practical and effective wa to charge EVs. There are several coils inside the ground-based charging plate or pad that are wired to a pov supply. An electromagnetic field is produced around the pad or plate when power is passed via these coil The positioning of the receiving coil on the vehicle's underbelly allows it to detect the electromagnetic fiel produced by the charging station. This causes an electrical current to flow through the receiving coil, whic is subsequently utilized to recharge the electric car's battery.

1.2 Literature Survey

1. "Advancements in Solar and Wireless Charging Technologies for Electric Vehicles"
Bugatha Ram Vara Prasad et al. (2021)

He proposed a solar charging station for electric vehicles (EVs) that utilizes a solar panel array and a power conditioning unit to convert solar energy into electrical power. The system includes an energy management system (EMS) to regulate the charging process and optimize the use of renewable energy sources.

2. "Bidirectional Battery Charging Systems for Electric Vehicles"
K. Aswini and Bugatha Ram Vara Prasad (2021)

They designed a bidirectional battery charger for EVs that efficiently manages the charging and discharging of the vehicle's battery. This system includes a battery management system (BMS) that ensures optimal performance during the charging process.

3. "Intelligent Coordination Systems for Electric Vehicles in Power Grid Support "
M. Singh et al. (2019)

He proposed a real-time coordination system for EVs to support the power grid at the distribution substation level. Their system leverages communication networks and intelligent algorithms to optimize the charging and discharging of vehicles, thus maximizing the use of renewable energy and minimizing dependence on the power grid.

1.3 Objectives

This EV charging system delivers following benefits:

• Harvesting of solar energy

• Wireless Transmission and Receiving of energy .

It leads to a Reliable Range Prediction, Eco-routing and Eco-driving as well as novel functionalities like Smart Fast Charging and Assured Charging.

CHAPTER -02: METHODOLOGY

2.1 Block diagram and working principle

Figure 2.1 shows the general block diagram of “Solor Wireless Electric vehicle charging system”. Block Diagram mainly consists of two units: Wireless charging unit and Electric Vehicle [4]. Power bunk unit mainly consists of solar panel, charge controller, battery, Wireless transmitter, Arduino Nano, LCD display. And electric vehicle unit mainly consists of charge controller, battery, Arduino Nano, Switch, and LCD display. If the vehicle stands in the region of charging point the vehicle stars charring.

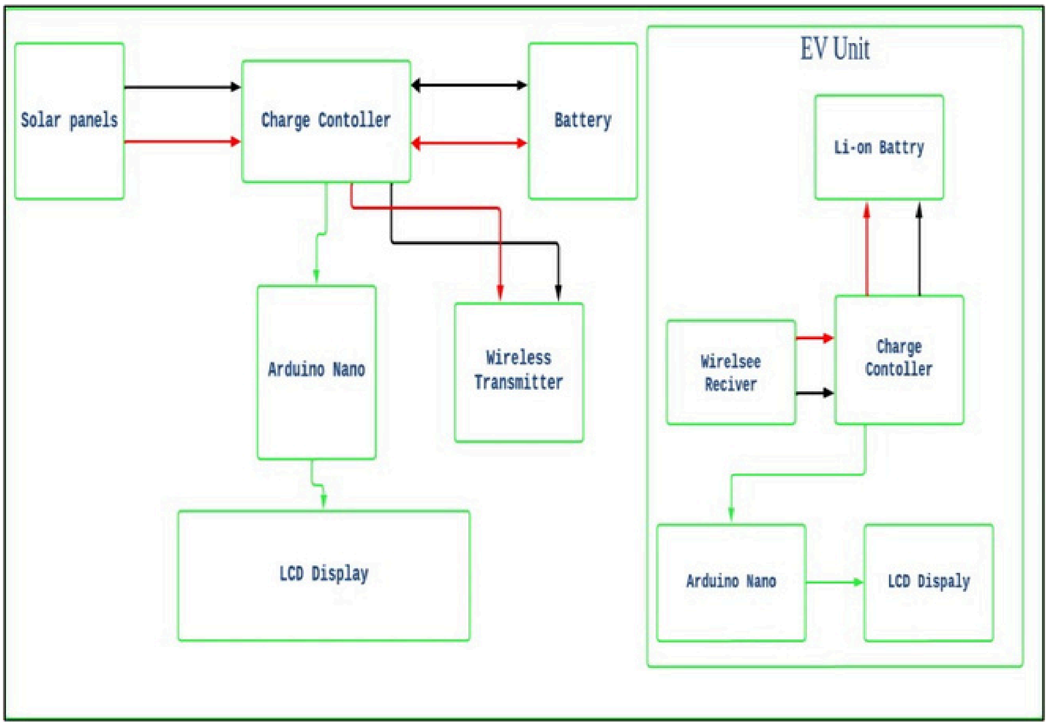

Figure 2.1: Block diagram of proposed system.

This system is mainly used to contact less EV Changing Station, Solar Panels are used to generate the power, through charge controller the battery gets charge. Charge controller is a derives used to protect the battery from over charging and discharging. Arduino nano is an At-mega 328p micro controller used to monitor the charging unit and LCD display is used get the Battery status, solar voltage and charging. In electric vehicle, when the electric vehicle battery is draining, then the EV required to charge the battery by this power stations, we can easily charge the batteries like fueling the vehicles in fuel bunks. We designed charging of battery in efficient manner.

When the is EV stand son Wireless changing unit, the battery gets charged through charge controller in a desired speed and in efficient manner, Arduino is connected to charge controller by this we can see the ba is charging or discharging by looking at percentage of battery. Hence in order to reduce the pollution throu motor vehicles, electric vehicles are being inverted and in order to run the electric vehicles the fuel require in electricity which can be storable through use of solar energy and run this electrical vehicle through th solar powered electric vehicle charging station, which is promising, alternative and environmentally sustainable station to meet up the energy crisis.

One solar freeway is a series of drive-on solar energy panels that have been physically designed. The goal i to replace present fossil fuel asphalt roads, parking garages, and pathways with solar road panels that coll energy for consumption [4] by houses and buildings, also with capacity to store surplus power in or alongs the solar roadways throughout the future. As a result, renewable energy eliminates necessity conventio fossil fuels for electricity generation, reducing carbon emissions and improving the quality of life. The pane is interested in parking places, driveways, and, eventually, motorways.

If the whole major highway system in the U.S. was covered in solar roadway panels, this would generate over three times the amount of electricity currently consumed in the country. The solar panel is adjusted an angle in which it can receive as much as the power it can and then once it is placed at a suitable angle t indicator shows it is charging. Then the charge is passed through the controller and then the charges a transferred to the storage battery.The charges are then passed through a converter which converts the D AC and then when the car is moved along the road the charges that gets stored in the battery is then trans wireless to the transmitting coils and the receiving coils of the car receives the charges as a sources of ele magnetic field and the car charges as it moves along the road.

Chapter 3: Software & Hardware Description

3.1 Hardware

3.1.1 Solar panel

A solar panel is a device that converts sunlight into electrical energy using photovoltaic (PV) cells [2]. These cells are made of semiconductor materials such as silicon, and when exposed to sunlight, they generate a flow of electrons which can be harnessed as electrical power. Figure 3.1.1 are shows the solar panel typically consists of multiple PV cells arranged in a grid-like pattern and enclosed in a frame. The most common type of solar panel is the flat-plate PV module, which is made up of a layer of PV cells, a layer of glass or plastic, and a layer of protective material on the back. When sunlight hits a solar panel, the photons in the sunlight interact with the electrons in the PV cells, causing them to move and create a flow of electrical current. This current is then sent to an invert, which converts the DC current into AC current that can be used to power homes or businesses. The amount of electricity generated by a solar panel depends on several factors, including the efficiency of the PV cells, the amount of sunlight available, and the temperature. To maximize the amount of electricity generated, solar panels are usually installed on rooftops or in areas that receive a lot of direct sunlight. Solar panels are a renewable energy source and produce no greenhouse gas emissions during operation, making them a clean and sustainable alternative to traditional fossil fuels. They have

become increasingly popular in recent years due to their falling costs, improved efficiency, and government

incentives and policies that support their adoption.

Figure 3.1.1: Solar panel .

Solar panels are classified according to their rated power output in Watts. This rating is the amount of power the solar panel would be expected to produce in 1 peak sun hour. Different geographical locations receive different quantities of average peak sun hours per day. In Australia, the figures range from as low as 3 in Tasmania to over 6 in areas of QLD, NT and WA. As an example, in areas of the Hunter Valley in NSW, the yearly average is around 5.6. The monthly figures for this area range from below 4.0 in June to above 6.5 in December.

This means that an 80W solar panel would ideally produce around 320W per day in June and around 520W per day in December, but based on the average figure of 4.3, it would produce a yearly avera of around 450W per day. without taking losses into account. Solar panels can be wired in series or in parall to increase voltage or current respectively. The rated terminal voltage of a 12 Volt solar panel is usually around 17.0 Volts, but through the use of a regulator, this voltage is reduced to around 13 to 15 Volts as required for battery charging. Solar panel output is affected by the cell operating temperature. Panels are r at a nominal temperature of 25 degrees Celsius. The output of a typical solar panel can be expected to var by 2.5% for every 5 degrees variation in temperature. As the temperature increases, the output decreases With this in mind, it is the cloud, it is possible to exceed the rated output of the panel. Keep this in mind wh sizing your solar regulator .

3.1.2 Charge controller

Figure 3.1.2 shows the charge controller, charge regulator or battery regulator limits the rate at which electric current is added to or drawn from electric batteries to protect against electrical overload, overcharging, and

may protect against over-voltage.This prevents conditions that reduce battery performance or lifespan and may pose a safety risk. It may also prevent completely draining ("deep discharging") a battery, or perform controlled discharges, depending on the battery technology, to protect battery life. The terms "charge controller" or "charge regulator" may refer to either a stand-alone device, or to control circuitry integrated within a battery pack, battery-powered device, and/or battery charger. Simple charge controllers stop charging a battery when they exceed a set high voltage level, and re-enable charging when battery voltage drops back below that level. pulse width modulation (PWM) and maximum power point tracker (MPPT) technologies are more electronically sophisticated, adjusting charging rates depending on the battery's level, to allow charging closer to its maximum capacity. A charge controller [7] with MPPT capability frees the system designer from closely matching available PV voltage to battery voltage.

Figure 3.1.2: Charge controller structure.

791 9volt MPPT Solar Panel Regulator Controller Battery Cell Charging This is a maximum power point tracking (MPPT) solar charger for single-cell LiPo batteries. This MPPT solar charger provides you with the ability to get the most possible power out of your solar panel or other photo-voltaic device and into a rechargeable LiPo battery. Set-up is easy as well, just plug your solar panel into one side of the solar charg and your battery into the other and you are good to start charging.

Features:

Automatic recharge

Charge status and charge end status indication

Battery over voltage protection

Solar panel maximum power point tracking

Complete charge management for single-cell lithium batteries.

Specifications:

Model	CN3791
Connector	2-pin JST
Operating Voltage (VDC)	9
Operating Temperature (°C)	-40 to 85
Switching Frequency (kHz)	300
Maximum Charging Current (A)	2
Length (mm)	45
Width (mm)	20
Height (mm)	9.5
Weight (gm)	10

Table 3.1.2 Charge Controller Specification

Package includes:

1 x CN3791 9V MPPT Solar Charger Module

1 x Pair of wires with 2-pin JST connector on both sides

3.1.3 Relay switch:

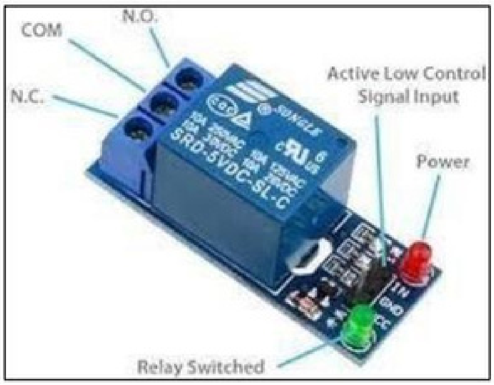

Figure 3.1.3 Relay

Relays are switches that open and close circuits electromechanically or electronically. Relays control one electrical circuit by opening and closing contacts in another circuit. As relay diagrams show, when a re contact is normally open (NO), there is an open contact when the relay is not energized.

The resistor absorbs the electrical energy in the process where it acts as a hindrance to the flow of electric by reducing the voltage, and it is dissipated as heat. In today's world of electronic circuits, the heat dissipa is typically a fraction of a watt. The resistor absorbs the electrical energy in the process where it acts as hindrance to the flow of electricity by reducing the voltage, and it is dissipated as heat. In today's world of electronic circuits, the heat dissipation is typically a fraction of a watt. A capacitor is a device that is used to store charges in an electrical circuit. A capacitor works on the principle that the capacitance of a conductor increases appreciably when an earthed conductor is brought near it. Hence, a capacitor has two plates separated by a distance having equal and opposite charges.

An IC can function as an amplifier, oscillator, timer, counter, logic gate, computer memory, micro controller or microprocessor. An IC is the fundamental building block of all modern electronic devices. An integrated circuit is also called as a chip, because of the face ICs come in a package resembling a chip.

A set of Integrated Circuits often referred to as a Chip set, then an IC set.

3.1.4 IR Sensor Module

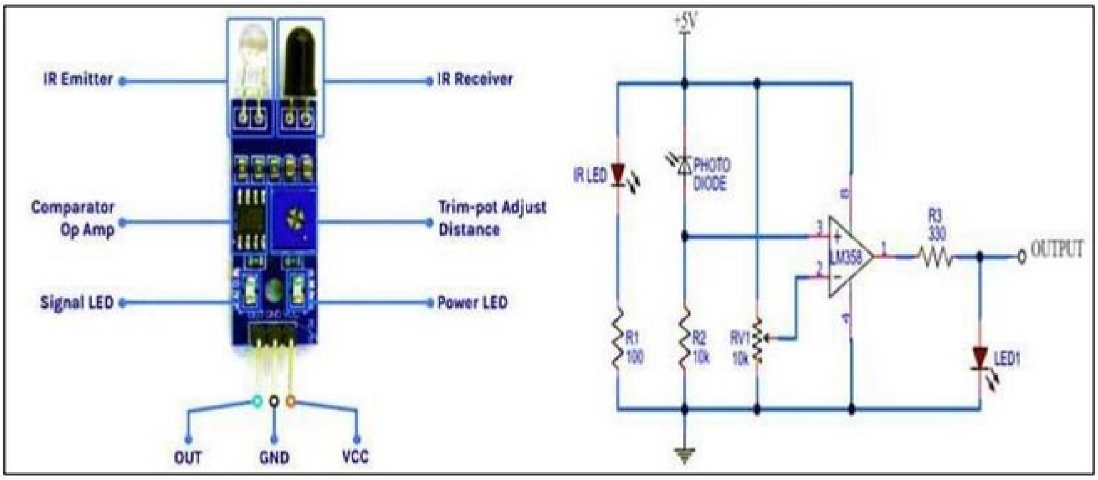

Figure 3.1.4 IR Sensor Module with Circuit

An IR sensor module is a device that contains an IR receiver LED and other components that are used to detect and process IR signals. It typically includes an IR receiver LED, a signal amplifier, and a demodulator circuit. The IR receiver LED is used to detect IR signals, while the signal amplifier and demodulator circuit are used to amplify and process the received signal, respectively. IR sensor modules are widely used in various electronic applications such as remote control, motion detection, proximity sensing and more. They are commonly used in consumer electronics, robotics, and automation systems. IR sensor modules come in various forms such as simple IR receiver modules and complex IR sensor modules with additional features such as signal processing and signal filtering. Some IR sensor modules also provide an output in a digital format that can be read by a micro controller or microprocessor. IR sensors find a wide variety of applications in various fields. Let’s take a look at a few of them.

IR Sensor Types

There are several types of IR sensors, each with different characteristics and applications. Some comm
types include:

Passive Infrared (PIR) Sensor: PIR sensors are used to detect motion by sensing changes in infrared radiation. They are commonly used in security systems, lighting control, and automatic doors.

Reflective IR Sensor: Reflective IR sensors use infrared LED to emit infrared light and a photo transistor to detect the reflected light from an object. They are used to measure distance and detect proximity.

Trans-missive IR Sensor: Trans-missive IR sensors use infrared LED to emit infrared light and a photo transistor to detect the light that passes through an object. They are used to measure distance and de
proximity.

IR proximity Sensor: IR proximity sensors are used to detect the presence of an object without making
physical contact. They are commonly used in mobile devices, robotics, and automation systems.

IR temperature Sensor: These can measure the temperature of an object by detecting the infrared radiatio
emitted by it. They are used in industrial, HVAC, and medical applications.

IR spectroscopy Sensor: These can use infrared radiation to analyze the properties of a substance. They are used in chemical analysis, medical diagnosis, and environmental monitoring.

IR Imaging sensor: These sensors use infrared radiation to create images, they are used in thermal imagin
night vision, and surveillance cameras. worth noting that, if the panels are very cool due to cloud cover, an
the sun bursts through.

3.1.5 LCD Display

A 16x2 LCD (Liquid Crystal Display) is a type of alphanumeric display that can display up to 16 characters in each of its two lines, for a total of 32 characters. The LCD is composed of a grid of pixels, eac of which can be switched on or off to create characters, symbols, and numbers. As shown in figure 3.1.4 The display is operated by sending commands and data to the LCD controller, which then displays the desi characters on the screen. Figure 3.1.4 shows A 16x2 LCD typically has a standard HD44780 controller and can display a variety of characters and symbols, including uppercase and lowercase letters, numbers, and special characters. The display is often backbit, making it easy to read in low light conditions. LCD displays are commonly used in a variety of applications, including industrial control systems, consumer electronics, and embedded systems [9]. They are relatively low-cost, low-power, and easy to interface with micro controllers, making them a popular choice for displaying information in electronic projects. Once the displa is properly connected and configured, you can send text and other information to the display using a variet of commands, such as "clear display", "move cursor", and "write character”

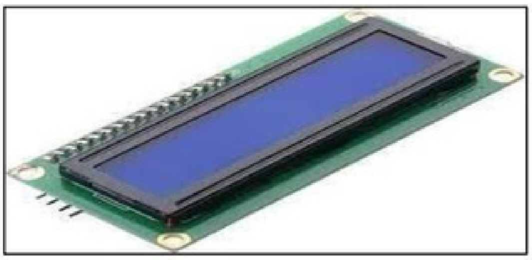

Figure 3.1.4: LCD Display .

LCD Pin Configuration

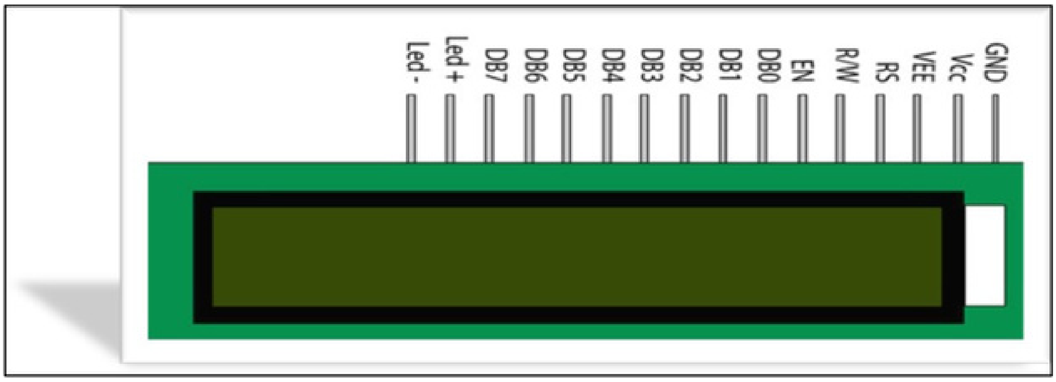

Figure 3.1.4: LCD pin configuration .

RS-RegisterSelect:

As said above there are 2 very important registers in LCD; the Command Code register and the Data Register.

- If RS=0, the Code register is selected, allowing user to send command.
- If RS=1, the Data register is selected allowing to send data that has to be displayed.

R\W-Read\Write:

R\W input allows the user to write information to LCD or read information from it.

How do we read data from LCD? The data that is being currently displayed will be stored in a buffer memor DDRAM. This data could be read if necessary.

- If R\W=1, then set for reading.
- R\W=0, then set for Writing.

E- Enable:

The enable Pin is used by the LCD to latch information at its data pins. When data is supplied to data pins a high to low pulse must be applied to this pin in order for the LCD to latch the data present in the data pir This pulse must be minimum of 450 ns wide. E=1 then 0, set the LCD a Toggle.

VEE:

VEE pin is meant for adjusting the contrast of the LCD display and the contrast can be adjusted by varying the voltage at this pin. This is done by connecting one end of a POT to the Vcc (5V), other end to the Grounc and connecting the center terminal (wiper) of the POT to the VEE pin.

Data pins:

DB0 to DB7 are the data pins. The data to be displayed and the command instructions are placed on these pins.Most color LCD systems use the same technique, with color filters used to generate red, green, and bl sub pixels. The LCD [6] color filters are made with a photo lithography process on large glass sheets that ar later glued with other glass sheets containing a thin-film transistor (TFT) array, spacers and liquid crysta creating several color LCD's that are then cut from one another and laminated with polarizer sheets. Re green, blue and black photo resists (resists) are used.

All resists contain a finely ground powdered pigment, with particles being just 40 nanometre across. Th
black resist is the first to be applied; this will create a black grid (known in the industry as a black matrix)
that will separate red, green and blue sub pixels from one another, increasing contrast ratios and preventi
light from leaking from one sub pixel onto other surrounding sub pixels.
After the black resist has been dried in an oven and exposed to UV light through a photo mask, the unexpo
areas are washed away, creating a black grid. Then the same process is repeated with the remaining resis
This fills the holes in the black grid with their corresponding colored resists Another color-generation meth
used in early color PDAs and some calculators was done by varying the voltage in a Super-twisted nomadi
LCD, where the variable twist between tighter-spaced plates causes a varying double refraction birefringen
thus changing. They were typically restricted to 3 colors per pixel: orange, green, and blue. In many applications IPS LCDs have replaced TN LCDs, particularly in smart phones.

LED+ and LED- :

+ is the anode of the back light LED and this pin must be connected to Vcc through a suitable series curre
limiting resistor. LED- is the cathode of the back light LED and this pin must be connected to ground.

Sending data to the LCD:

The steps for sending data to the LCD module are given below. It is the logic state of these pins that mak
the module to determine whether a given data input is a command or data to be displayed.

- Make R/W low.
- Make RS=0 if data byte is a command and make RS=1 if the data byte is a data to be displayed
- Place data byte on the data register.
- Pulse E from high to low.

Pin description:

- Pin1 (Ground/Source Pin): This is a GND pin of display, used to connect the GND terminal of the microcontroller unit or power source.
- Pin2 (VCC/Source Pin): This is the voltage supply pin of the display, used to connect the supply pin of th power source.
- Pin3 (V0/VEE/Control Pin): This pin regulates the difference of the display, used to connect a changeab POT that can supply 0 to 5V.
- Pin4 (Register Select/Control Pin): This pin toggles among command or data register, used to connec micro controller unit pin and obtains either 0 or 1(0 = data mode, and 1 = command mode).
- Pin5 (Read/Write/Control Pin): This pin toggles the display among the read or writes operation, and it connected to a microcontroller unit pin to get either 0 or 1 (0 = Write Operation, and 1 = Read Operation).
- Pin 6 (Enable/Control Pin): This pin should be held high to execute Read/Write process, and it is connec to the microcontroller unit & constantly held high.
- Pins 7-14 (Data Pins): These pins are used to send data to the display. These pins are connected in two- modes like 4-wire mode and 8-wire mode. In 4-wire mode, only four pins are connected to the microcontr unit like 0 to 3, whereas in 8-wire mode, 8-pins are connected to microcontroller unit like 0 to 7.
- Pin15 (+ve pin of the LED): This pin is connected to +5V
- Pin 16 (-ve pin of the LED): This pin is connected to GND.

3.1.6 Wireless transmitter and receiver :

Wireless power transmission, also known as wireless charging [5], is the process of transmitting electrical energy from a power source to an electrical load without the need for wires or cables. The transmission is achieved by using two coils, a transmitting coil and a receiving coil, that are in close proxim to each other. The transmitting coil, also known as the primary coil, is typically connected to a power sourc and generates an oscillating magnetic field when an alternating current is applied.

The receiving coil, also known as the secondary coil, is placed in the proximity of the transmitting coil and is used to pick up the magnetic field generated by the transmitting coil. This magnetic field induces a electrical current in the receiving coil, which can be used to power an electrical load or charge a battery Figure 3.1.5 shows the transmitting coil is typically designed as a flat, circular coil made of copper wire or a printed circuit board (PCB) trace. The number of turns, size, and shape of the coil can vary depending on th application, but the goal is to create a strong magnetic field that can be picked up by the receiving coil.

The receiving coil is also typically designed as a flat, circular coil made of copper wire or a PCB trace. The number of turns, size, and shape of the coil can vary depending on the application, but the goal is to create coil that can pick up the magnetic field generated by the transmitting coil and convert it into an electrica current. The 5V 2A wireless transmitter receiver charging coil module is for a variety of small electronic products, wireless charging, power supply development, and design, with a small size, easy to use, hig efficiency, and lowprice characteristics.

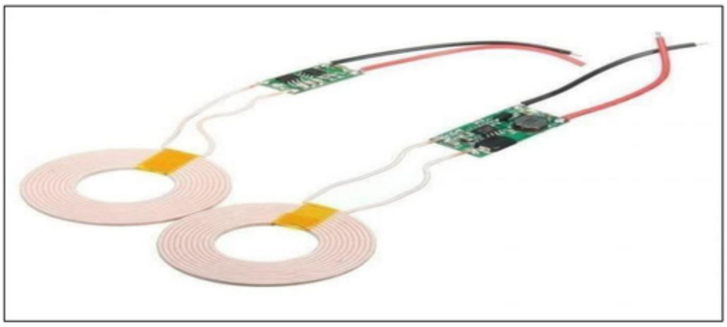

Figure 3.1.5:Wireless transmitter and receiver.

It is mainly used in mobile electronics products such as for charging mobile phones and electronic gadge wireless. The adoption of a Contact less charging power supply can be used to sealing of the products to m them waterproof and dust-proof and increase product service life to make it more convenient.

Specification:

Model	XKT-412.
Input Voltage	12VDC
Output	5V / 1A current
Normal Use Distance	2 ~ 10mm
Operating Current	1.2-2 A.
Tx/Rx Coil Dimensions	Diameter 43mm, Inner diameter 20mm,
Coil Wire Thinkness	2.3mm
The transmitting module size	18mm*8.5mm*15mm
The receiving module size	10mm*25mm*3mm
Shipment Weight	0.035 kg
Shipment Dimensions	15 × 10 × 8 cm

Table 3.1.5 Wireless coil Specification

3.1.7 Battery

A rechargeable battery is a type of energy storage device that can be recharged and reused multiple times. It is also known as a secondary cell, as opposed to a primary cell which is a non-rechargeable batt that can only be used once. Rechargeable batteries come in various chemistries such as lead-acid, nickel cadmium (Ni-Cd), nickel-metal-hydroxide (NiMH), and lithium-ion (Li-ion). Lithium-ion batteries are widely used in portable electronic devices and electric vehicles due to their high energy density, low self-discharge rate, and long cycle life. Rechargeable batteries consist of one or more electrochemical cells th convert chemical energy into electrical energy. During discharge, the chemical reactions in the battery produce electrons that flow through an external circuit to power a device. During charging, the flow of electrons is reversed, which restores the chemical composition of the battery and allows it to be used ag The voltage of a rechargeable battery depends on its chemistry and can range from 1.2V for Ni-Cd and Ni MH batteries to 3.7V for Figure 4.8 shows the Li-ion batteries. Rechargeable batteries can be charged usi a variety of charging methods,

including constant current, constant voltage, and pulse charging. Care must be taken when charging rechargeable batteries to prevent overcharging, which can lead to reduced battery life or even damage to battery. A lithium-ion or Li-ion battery is a type of rechargeable battery which uses the reversible reductio of lithium ions to store energy. The negative electrode of a conventional lithium-ion cell is typically graphite a form of carbon. This negative electrode is sometimes called the anode as it acts as an anode durin discharge. The positive electrode is typically a metal oxide and is sometimes called the cathode as it acts a cathode during discharge. Positive and negative electrodes remain positive and negative in normal us whether charging or discharging and therefore are clearer terms than anode and cathode, which are revers during charging

Figure 3.1.6 : 5V Batter

Software

3.2.1 Arduino IDE

The Arduino IDE (Integrated Development Environment) is a powerful tool for developing software for Arduino boards and other compatible microcontroller platforms. It's designed to be user-friendly, making it accessible for beginners while still offering the necessary features for advanced users. The IDE is open- source and free to use, contributing to its widespread adoption in education, hobby projects, and even
professional development.

Figure 3.2.1 Arduino Icon

Key Components of the Arduino IDE

1.Menu Bar

• File: Create new sketches, open existing ones, save, and print your code. Also, manage your sketchbook and preferences.
• Edit: Basic text editing commands like cut, copy, paste, and find. Also includes options to increase/decrea indentation and comment/uncomment lines.
• Sketch: Verify and upload code, include libraries, and manage the serial monitor.
• Tools: Access settings related to the board, port, and programmer. Here, you can also start the Serial Mo and change IDE settings.
• Help: Links to official Arduino documentation, references, and troubleshooting guides.

2. Toolbar
• Verify/Compile: Checks your code for errors and compiles it into machine language.
• Upload: Sends the compiled code to your connected Arduino board.
• New/Open/Save: Quick access buttons to create new sketches, open existing ones, or save your work.
• Serial Monitor: Opens the Serial Monitor for debugging and communication.

3. Code Editor
• Syntax Highlighting: Differentiates keywords, variables, and comments with distinct colours, enhancing readability.
• Auto-Indentation: Keeps your code well-formatted and easy to navigate.
• Line Numbering: Helps in locating specific parts of your code quickly.
• Bracket Matching: Assists in keeping track of opening and closing brackets.

4. Output Pane
• Compiler Messages: Displays the result of the compilation process, including errors and warnings.
• Upload Status: Shows the progress and success/failure of the upload process.

5. Serial Monitor
• Realtime Communication: Sends and receives data between your computer and the Arduino board.
• Baud Rate Selection: Configure the communication speed, matching the baud rate set in your sketch.
• Data Display: View output from your Arduino program, helpful for debugging and data logging.

Features of the Arduino IDE
1. Cross-Platform Compatibility
• The IDE runs on Windows, macOS, and Linux, ensuring accessibility across various operating systems.
2. Extensive Board Support
• Built-in Board Manager: Easily add and manage support for various Arduino and third-party boards.
• Popular Boards Supported: Includes Arduino UNO, Mega, Nano, Leonardo, MKR series, ESP8266, ESP32, and more.
2. Library Management
• Library Manager: Search for, install, and update libraries directly from the IDE.
• Built-in Libraries: Access a wide range of pre-installed libraries for common tasks, such as handling sens motors, and displays.
3. Sketch Management
• Sketchbook Organization: Keep your projects organized within the Arduino folder structure.
• Example Sketches: Access numerous example sketches that demonstrate how to use various libraries ar hardware components. 5. Debugger and Error Handling
• While not as sophisticated as professional IDEs, Arduino IDE offers basic debugging tools.
• Clear error messages help identify issues in your code, guiding you to resolve them.

Installation and Setup

1. Download and Install

• Visit the Arduino Software page to download the latest version of the IDE for your operating system.

• Follow the installation instructions specific to your OS.

2. Initial Configuration

• Connect Your Board: Use a USB cable to connect your Arduino board to your computer. • Select Board and Port: Go to Tools > Board to select your board model, and Tools > Port to choose the correct port.

• Install Drivers: Some boards may require additional drivers, which are typically included in the IDE installation package.

Writing and Uploading Code

1. Creating a New Sketch

• Start a new sketch from File > New. This opens a blank canvas for writing your code. 2. Basic Structure of an Arduino Sketch Every Arduino sketch has two main functions:

• setup(): This function runs once when the program starts. It's used to initialize variables, pin modes, libra etc.

• loop(): After setup(), the loop() function runs repeatedly, allowing your program to change and respond. 3 Uploading Code to the Arduino Board

• Click the "Verify" button to check your code for errors.

• Once verified, click the "Upload" button to compile and send the code to the board. • The onboard LED wi usually flash during upload, and the IDE will notify you once the upload is successful.

Using the Serial Monitor

The Serial Monitor is an essential tool for debugging and monitoring your Arduino projects. Here's how to use it:

1. Initialize Serial Communication: Add Serial.begin(9600); in your setup() function to start serial communication at a baud rate of 9600.

2. Send Data to the Serial Monitor: Use Serial.print() or Serial.println() to send data.

3. Open the Serial Monitor: Click on the magnifying glass icon in the IDE or go to Tools > Serial Monitor to open it and view the output.

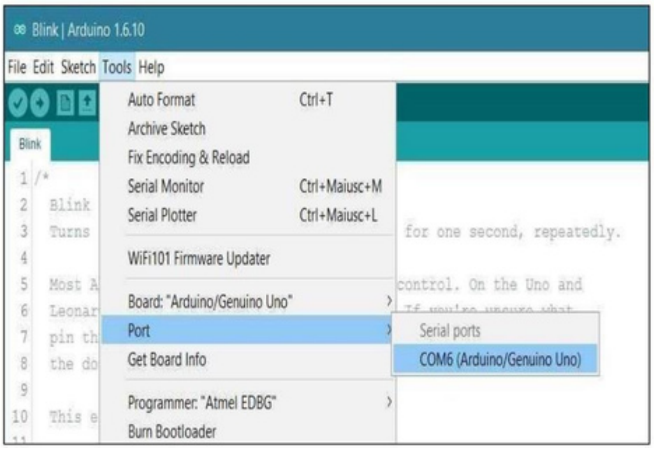

Figure 3.2.1 Port selection In Arduino

Advanced Features and Extensions

1. Using External Libraries

• Install-Libraries: Use the Library Manager (Sketch > Include Library > Manage Libraries) to find and instal additional libraries.

• Include Libraries: Add #include at the beginning of your sketch to use the installed library.

2. Custom Board Packages

• Use the Board Manager (Tools > Board > Boards Manager) to add custom board packages for third-party hardware.

3. Extensions and Plugins

• VS Code Integration: Use the Arduino extension for Visual Studio Code to gain access to advanced featur and a more robust code editor.

• PlatformIO: An alternative development environment with enhanced features for managing multiple projects and boards.

3.2.2 Arduino Nano

Figure 3.2.2 shows The Arduino Nano is a compact board similar to the UNO. The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328P (Arduino Nano 3.x). It has m or less the same functionality of the Arduino Duemilanove, but in a different package. It lacks only a DC power jack and works with a Mini-B USB cable instead of a standard one. Power: The Arduino Nano can be powered via the Mini-B USB connection, 6-20V unregulated external power supply (pin 30), or 5V regulate external power supply (pin 27). The power source is automatically selected to the highest voltage sourc Memory: The ATmega328 has 32 KB, (also with 2 KB used for the bootloader. The ATmega328 has 2 KB of SRAM and 1 KB of EEPROM.

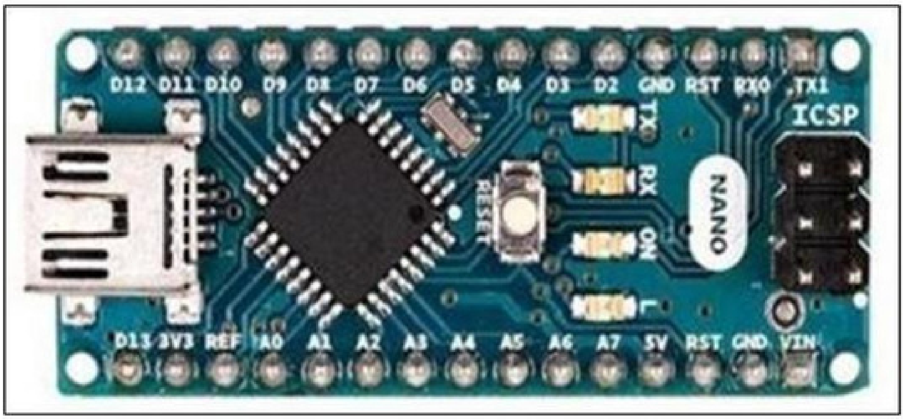

Figure 3.2.2 Arduino NANO

Input and Output: Each of the 14 digital pins on the Nano can be used as an input or output, using pinMode(), digitalWrite(), and digitalRead() functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40 mA and has an internal pullup resistor (disconnected by default) of 20-50 KOhm In addition, some pins have specialized functions:

Serial: 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the FTDI USB-to-TTL Serialchip.

External Interrupts: 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the attachInterrupt() function for details.

PWM: 3, 5, 6, 9, 10 and 11. Provide 8 -bit PWM output with the analogWrite() function.

SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication, which, although provided by the underlying hardware, is not currently ncluded in the Arduino language.

LED: 13. There is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off. The Nano has 8 analog inputs, each of which provide 10 bits of resolution (i.e. 1024 different values). By default, they measure from ground to 5 volts, though is it possible to change the upper end of their range [5] using the analog Reference() function. Analog pins 6 and 7 cannot be used as digital pins. Additionally, some pins have specialized functionality:I2C: A4 (SDA) and A5 (SCL). Support I2C (TWI) communication using the Wire library.

There are a couple of other pins on the board:

AREF: Reference voltage for the analog inputs. Used with analogReference().

RESET: Bring this line LOW to reset the micro controller. Typically used to add are set button to shields which block the one on the board. Communication: The Arduino Nano has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provide UARTTTL(5V) serial communication, which is available on digital pins 0 (RX)and 1 (TX). An FTDIFT232RL on the board channels this serial communication over USB and the FTDI drivers (included with the Arduino software) provide a virtual com port to software on the computer. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The RX and TX LEDs on the board will flash when data is being transmitted via the FTDI chip and USB connection to the computer. A Software Serial library allows for serial communication on any of the Nano's digital pins. The ATmega328

also support I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify

use of the I2C bus. To use the SPI communication, please see ATmega328 datasheet. This Arduino Nano is

Original Arduino Nano Board.

It is a breadboard-friendly board based on the ATmega328P from Arduino officials made in Italy. It has more or less the same functionality of the Arduino Duemilanove but in a different package. It lacks only a DC power jack and works with a Mini-B USB cable instead of a standard one. Original Arduino Nano is a surface mount breadboard embedded version with integrated USB. It is the smallest, complete, and breadboard friendly. It has everything that Diecimila/Duemilanove has (electrically) with more analog input pins and onboard +5V AREF jumper. Physically, it is missing power jack.

The Nano automatically senses and switch to the higher potential source of power, there is no need for the power select jumper. Nanos got the breadboard-ability of the Board audino and the Mini+USB with a smaller footprint than either, so users have more breadboard space. It's got a pin layout that works well with the Mini or the Basic Stamp (TX, RX, ATN, GND on one top, power and ground on the other). This new version

3.0

comes with ATMEGA328 which offers more programming and data memory space.

It is two layers. That makes it easier to hack and more affordable. This Arduino Nano is an Original

8 analog inputs ports: A0 ~ A7

1. 14 Digital input / output ports: TX, RX, D2 ~ D13
2. 1 pair of TTL level serial transceiver ports RX / TX
3. Using Atmel Atmega328P-AU MCU
4. There is a bootloader installed in it
5. Standard 0.1” spacing DIP (breadboard friendly).
6. Manual reset switch.

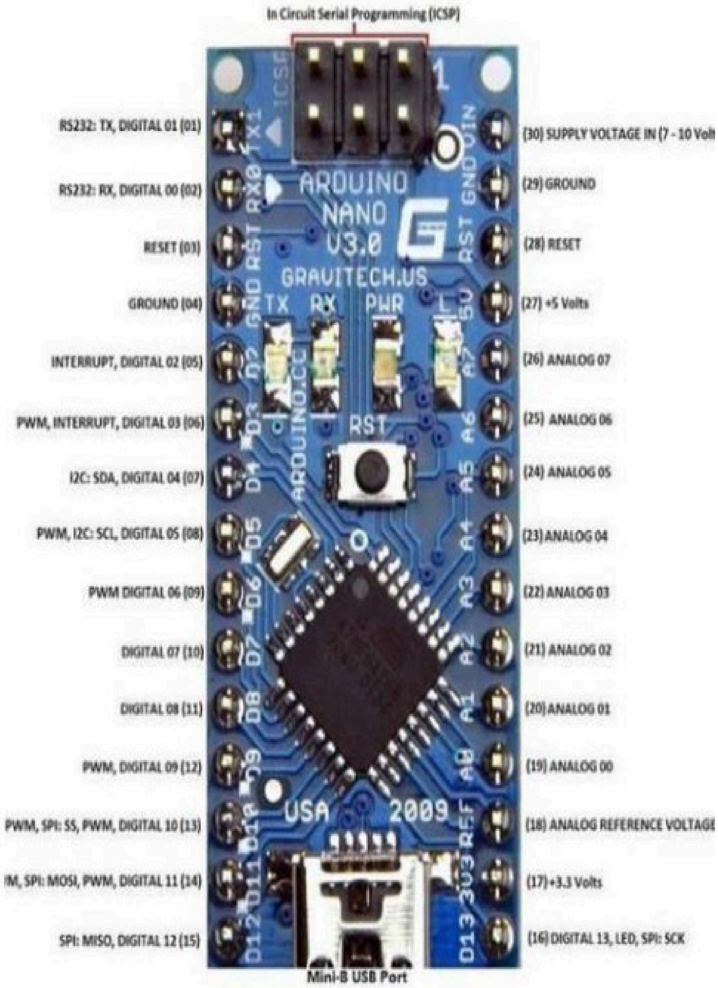

Figure 3.2.2 Arduino Nano Pin Description

Specification

Model Type	Nano
Color	Blue
Microcontroller	ATmega328
Operating voltage (VDC)	5
Input Supply Port	USB Mini
Input Voltage	7-12 V
Power Consumption (Watt)	1
Analog I/O Pins	8
Digital I/O Pins	22 (6 of which are PWM)
PWM Output Pins	6
Architecture	AVR
Clock Speed	16 MHz
Flash Memory	32 KB
EEPROM	1 KB
SRAM	2
Weight (gm)	7
Length (mm)	45
Width (mm)	18
Shipment Weight	0.019 kg
Shipment Dimensions	9 × 6 × 3 cm

Table 3.2.2 Specification of Arduino NANO

3.2.3 EMBEDDED C:

Having decided to use an 8051 processor as the basis of your embedded system, the next key decision that needs to be made is the choice of programming language. In order to identify a suitable language for embedded systems, we might begin by making the following observations:

• Computers (such as microcontroller, microprocessor or DSP chips) only accept instructions in 'machine code' ('object codes'). Machine code is, by definition, in the language of the computer, rather than that of t programmer.

• All software, whether in assembly, C, C++, Java must ultimately be translated into machine code in order to be executed by the computer.

• There is no point in creating 'perfect' source code, if we then make use of a poor translator program (suc as an assembler or compiler) and thereby generate executable code that does not operate as we intended

• Embedded processors – like the 8051 – have limited processor power and very limited memory availabl the language used must be efficient.

• To program embedded systems, we need low-level access to the hardware this means, at least, being a to read from and write to particular memory locations.

• No software company remains in business for very long if it generates new code, from scratch, for ever project. The language used must support the creation of flexible libraries, making it easy to re-use (wel tested) code components in a range of projects.

• The language chosen should be in common use. This will ensure that you can continue to recruit experier developers who have knowledge of the language. It will also mean that your existing developers will hav access to sources of information which give examples of good design and programming practice.

Chapter 4: Merits and Demerits

4.1 Merits

- Manual operation has been reduced to major extent.
- Less manpower required.
- Efficient distribution system.
- Easy to use.
- Virtually no maintenance as solar panels last over 30 years.
- Use batteries to store extra power to use at night.
- Efficient and reliable.
- Solar power is pollution free and causes no greenhouse gases to be emitted after installation.

4.2 Demerits

- Initial installation cost is high.
- Long charging time 1-3 hours required for charging.

Chapter 5: Results and Discussion

5.1 RESULT ANALYS IS

Figure 4.1.1 shows the Charge unit gets the charge from the solar panels. We can monitor the Battery of charging unit, by State of charge (SOC) of battery for both Vehicle and Charging Unit. Transforming of power through wireless drives form charging unit to Ev's

Figure 5.1: Working model of proposed system

The wireless power transmission system used in the project was able to transfer power efficiently ar effectively over a short distance, and the use of transmitting and receiving coils allowed for flexibility in the positioning of the EV during charging. Figure 5.1.1 shows The LCD display provided clear indications of the charging process, making it easy for users to monitor the progress of the charging cycle. In addition, wirele technology lowers maintenance costs associated with conventional cable charging systems, and the utiliza of solar power greatly lowers the cost of charging electric cars.The results of the SWEVCS demonstrate th feasibility and effectiveness of using a solar-powered wireless charging system for electric vehicles

Figure 5.1: LCD indicating solar panels are turned on status.

When the solar panels are turned off, the LCD display in the will continue to function and display the current level of charge in the vehicle's battery. This is because the system includes a battery backup that stores energy from the solar panels, allowing the LCD display to continue operating even when the panels are not generating power. This feature ensures that the user can still monitor. Figure 5.1.1 shows the charging process even when solar energy is not available, providing added convenience and peace of mind

Figure 5.1: Vehicle charging indication.

Wireless electric vehicle charging involves the transfer of energy between a charging coil on the ground an a receiver on the underside of the electric vehicle. The charging pad is connected to a power station, and t energy is transferred through magnetic induction. When the solar panels are turned on in the, the LCD disp will show the current level of charge in the electric vehicle's battery. As the solar panels generate power, t boost converter steps up the voltage to a level sufficient for charging the battery. The LCD display continua updates to show the progress of the charging process, allowing the user to monitor the level of charge ar estimate the time required for a full charge. This real-time information provides convenience and flexibilit for the user, enabling them to manage their charging requirements efficiently. When the battery in the elec vehicle is fully charged, the LCD display will indicate that the battery is full, and the charging process is complete. The LCD display will show the current charge level in the battery, along with a message indicatin that the battery is full. This information is useful to the user, as it allows them to disconnect the electri vehicle from the charging system, thereby avoiding unnecessary overcharging, which can cause damage t the battery. The system provides an effective way to monitor the charging process and ensures that the us is aware of when the battery is fully charged.

Chapter 6: Conclusion and Future scope

6.1 CONCLUSION

We have been discussed in the abstract that the demand for electric vehicles has increased due to the population growth. So the number of casualties associated with road collisions is growing rapidly. We have learnt the details of the components which we have used in our project. We also discussed in methodology, the working procedure of our project. Various strategies and easy charging of electric vehicles without the use of bulky wires or connectors etc. The integration of these systems with vehicles would be somehow expensive yet will give various advantages.

6.2 FUTURE SCOPE

In today's world technology has spread over a large variety of practical applications ranging from smart phones, computers, kitchen appliances and mostly in the field of electric vehicles. There are a numb of methods of charging wireless and the main aim is to cut loose of cables. Automotive, health care an manufacturing industries are rapidly embracing these technologies with a promise to improve mobility ar also promising the enablement in IoT (Internet of Things) devices to be powered from a distance. In ou opinion the specific set of technologies that are discussed in this study is aiming to take the abovemention technical advancements to a new level and also providing the total guarantee to be user friendly and save and also with a root cause to deplete the use of traditional methods which affect our nature.

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APPENDIX

Embedded C Program Electric Vehicle unit:

```
#include <LiquidCrystal.h>

// Initialize the LCD library with the numbers of the interface pins
LiquidCrystal lcd(7, 8, 9, 10, 11, 12);
const int irSensorPin = 2;
const int relayPin = 3;
int irSensorState = 0;

void setup() {
 // Set up the LCD's number of columns and rows:
  lcd.begin(16, 2);
  // Print a message to the LCD.
  lcd.print("IR Sensor State:");

  // Initialize the IR sensor pin as an input:
  pinMode(irSensorPin, INPUT);

  // Initialize the relay pin as an output:
  pinMode(relayPin, OUTPUT);

  // Initially turn off the relay:
  digitalWrite(relayPin, LOW);
}
void loop() {
  // Read the state of the IR sensor:
  irSensorState = digitalRead(irSensorPin);

  if (irSensorState == HIGH) {
    // If the sensor is HIGH, turn the relay ON
    digitalWrite(relayPin, HIGH);
    lcd.setCursor(0, 1);
    lcd.print("Load: ON ");
  } else {
    // If the sensor is LOW, turn the relay OFF
    digitalWrite(relayPin, LOW);
    lcd.setCursor(0, 1);
    lcd.print("Load: OFF ");
  }
  delay(100); // Add a small delay to stabilize the sensor reading
```