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Smart Hybrid Vehicle Using Internet of Things (IOT)

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Abstract: Energy crisis and pollution caused by vehicle emissions are one of the most important issues in the present society. Due to the charging time of battery of electric vehicle, requirement of charging on board is explored as option. This project deals with the design of a hybrid model of a solar and wind, which uses the battery asits storage system. This system allows the two sources to supply the load separately or simultaneously depending on the availability of the energy sources. The power generated from the wind and solar is fluctuating in nature.

The system obtains maximum solar energy during day time and it produces 12 Watts electric power. Here we are using 12V, 1.Amp solar panel and maximum wind energy during the night time because the wind blows more at night and it produces 12V, & 1.Amp totally it produces 12Watts per hour in Night Time compared to day time. Therefore, battery of the vehicle can be charged by using hybrid energy system.

For full charge of battery it takes 4.Hours, with these power rating devices (Solar panel and Wind power). Along with these parameters we are including some more features like normal accidents and fire accidents detection and sending the information automatically using IOT Technology with mobile charging feature in the vehicle and it runs with the help of generated power from natural resources without emitting any flue gases. By using these types of smart hybrid vehicle, we can save our environment and resources.

Keywords: Solar Panel, DC Generator, Battery, Charging Sensor, IR Sensor,

I. INTRODUCTION

Integration of renewable energy sources such as Solar PV (SPV) and wind energy into main grid is given higher priority with higher depletion rate of fossil fuel resources. With the seasonal variation of solar and wind energy potential, it is difficult to increase the renewable energy.

This makes it essential to amalgamate an energy storage which can absorb the fluctuations up to a certain extent. Recently, a number of studies have focused economic and environmental prospect of vehicle.

Uncertainty of main grid due to changes in demand, renewable energy potential and availability of vehicles makes it difficult to optimize renewable energy systems with vehicle.

A number of case studies that are conducted in different parts of the world in order to evaluate the economic feasibility of a vehicle in smart energy systems. These publications report that vehicle support to integrate renewable energy sources while absorbing the fluctuations of the demand. Numerous difficulties are reported in optimizing such systems.

However, it was observed that most of the mathematical models have been developed for simplifying the basic problem. It's assumed that, electric.

Driven vehicles are used during the day time, cost of grid electricity remains constant, daily/weekly fluctuations will maintain throughout the year etc. In order to address both the aforementioned limitations, a novel simulation.based optimization algorithm is introduced in this project.

A. Renewable Energy Model

Renewable energy component of the Hybrid Renewable Energy System (HRES) consists of SPV panels and wind turbines. Hourly, solar irradiation on a horizontal plane at Hamartoma, a south coastal location of Sri Lanka is used in this project. An isotropic model is used to convert the hourly horizontal solar irradiation into a tilted hourly solar irradiation. Renewable energy model is as shown in the below Fig 1.1

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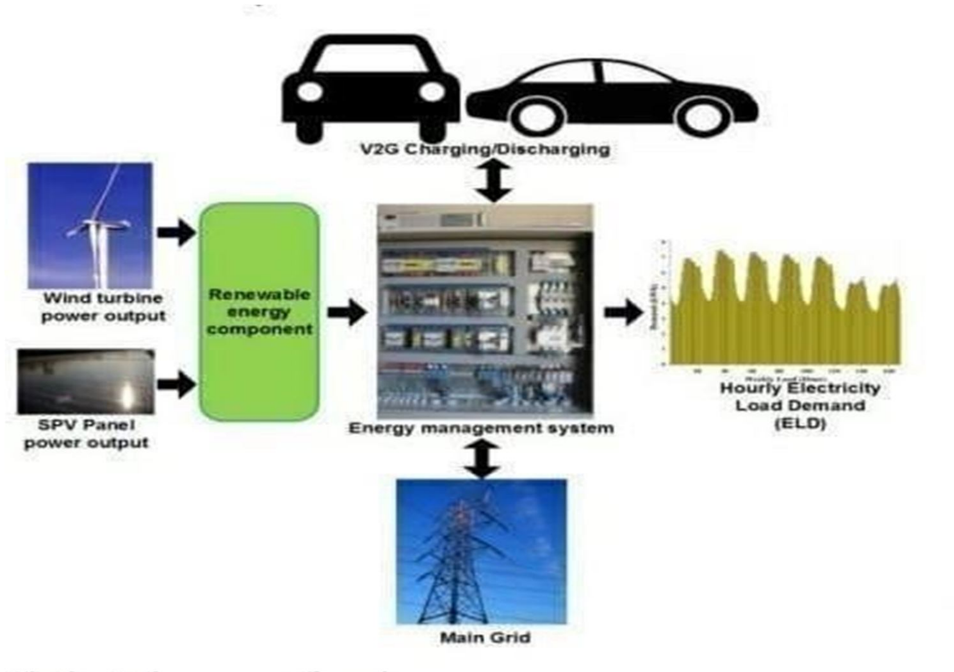

Fig.1.1. Renewable energy system

Energy interaction with vehicles mainly depends on willingness to purchase electricity by the vehicle owner, State of Charge (SOC) of the battery banks of EV/PHV. In addition to that wear cost of battery bank also influences the energy interaction that depends on the type of battery, capacity of the vehicle fleet and the rate of charge/discharge. There are number of factors which control the energy flow among main grid (ESP)and vehicle fleet. COE of the main grid (ESP provider), maximum number of electricity units that can be taken from main grid (upper bound for energy inflow) or given to the main grid (upper bound for energy outflow) can be taken as major parameters which influence the optimum solution to arrive. In addition, the profit margins are to be maintained when charging and discharging EV/PHEV, location of vehicle etc., are also becoming vital. It is an extensive task to consider the sensitivity of all the aforementioned factors.

These results clearly depict that it is economical to utilize parking slots in urban areas as vehicle charging. Gradual increase in vehicle station size and wind turbine capacity can be observed with the increase of COE. Furthermore, the capacity has increased its size significantly from eight vehicles to forty vehicles. This facilitates more interaction with both vehicle and main grid. Although, interaction with both grid and vehicle increases with the increase of COE renewable energy wasted due to limitations in grid integration and vehicle charging is increasing. In addition, these results clearly show that cost of renewable energy sources, and vehicle facility needs to be significantly low when compared to COE in order to become energy interactions.

B. Embedded Systems

An Embedded system is a special purpose system in which the computer is completely encapsulated by or dedicated to the device or system it controls. Unlike a general purpose computer, such as a personal computer, an embedded system performs one or a few predefined tasks, usually with very specific requirements. Since the system performs specific tasks, and the design engineers can optimize it by reducing the size and cost of the product.

Personal digital assistants (PDAs) or handheld computers are generally considered as embedded devices because of the nature of their hardware design, even though they are more expandable in software terms. With the introduction of the OQO Model 2 of the Windows XP operating system and ports such as a USB port both features usually belong to "general purpose computers".

Physically, embedded systems range from portable devices such as digital watches and MP3 players, to large stationary installations like traffic lights, factory controllers, or the systems controlling nuclear power plants. In terms of complexity, embedded systems can be controlled with a simple single microcontroller chip, to very complex multiple units, peripherals and networks mounted inside a large chassis or enclosure.

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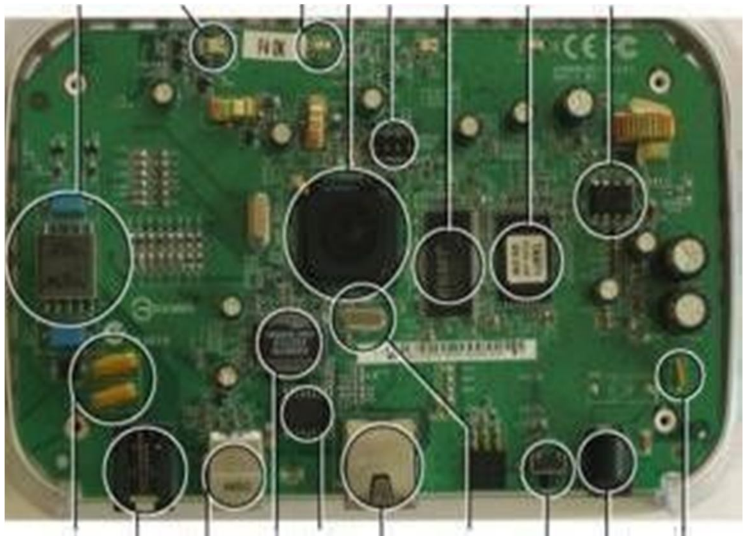

Fig 1.2. Example of embedded system

1) *Classification Of Embedded Systems*

Embedded systems are classified into four categories based on their performance and functional requirements.

a) Standalone embedded systems ❖ Real time embedded systems
b) Networked embedded systems
c) Mobile embedded systems
d) Embedded Systems are classified into three types based on the performance of the microcontroller such as
e) Small scale embedded systems
f) Medium scale embedded systems
g) Sophisticated embedded systems

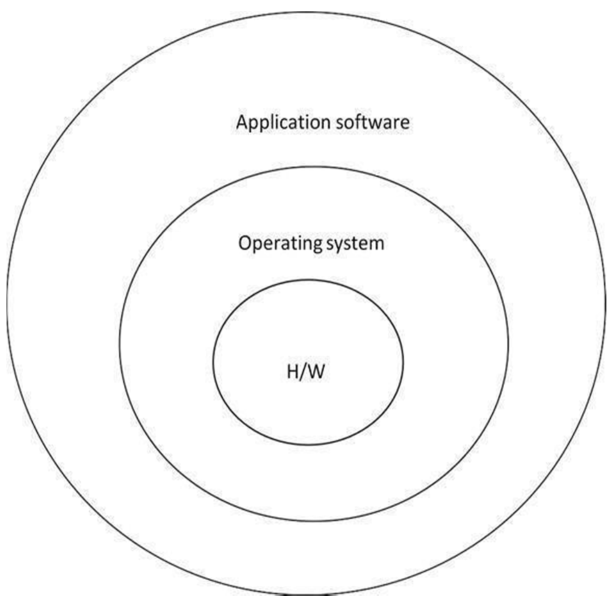

Fig.1.3. Applications of Embedded System Architecture

The operating system runs between the hardware and the application software runs above the operating system. The same architecture is applicable to any computer including desktop computer. However, these are some of the significant differences. It's not compulsory to have an operating system in every embedded system. For small applications such as remote control units, air conditioners, toys etc.

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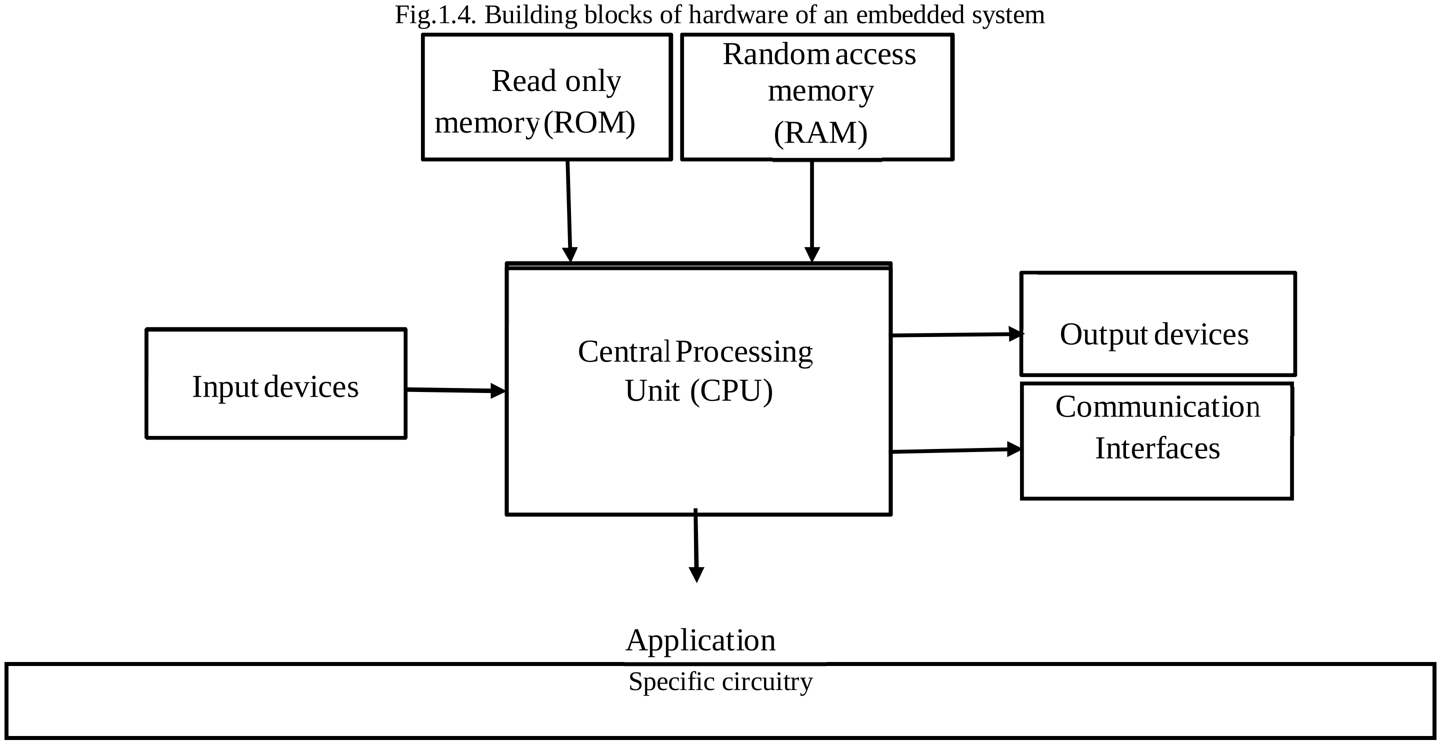
2) Overview of Embedded System Architecture

Every embedded system consists of custom built and a hardware built around a Central Processing Unit (CPU). This hardware also contains memory chips through which software is loaded. The software residing on the memory chip is also called the 'firmware'. The embedded system architecture can be represented as a layered architecture as shown in Fig 1.3.

The operating system runs above the hardware, and the application software runs above the operating system. The same architecture is applicable to any computer including a desktop computer. However, there are significant differences. It is not compulsory to have an operating system in every embedded system. For small appliances such as remote control units, air conditioners, toys etc., there is no need of an operating system and you can write only the software specific to that application. For applications involving complex processing, it's advisable to have an operating system and you can write only the software specific that is application. For applications involving complex processing, it is advisable to have an operating system. In such a case, you need to integrate the application software with the operating system and then transfer the entire software on to the memory chip. Once the software is transferred to the memory chip, the software will continue to run for a long time and you don't need to reload new software. The details of various building blocks of the hardware of an embedded system. Fig 1.4 will show the block diagram representation of an Embedded System.

- Central Processing Unit (CPU)
- Memory(Read Only Memory and Random Access Memory)
- Input Devices
- Output devices
- Application –specific circuitry

Fig.1.4. Building blocks of hardware of an embedded system



a) Central Processing Unit (CPU)

The Central Processing Unit (processor, in short) can be any of the following. microcontroller, microprocessor or Digital Signal Processor (DSP). A micro controller is a low cost processor. Its main intention is to turn on chip itself, there will be many other components such as memory, serial communication interface, analog.to digital converter etc. So, for small applications, a micro. controller is the best choice as the number of external components required will be very less. On the other hand, microprocessors are more powerful, but you need to use many external components with them. DSP is used mainly for applications in which signal processing is involved such as audio and video processing.

b) Input Devices

Unlike the desktops, the input devices to an embedded system have very limited capability. There will be no keyboard or a mouse, and hence interacting with the embedded system is no easy task. Many embedded systems will have a small keypad. you press one key to give a specific command. A keypad may be used to input only the digits. Many embedded systems used in process control do not have any input device for user interaction; they take inputs from sensors or transducers and it produces electrical signals that are in turn fed to other systems.

c) Output Devices

The output devices of the embedded systems also have very limited capability. Some embedded systems will have a few Light Emitting Diodes (LEDs) to indicate the health status of the system modules, or for visual indication of alarms. A small Liquid Crystal Display (LCD) may also be used to display some important parameters.

d) Communication Interfaces

The embedded systems may need to, interact with other embedded systems at they may have to transmit data to a desktop. To facilitate this, the embedded systems are provided with one or a few communication interfaces such as RS232, RS422, RS485, Universal Serial Bus (USB), and IEEE 1394, Ethernet etc.

3) Embedded Software Architectures

There are several different types of software architecture in common use.

a) Simple Control Loop

In this design, the software simply has a loop. The loop calls subroutines, each of which manages a part of the hardware or software.

b) Interrupt Controlled System

Some embedded systems are predominantly interrupt controlled. This means that tasks performed by the system are triggered by different kinds of events. An interrupt could be generated for example by a timer in a predefined frequency, orby a serial port controller receiving a byte. These kinds of systems are used if event handlers need low latency and the event handlers are short and simple. Usually these kinds of systems run a simple task in a main loop also, but this task is not very sensitive to unexpected delays. Sometimes the interrupt handler will add longer tasks to a queue structure. Later, after the interrupt handler has finished, then these tasks are executed by the main loop. This method brings the system close to a multitasking kernel with discrete processes.

c) Cooperative Multitasking

A non primitive multitasking system is very similar to the simple control loop scheme, except that the loop is hidden in an Application programming interface (API). The programmer defines a series of tasks, and each task gets its own environment to “run” in. When a task is idle, it calls an idle routine, usually called “pause”, “wait”, “yield”, “nap” (stands for "no operation"), etc. Adding new software is easier, by simply writing a new task, or adding to the queue interpreter.

d) Preemptive Multitasking Or Multi.Threading

In this type of system, a low level piece of code switches between tasks or threads based on a timer (connected to an interrupt). This is the level at which the system is generally considered to have an "operating system" kernel. Depending on how much functionality is required, it introduces more or less of the complexities of managing multiple tasks running conceptually in parallel. Because of these complexities, it is common for organizations to use a real time operating system (RTOS), allowing the application programmers to concentration device functionality rather than operating system services, at least for large systems; smaller systems often can’t afford the overhead associated with a generic real time system, due to limitations regarding memory size, performance, and/or battery life. The RTOS brings its own issues as the selection must be done prior to starting the application development process. This timing forces developers to choose the embedded operating system for their device based upon current requirements and so restricts future options to a large extent. The restriction of future options becomes an issue as product life decreases. Additionally, the level of complexity is continuously growing as devices are required to manage many variables such as serial, USB, TCP/IP, Bluetooth, Wireless LAN, trunk radio, multiple channels, data and voice, enhanced graphics, multiple states, multiple threads, numerous wait states and so on. These trends are leading to the uptake of embedded middleware in addition to a real time operating system.

4) Applications

a) Military and aerospace embedded software applications.
b) Communication Applications.
c) Industrial automation and process control software.
d) Mastering the complexity of applications.
e) Reduction of product design time.
f) Realtime processing of ever increasing amounts of data.
g) Intelligent, autonomous sensors.

5) Microcontroller

A microcontroller (MCU for microcontroller unit or UC for *μ-controller*) is a small computer on a single integrated circuit. In modern terminology, it is similar to, but less sophisticated than a System on a chip (SoC) and SoC may include a micro. controller as one of its components. A microcontroller contains one or more CPUs (processor cores) along with memory and programmable input/output peripherals. Program memory in the form of ferroelectric RAM, NOR flash or OTP ROM is also often included on chip, as well as a small amount of RAM. Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications consisting of various discrete chips.

Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices, remote controls, office machines, appliances, power tools, toys and other embedded systems. By reducing the size and cost compared to a design that uses a separate microprocessor, memory, and input/output devices, microcontrollers make it economical to digitally control even more devices and processes. Mixed signal microcontrollers are common, integrating analog components needed to control non-digital electronic systems. In the context of the internet of things, microcontrollers are an economical and popular means of, sensing and actuating the physical world as edge devices.

Some microcontrollers may use four-bit words and operate at frequencies as low as 4 kHz, for low power consumption (single-digit milliwatts or microwatts). They generally have the ability to retain functionality while waiting for an event such as a button press or other interrupt; power consumption while sleeping (CPU clock and most peripherals off) may be just nanowatts, making many of them well suited for long lasting battery applications. Other microcontrollers may serve performance critical roles, where they may need to act more like a digital signal processor (DSP), with higher clock speeds and power consumption.

II. BLOCK DIAGRAM and WORKING of HRES

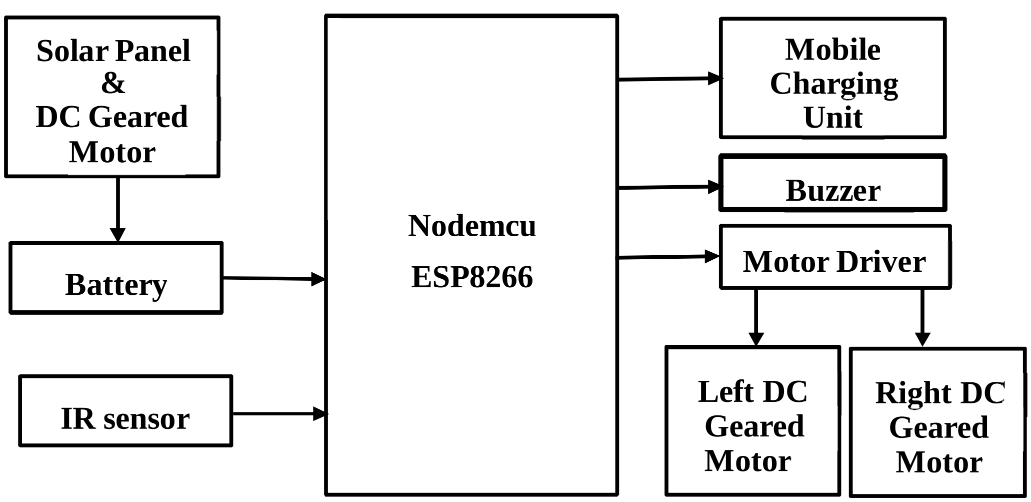


Fig.2.1. Block Diagram of HRES

Hybrid Renewable Energy System (HRES) is a combination of two energies namely Solar and Wind energy and a battery is placed to charge (or) store the energy. Here we are using 12V Battery and by using HRES we can charge the battery within 4 hours of time and by using the renewable energy we can run the vehicle more than 2 hours. By using Nodemcu, the entire vehicle movement and charging can be controlled.

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We are not able to control the DC geared motor directly by using Microcontroller and with the help of a Motor driver we are interfacing the motor and microcontroller. If the vehicle hits any obstacle then the IR sensor activates the Buzzer and sends the notification alert, the buzzer continuously beeps until a person reaches the vehicle, a Blynk app is used to control the Vehicle movement and also to Share the Location immediately after the detection of an accident. By using this app, we can reduce the death rate that's occurred after the accident. The hardware components are connected to the internet by using IOT. We can connect the whole system to the internet with the help of a Wi.Fi module namely ESP.12E.

A. Hardware Components & Description

1) Solar Panel

A photovoltaic (PV) module is a packaged; connect assembly of typically 6x10 photovoltaic solar cells. Photovoltaic modules constitute the photovoltaic array of a photovoltaic system that generates and supplies solar electricity in commercial and residential applications. Each module is rated by its DC output power under standard test conditions (STC), and typically ranges from 100 to 365 Watts (W). The efficiency of a module determines the area of a module given the same rated output – an 8% efficient module will have twice the area of a 16% efficient 230 W module. There are few commercially available solar modules that exceeds efficiency of 22% and reportedly also exceeds 24%. A single solar module can produce only a limited amount of power; most of the installations contain multiple modules. A photovoltaic system typically includes an array of photovoltaic modules, an inverter, a battery pack for storage, interconnection wiring, and optionally a solar tracking mechanism. The most common application of solar panels is solar water heating systems. The price of solar power continued to fall so that in many countries it is cheaper than ordinary fossil fuel electricity from the grid (there is "grid parity).

Solar cells and solar panels have lot of uses. They are in everyday things like calculators, watches, and flashlights. There are solar-powered toys, radios, and MP3 players. There are solar-powered cell phones and pagers. Using solar power with devices like these means you never have to worry about batteries. Solar panels are sometimes used to make the electricity to light up road signs and bus stops. They may make the electricity that makes road side emergency phones or parking meters work. Even some ATMs (machines that lets you to get money from or put money into your bank account) have solar panels.

Fig.2.2. Structure of Solar Panel

a) Theory and Construction

Photovoltaic modules use light energy (photons) produced by the Sun to generate electricity with the help of photovoltaic effect. The majority of modules use wafer-based crystalline silicon cells or thin film cells. The structural (load carrying) member of a module can either be the top layer or the back layer. Cells must also be protected from mechanical damage and moisture. Most modules are rigid, but semi-flexible one sure available, based on thin film cells. The cells must be connected electrically in series, one to another. Externally, most of photovoltaic modules use MC4 connector's type to facilitate easy weather proof connections to the rest of the system.

Modules electrical connections are made in series to achieve a desired output voltage or in parallel to provide a desired current capability. The conducting wires that take the current from the modules may contain silver, copper or other non. magnetic conductive transition metals. Bypass diodes may be incorporated or used externally, in case of partial module shading, to maximize the output of module sections still illuminated. Some special solar PV modules include concentrators in which light is focused by lenses or mirrors onto smaller cells. This enables the use of cells with a high cost per unit area (such as gallium arsenide) in a cost. effective way. Fig 2.1.1.1 will show the diagrammatic representation of the layers in solar panel.

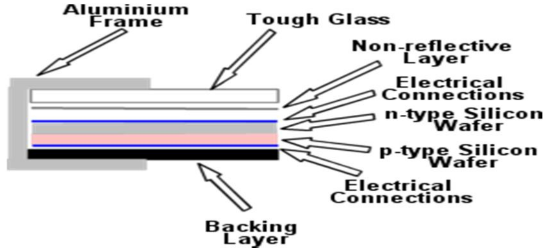

Fig 2.3. Layers of Solar Panel

The Sun constantly provides the energy. The energy is carried through space as electromagnetic radiation. There are several types of electromagnetic radiation. Light is one type. Radio waves are another type. Electromagnetic radiation travel like waves in water. Like water waves, it is a series of ups and downs. Various types of electromagnetic waves differ is in their wavelength. This is the distance between two ups(or two downs) in a row. The wavelengths of radio waves are longer than those of light. Among the different types of light, red has a longer wavelength than blue.

- *How Solar Cells Use Light.*

Only part of the energy sent towards the Earth by the Sun actually makes it to Earth's surface. Some solar energy gets bounced back into Space. Some of it gets absorbed by the air. Most of the solar energy is sent to Earth's surface is in the form of visible light. Solar cells can use the energy of this light to make electricity. But they don't work equally well with all forms of light. Different types of solar cells use different wavelengths. This means a cell can use only some of the solar energy that it receives.
Solar cells are available in various sizes. Some are thinner than a stamp. Some are of 5 inches (12 centimeters) size. The cells made up of a type of material known as a semiconductor. Often, they are made of silicon. Semiconductors can conduct, or carry, electricity. However, They don't do this as metals. That is why they are called "semi." Because they only "semi" conduct electricity, they can be used to control electric current. On their top and bottom they typically have metal contacts through which current can flow. A typical simple cell has two layers of silicon. One is known as n.type. The other is p.type. The layers are different from each other.

- *How Solar Cells Make Electricity.*

The process of making electricity begins when the silicon atoms absorb some light. The light energy returns some electrons out of the atoms. The electrons flow between the two layers. The flow makes an electric current. The current can leave the cell through the metal contacts and be used. When light hits a solar cell, much of its energy is wasted as shown in Fig.2.1.1.2. Some light bounces off or passes through the cell. Some is turned into heat. Only light with the desired wavelengths or colors, is absorbed and then turned into electricity.

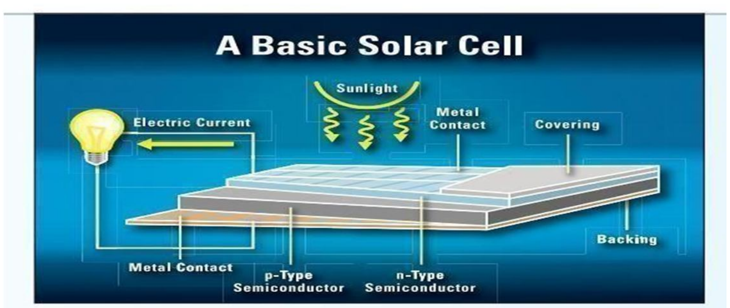

Fig.2.4. Basics layers of solar panel

A single simple solar cell makes only a little amount of electricity. For this reason, cells are linked together in groups known as solar modules. A solar module has a frame that holds the cells. Some modules are several feet long and wide. They usually can produce a power of up to a few hundred watts of electricity. If more power is needed, modules can be joined together to form a large solar array. Modules are sometimes called solar panels. Arrays are also sometimes called solar panels.

Whatever you call a group of solar cells, the fact remains. the more cells you link together, the more electricity you make. With enough modules, huge amount of power generation possible. A good example is a new power plant being built at Moura in Portugal. The first phase of the project has 262,080 solar modules, each with 48 cells. They will produce up to 46 megawatts of electricity. Many experts think even bigger power plants using solar panels will be built in the coming years. Sometimes the solar plants may be able to make 500 Megawatts of power.

Solar panels for buildings are not different from other panels. They must be able to receive enough sunlight to be useful. Often, they are put on a roof that faces the Sun and is not shaded. Sometimes they are simply built on the ground. Solar panels come in various colors and designs. They may be put on a wall or roof and blend right in, so you don't even notice them. Roof shingles and tiles can be made using thin.film panels.

b) Types of Solar Photovoltaic Cells

Electricity is produced in solar cells which consists of more layers of semi conductive material. When the sun's rays fall upon the solar cells, the electromotive force between these layers is being created, which causes the flow of electricity. The most common material for the production of solar cells is silicon. Silicon is obtained from sand and is one of the most common elements in the earth's crust, so there is no limit to the availability of raw materials. The construction of solar panel is as shown in Fig 2.5.

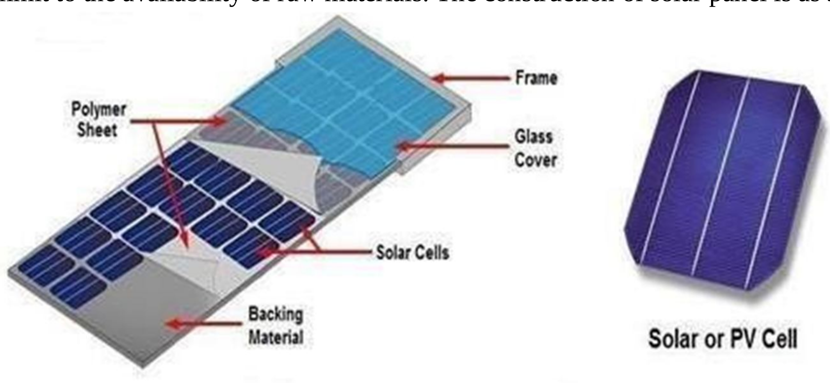

Fig.2.5. Construction of Solar Cell

Solar cell manufacturing technologies are.

- Monocrystalline
- Polycrystalline
- Bar-crystalline silicon
- Thin-film technology

c) Solar Power Applications

➢ *Concentrating Solar Power (CSP)*

Concentrating solar power (CSP) plants are utility-scale generators that produce electricity using mirrors or lenses to concentrate the sun's energy efficiently. The four principal CSP technologies are parabolic troughs, dish-stirling engine systems, central receivers, and concentrating photovoltaic systems (CPV).

➢ *Solar Thermal Electric Power Plants*

Solar thermal energy involves harnessing solar power for practical applications from solar heating to electrical power generation. Solar thermal collectors, such as solar hot water panels, are commonly used to generate solar hot water for domestic and industrial applications. This energy system is also used in architecture and building design to control heating and ventilation in both active solar and passive solar designs.

- *Photovoltaics*

Photovoltaic or PV technology employs solar cells or solar photovoltaic arrays to convert energy from the sun into electricity. Solar cells produce direct current (D.C) electricity from the sun's rays, which can be used to power equipment or to recharge batteries. Many pocket calculators incorporate a single solar cell, but for larger applications, cells are generally grouped together to form PV modules that are in turn arranged in solar arrays. Solar arrays can be used to power orbiting satellites and other spacecraft and in remote areas as a source of power for roadside emergency telephones, remote sensing, and cathodic protection of pipelines.

- *Solar Heating Systems*

Solar hot water systems use sunlight to heat water. The systems are composed of solar thermal collectors and a storage tank, and they may be active, passive or batch systems.

2) DC Generator

Almost every mechanical development that we see in our day to day life is accomplished by an electric motor. Electric machines are used for converting energy. Motors take electrical energy and produce mechanical energy. Electric motors are utilized to power hundreds of devices we use in everyday life.
Electric motors are broadly classified into two different categories. Direct Current (DC)motor and Alternating Current (AC) motor. In this project we are going to discuss about the DC motor and it's working. And also, how a DC gear motors works.
A DC motor is an electric motor that runs on direct current power. In any electric motor, operation is dependent upon simple electromagnetism. A current carrying conductor generates a magnetic field, when this is placed in an external magnetic field, it will encounter a force proportional to the current in the conductor and to the strength of the external magnetic field. It is a device which converts electrical energy to mechanical energy. It works on the fact that a current carrying conductor placed in a magnetic field experiences a force which makes it to rotate with respect to its original position. The below Fig 2.6 shows the working of a brushless DC motor.
Practical DC Motor consists of field windings to provide the magnetic flux and armature which acts as the conductor.

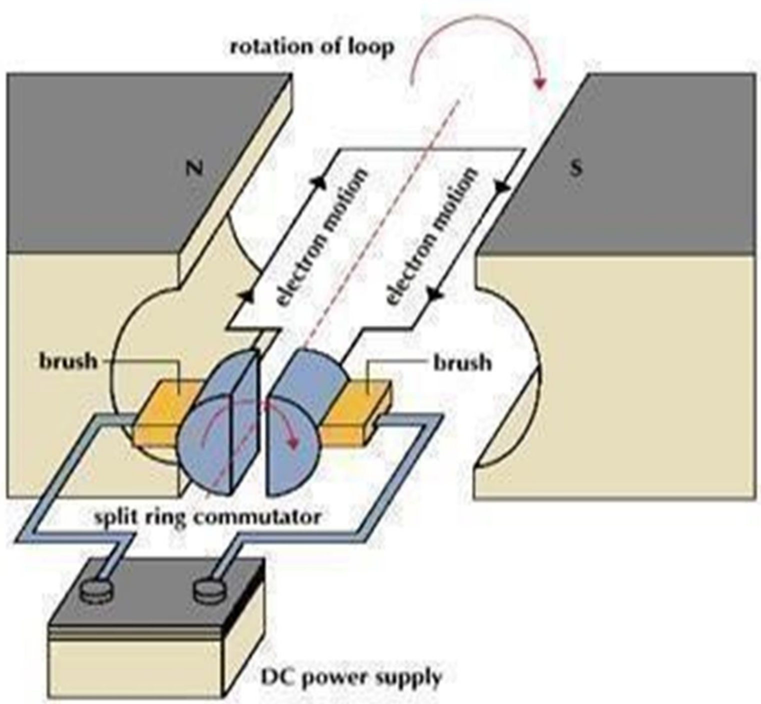

Fig.2.6. Working of brushless DC motor

The input of a brushless DC motor is current/voltage and its output is torque. Understanding the operation of DC motor is very simple from a basic diagram is shown in below Fig 2.7. DC motor basically consists of two main parts. The rotating part is called the rotor and the stationary part is also called the stator. The rotor rotates with respect to the stator.

Fig.2.7. DC geared Motor

The rotor consists of windings, the windings being electrically associated with the commutator. The geometry of the brushes, commutator contacts and rotor windings are those devices that when power is applied, the polarities of the energized winding and the stator magnets are misaligned and the rotor will turn until it is very nearly straightened with the stator's field magnets. The components & Cross. Section of DC motor is shown in Fig 2.8.

As the rotor reaches alignment, the brushes move to the next commutator contacts and energize the next winding. The rotation reverses the direction of current through the rotor winding, prompting a flip of the rotor's magnetic field, driving it to keep rotating.

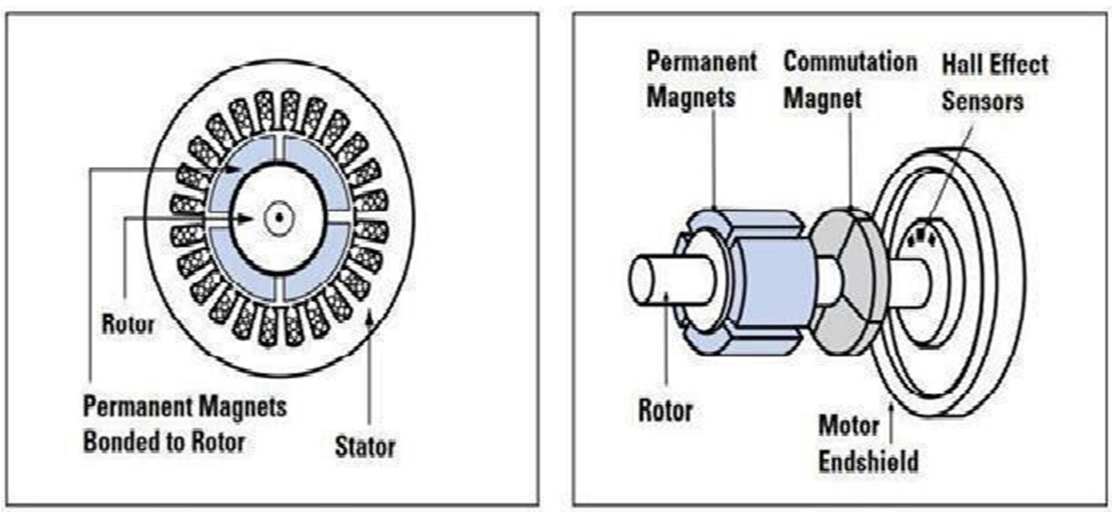

Fig.2.8. Cross-section & components of DC Motor

a) Advantages of DC Motor

Provide excellent speed control

- Easy to understand design
- Simple, cheap drive design

b) Connecting DC Motor with Microcontroller

Microcontrollers can't drive the motors directly. So, we need some kind of drivers to control the speed and direction of motors. The motor drivers will act as interfacing devices between microcontrollers and motors. Motor drivers will act as current amplifiers since they take a low current control signal and provide a high current signal. This high current signal is used to drive the motors. Using L293D chip is the easy way for controlling the motor using microcontroller. It contains two H- bridge driver circuits internally.

This chip is designed to control two motors. L293D has two sets of arrangements where1 set has input1, input 2, output1, output 2, with enable pin while other set has input 3, input 4, output 3, output 4 with other enable pin. As shown in the below Fig 2.9.

Here is an example of DC motor which is interfaced with L293D microcontroller.

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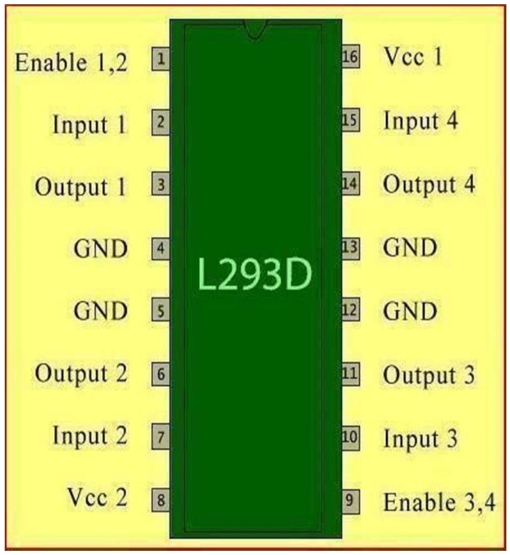

Fig.2.9. L293D interfaced with DC Motor & Microcontroller

- L293D has two set of arrangements where one set has input 1, input 2, output 1 and output 2 and other set has input 3, input 4, output 3 and output 4, according to above diagram,
- If pin no 2 and 7 are high then pin no 3 and 6 are also high. If enable 1 and pin number 2 are high leaving pin number 7 as low then the motor rotates in forward direction.
- If enable 1 and pin number 7 are high leaving pin number 2 as low then the motor rotates in reverse direction.
- Today dc motors are still found in many applications as small as toys and disk drives or in large sizes to operate steel rolling mills and paper machines.

c) Geared DC Motors

Geared motors tend to reduce the speed of the motor but with a corresponding increase in torque. This property comes in handy, as DC motors can rotate at speeds much too fast for an electronic device. Geared motors commonly consist of a DC brush motor and a gearbox attached to the shaft. Motors are distinguished as a geared by two connected units. It has many applications due to its cost of designing, reduces the complexity and constructing applications such as industrial equipment, actuators, medical tools and robotics. A good robot can't be built without gears. All things are to be considered, a good understanding of how gears affect parameters such as torque and velocity are very important. Gears work on the principle of mechanical advantage. This implies that by using distinctive gear diameters, we can exchange between rotational velocity and torque. The image representation of Geared DC motor is shown in Fig 2.10.

Fig.2.10. Geared DC Motor

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A gear motor is a specific type of electrical motor that is designed to produce high torque while maintaining a low horsepower, or low speed, motor output. Gear motors can be found in different applications, and are probably used in many devices in your home.
Gear motors are commonly used in devices such as can openers, garage door openers, washing machine time control knobs and even electric alarm clocks. Common commercial applications of a gear motor include hospital beds, commercial jacks, cranes and many other applications.

d) Basic Principle of Operation

A gear motor can be either an AC (alternating current) or a DC (direct current) electric motor. Most gear motors have an output between 1,200 to 3,600 revolutions per minute (RPMs). These types of motors also have two different speed specifications. normal speed and the stall-speed torque specifications. Gear motors are primarily used to reduce speed in a series of gears, which in turn creates more torque. This is accomplished by an integrated series of gears or a gear box being attached to the main motor's rotor and shaft via a second reduction shaft. The second shaft is then connected to the series of gears or gearbox to create a series of reduction gears. Generally speaking, the longer the train of reduction gears, the lower the output of the end, (or) final, gear will be.
An excellent example of this principle would be an electric time clock (the type that uses hour, minute and second hands). The synchronous AC motor is used to power the time clock, usually spin the rotor at around1500 revolutions per minute. However, a series of reduction gears is used to slow the movement of the hands on the clock. For example, while the rotor spins at about 1500 revolutions per minute, the reduction gears allow the final second-hand gear to spin at only one revolution per minute. This is what allows the second hand to make one complete revolution per minute on the face of the clock.

e) Voltage Regulator

A voltage regulator is designed to automatically maintain a constant voltage level. A voltage regulator may be a simple "feed-forward" design or may include negative feedback control loops. It may use an electromechanical mechanism, or electronic components. Depending on the design, it may be used to regulate one or more AC or DC voltages. Electronic voltage regulators are found in devices such as computer power supplies where they stabilize the DC voltages used by the processor and other elements. In automobile alternators and central power station generator plants, voltage regulators control the output of the plant. In an electric power distribution system, voltage regulators may be installed at a substation or along distribution lines so that all customers receive steady voltage independent of how much Power is drawn from the line. The image of an voltage regulator is shown in Fig 2.11.

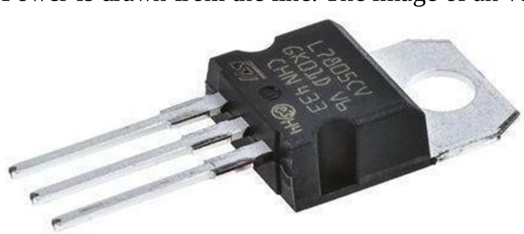

Fig.2.11. Voltage Regulator

f) 12V Battery

The twelve-volt battery, is a common size of battery that was introduced for the early transistor radios. It has a rectangular prism shape with rounded edges and a polarized snap connector at the top. This type is commonly used in walkie. talkies, clocks and smoke detectors.
The twelve-volt battery format is commonly available in primary carbon-zinc and alkaline chemistry, in primary lithium iron disulfide, and in rechargeable form in nickel. cadmium, nickel-metal hydride and lithium-ion. Mercury-oxide batteries of this format, once common, have not been manufactured in many years due to their mercury content. Designations for this format include NEDA 1604 and IEC 6F22(for zinc-carbon) or MN1604 6LR61 (for alkaline). The size, regardless of chemistry, is commonly designatedPP3 . a designation originally reserved solely for carbon-zinc. or in some countries, E or E-block.
Most nine-volt alkaline batteries are constructed of six individual 1.5 V LR61 cells enclosed in a wrapper. These cells are slightly smaller than LR8D425 AAAA cells and can be used in their place for some devices, even though they are 3.5 mm shorter. Carbon-zinc types are made with six flat cells in a stack, enclosed in a moisture-resistant wrapper to prevent drying. Primary lithium types are made with three cells in series. In 2007, 9.volt batteries accounted for 4% of alkaline primary battery sales in the US. In Switzerland in 2008, 12.volt batteries totaled 2% of primary battery sales and 2% of secondary battery sales. The image representation of sealed rechargeable battery is shown in Fig 2.12.

Fig.2.12. A sealed rechargeable battery

The battery has both terminals in a snap connector on one end. The smaller circular (male) terminal is positive, and the larger hexagonal or octagonal (female) terminal is the negative contact. The connectors on the battery are the same as on the connector itself; the smaller one connects to the larger one and vice versa. The same snap-style connector is used on other battery types in the Power Pack (PP) series. A problem with this style of connector is that it is very easy to connect two batteries together in a short circuit, which quickly discharges batteries, generating heat and possibly a fire. Because of this hazard, 12.volt batteries should be kept in the original packaging until they are going to be used. An advantage is that several nine-volt batteries can be connected to each other in series to provide higher voltage.

g) Technical Specifications

The most common type of 9V battery is commonly referred to simply as 9. volt, although there are less common 12V batteries of different sizes. Codes for the usual size include PP3 (for size and voltage, any technology), 6LR61 (IEC code for alkaline batteries), and in Japan 006P. The PP3 size battery has height 48.5 mm, width 26.5 mm, depth 17.5 mm (or 1.9 in × 1.0 in × 0.68 in). Both terminals are at one end and their centers are ½ inch (12.7 mm) apart. Inside an alkaline or carbon-zinc 12.volt battery there are six cylindrical or flat cells connected in series. Some brands use welded tabs internally to attach to the cells, others press foil strips against the ends of the cells. Mercury batteries were formerly made in this size. They had higher capacity than the standard carbon-zinc types, a nominal voltage of 9.volts, and stable voltage. Once used in photographic and measuring instruments or long-life applications, they are no longer manufactured as mercury is an environmental pollutant.

h) Temperature Performance

TYSONIC Ni.MH battery can be used in wider range of temperature, but the battery performance changes according to the ambient temperature, so the battery should be used within the following range of temperature. Charge. 0℃ to +45℃
Discharge. .20℃ to +60℃ Storage. .30℃ to +50℃ (long term storage. .30℃ to +35℃

3) NODEMCU ESP8266

ESP.12E Wi.Fi module is developed by Ai-thinker Team. core processor ESP8266 in smaller sizes of the module encapsulates Ten silica L106 integrates industry-leading ultra-low power 32.bit MCU aa5micro, with the 16.bit short mode, Clock speed support 80 MHz, 160 MHz, supports the RTOS, integrated Wi.Fi MAC/BB/RF/PA/LNA, on-board antenna. The module supports standard IEEE802.11 b/g/n agreement, complete TCP/IP protocol stack. Users can use the add modules to an existing device networking, or building a separate network controller. ESP8266 is high integration wireless SOCs, designed for space and power constrained mobile platform designers. It provides unsurpassed ability to embed Wi. Fi capabilities within other systems, or to function as a standalone application, with the lowest cost, and minimal space requirement.

ESP8266EX offers a complete and self-contained Wi.Fi networking solution; it can be used to host the application or to offload Wi.Fi networking functions from another application processor. When ESP8266EX hosts the application, it boots up directly from an external flash. ESP8266EX is among the most integrated Wi.Fi chip in the industry; it integrates the antenna switches, power amplifier, low noise receive amplifier, filters, power management modules, it requires minimal external circuitry, and the entire solution, including front-end module, is designed to occupy minimal PCB area. Fig 2.13 shows the image representation of Nodemcu ESP8266.

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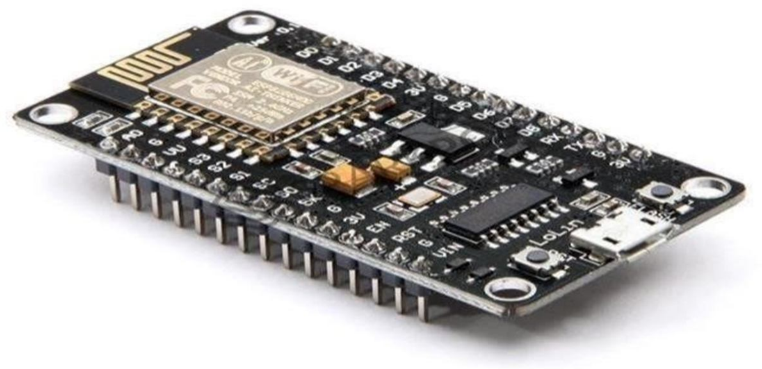

Fig.2.13. Nodemcu esp8266

a) *Family of Breakout Boards*

Quickly after launch, a variety of breakout boards for the ESP8266 started becoming available. The most popular ones have been the ESP.NN series, which typically integrate the SOC along with Flash RAM, a crystal, and even an onboard antenna. The most salient distinction between different ESP.NN models are the pins that are broken out from the ESP8266.

The connector gave access to the pins used for serial communication, namely RX and TX, as well as4 control pins, GPIO0, GPIO2, CH_PD and RST (reset), along with VCC and GND**.** Because the ESP8266 provides a cost-effective solution to the rapidly growing market of internet. connected projects and devices (i.e., the so. called Internet of Things), it has become one of the most popular development platforms over the past year and a half.

For starters, different firmware options have been ported to run on the ESP8266, effectively taking it from a simple Serial to Wi.Fi adapter into a fully functional microcontroller with access to its GPIO and hardware-based functions like PWM, I2C, 1.Wire communication, and ADC; all this, of course, in addition to maintaining its Wi.Fi capabilities.

b) *Features*

- Integrated low power 32.bit MCU
- Integrated 10.bit ADC
- Integrated TCP/IP protocol stack
- Integrated TR switch, LNA, power amplifier and matching network
- Integrated PLL, regulators, and power management units
- Supports antenna diversity
- Wi.Fi 2.4 GHz, support WPA/WPA2
- Support STA/AP/STA+AP operation modes
- Support Smart Link Function for both Android and iOS devices
- SDIO 2.0, (H) SPI, UART, I2C, I2S, IRDA, PWM, GPIO
- Deep sleep power < 5uA
- Wake up and transmit packets in < 2ms
- Standby power consumption of < 1.0mW
- +20dBmoutput power in 802.11b mode
- Operating temperature range .40C ~ 125C

c) *Applications*

- Smart power plug
- Home automation
- Mesh network
- Industrial wireless control
- Baby monitors

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- IP Cameras
- Sensor network
- Wi.Fi location aware device
- Security ID tags

d) AT Command Processor (Default)

The quickest way to get started with the ESP8266 is to use its original firmware, which allows it to process any AT commands that it receives over its Serial UART interface. The biggest advantage of this option is that we need not be familiar with any specific language or framework to use the module. The downside to this is that we need either an additional microcontroller involved or a USB to Serial adapter to send the necessary commands.

Whereas the AT commands are the standard way of communicating with wireless. capable ICs (e.g., Bluetooth, Wi.Fi, GSM), they pose the limitation of needing another module to run the application that specifies these commands accordingly. However, if we could run the application within the ESP8266 itself then we'd have everything self-contained by a single IC.

e) ESP.12E Pin diagram

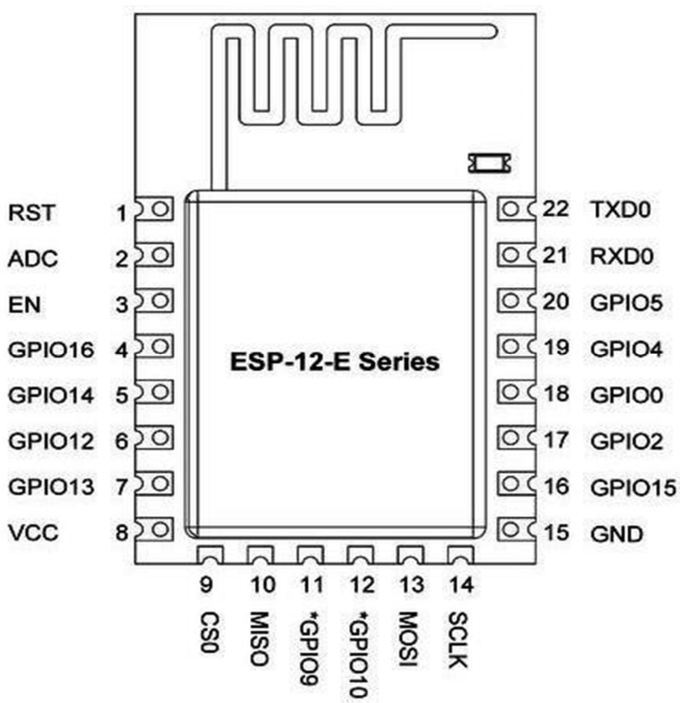

Fig.2.14. ESP.12E Pin diagram

- *Pin Description.*

Table.2.1. Pin description of ESP8266

S.NO	Pin Name	Pin Description
1	RST	Reset the module
2	ADC	A/D Conversion result. Input voltage range 0. 1v, scope.0.1024
3	EN	Chip enable pin. Active high

4	IO16	GPIO16; can be used to wake up the chipset from deep sleep mode.
5	IO14	GPIO14; HSPI_CLK
6	IO12	GPIO12; HSPI_MISO
7	IO13	GPIO13; HSPI_MOSI; UART0_CTS
8	VCC	3.3V power supply (VDD)
9	CS0	Chip selection
10	MISO	Master input Slave output
11	IO9	GPIO9
12	IO10	GBIO10
13	MOSI	Master output slave input
14	SCLK	Serial Clock
15	GND	GND
16	IO15	GPIO15; MTDO; HSPICS; UART0_RTS
17	IO2	GPIO2; UART1_TXD
18	IO0	GPIO0
19	IO4	GPIO4
20	IO5	GPIO5
21	RXD	UART0_RXD; GPIO3
22	TXD	UART0_TXD; GPIO1

➢ *MCU*

ESP8266EX is embedded with Ten silica L106 32.bit micro controller (MCU), which features extra low power consumption and 16.bit RISC. The CPU clock speed is 80MHz. It can also reach a maximum value of 160MHz. ESP8266EX is often integrated with external sensors and other specific devices through its GPIOs; codes for such applications are provided in examples in the SDK.

f) Memory Organization

➢ *Internal SRAM and ROM*

ESP8266EX Wi.Fi SOC is embedded with memory controller, including SRAM and ROM. MCU can visit the memory units through iBus, dBus, and AHB interfaces. All memory units can be visited upon request, while a memory arbiter will decide the running sequence according to the time when these requests are received by the processor. According to our current version of SDK provided, SRAM space that is available to users is assigned as below.

RAM size < 36kB, that is to say, when ESP8266EX is working under the station mode and is connected to the router, programmable space accessible to user in heap and data section is around 36kB.)

There is no programmable ROM in the SOC, therefore, user program must be stored in an external SPI flash.

➢ *External SPI Flash.*

This module is mounted with an 4 MB external SPI flash to store user programs. If larger definable storage space is required, a SPI flash with larger memory size is preferred. Theoretically speaking, up to 16 MB memory capacity can be supported.

4) L293D Motor Driver

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16.pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC. The L293 and L293D devices are quadruple high current half H-drivers. The L293D is designed to provide bi directional drive currents of up to 1A at voltages from 4.4 to 36 V. TheL293D is designed to provide bi directional drive currents of upto 600. m A at voltages from 4.5V to 36V.Both devices are designed to drive inductive loads such as relays, solenoids, DC and bipolar stepping motors as well as other high current/high voltage loads in positive supply applications. Each output is a complete totem. pole drive circuit, with a Darlington transistor sink and a pseudo. Darlington source. Drivers are enabled in pairs with drivers 1 and 2 enabled by 1, 2 EN and drivers 3 and 4 enabled by 3 and 4 EN pins.

The L293 and L293D are characterized for operation from 0°C to 70°C.

a) Working Principle

It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. As you know that voltage changes its direction for being able to rotate the motor in clockwise or anticlockwise direction, hence H.-bridge IC are ideal for driving a DC motor. In a single L293D chip there are two h-Bridge circuit inside the IC which can rotate two dc motor independently. Due its size it is very much used in robotic application for controlling DC motors. Given below is the pin diagram of a L293Dmotor controller. There are two Enable pins on L293D. Pin 1 and pin 9, for being able to drive the motor, the pin 1 and 9 need to be high. For driving the motor with left H-bridge you need to enable pin 1 to high. And for right H. Bridge you need to make the pin9 to high. If anyone of the either pin1 or pin9 goes low then the motor in the corresponding section will suspend working. It's like a switch.

b) Working of L293D

There are 4 input pins for L293D, pin 2, 7 on the left and pin 15 ,10 on the right as shown on the pin diagram. Left input pins will regulate the rotation of motor connected across left side and right input for motor on the right-hand side. The motors are rotated on the basis of the inputs provided across the input pins as LOGIC 0 or LOGIC 1.

In simple you need to provide Logic 0 or 1 across the input pins for rotating the motor.

c) L293D Logic Table

Let's consider a Motor connected on left side output pins (pin 3, 6). For rotating the motor in clockwise direction, the input pins have to be provided with Logic 1 and Logic 0.

- Pin 2 = Logic 1 and Pin 7 = Logic 0 | Clockwise Direction
- Pin 2 = Logic 0 and Pin 7 = Logic 1 | Anticlockwise Direction
- Pin 2 = Logic 0 and Pin 7 = Logic 0 | Idle [No rotation] [Hi-Impedance state]
- Pin 2 = Logic 1 and Pin 7 = Logic 1 | Idle [No rotation]

In a very similar way the motor can also operate across input pin 15, 10 for motor on the right-hand side.

d) Voltage Specifications

V_{cc} is the voltage that it needs for its own internal operation 5v; L293D will not use this voltage for driving the motor. For driving the motors, it has a separate provision to provide motor supply VSS (V supply). L293D will use this to drive the motor. It means if you want to operate a motor at 9V then you need to provide a Supply of 9V across V_{ss} Motor supply.

The maximum voltage for VSS motor supply is 36V. It can supply a max current of 600mA per channel. Since it can drive motors Up to 36v hence you can drive pretty big motors with this L293D.

V_{cc} pin 16 is the voltage for its own internal Operation. The maximum voltage ranges from 5v and up to 36v.

e) Features

- Wide Supply-Voltage Range. 4.5V to 36V
- Separate Input-Logic Supply
- Internal ESD Protection
- High-Noise-Immunity Inputs
- Output Current 1 A Per Channel (600mA for L293D)

- Peak Output Current 2 A Per Channel (1.2A for L293D)
- Output Clamp Diodes for Inductive Transient Suppression (L293D)

f) Applications
- Stepper Motor Drivers
- DC Motor Drivers
- Latching Relay Drivers

g) L293D Pin Diagram

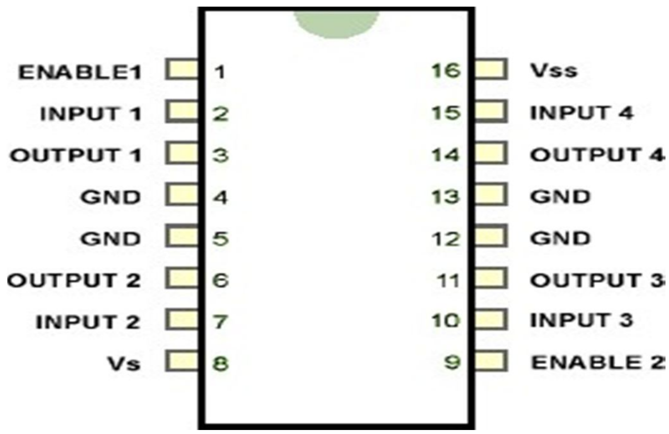

Fig.2.15. Pin Diagram of L293D Motor Driver

5) IR Sensor

IR Sensor is a general-purpose proximity sensor. Here we use it for collision detection. The module consists of an IR emitter and IR receiver pair. The high precision IR receiver always detects an IR signal. The module consists of 358 comparator IC. The output of sensor is high whenever it detected the object and low otherwise. The on-board LED indicator helps user to check status of the sensor without using any additional hardware. The power consumption of this module is low. It gives a digital output.

Based on a simple basic Idea, this IR obstacle sensor is easy to build, easy to calibrate and still, it provides a detection range of 5.20 cm. This sensor can be used for most indoor applications where no important ambient light is present. It is the same principle in ALL Infra-Red proximity sensors. The basic idea is to send infrared light through IR.LEDs, which is then reflected by any object in front of the sensor.

IR sensor consist of IR emitter and IR receiver as shown in Fig 2.16. IR emitter will emit infrared rays continuously when power is supplied to it. On the other hand, the IR receiver will be connected and perform the task of a voltage divider. IR receiver can be imagined as a transistor with its base current determined by the intensity of IR light received. The lower the intensity of IR light cause higher resistance between collector-emitter terminals of transistor, and limiting current from collector to emitter. This change of resistance will further change the voltage at the output of voltage divider. In others word, the greater the intensity of IR light hitting IR receiver, the lower the resistance of IR receiver and hence the output voltage of voltage divider will be decreased.

Fig.2.16. IR Sensor

a) Pin Configuration

The figure to the right is a top view of the IR Sensor module. The following table.2.2 gives the pin configuration.

Table.2.2. Pin Configuration of IR Sensor

Pin No.	Connection	Configuration
1	Output	Digital Output (High or Low)
2	VCC	Connected to circuit Supply
3	Ground	Connected to circuit Ground

b) Overview of IR Sensor

The sensitivity of the IR Sensor is tuned using the potentiometer. The potentiometer is tunable in both the directions. Initially tune the potentiometer in clockwise direction such that the LED starts glowing. Once that is achieved, turn the potentiometer just enough in anti-clockwise direction to turn off the LED. At this point the sensitivity of the receiver is maximum. Thus, its sensing distance is maximum at this point. If the sensing distance (i.e., Sensitivity) of the receiver is to be reduced, then one can tune the potentiometer in the anti-clockwise direction from this point. Further, if the orientation of both TX and Rx LED's is parallel to each other, such that both are facing outwards, then their sensitivity is maximum. If they are moved away from each other, such that they are inclined to each other at their soldered end, then their sensitivity reduces. For example, if the potentiometer is tuned inside room/building for maximum sensitivity and then taken out in open sunlight, it will require retuning, since sun's rays also contain Infrared (IR) frequencies, thus acting as a IR source (transmitter). This will disturb the receiver's sensing capacity. Hence it should be returned to work perfectly in the new surroundings. Hence the output pin is normally low because the IR LED is continuously transmitting the IR rays due to no obstacle nothing is reflected back to the IR receiver. The indication LED is off. When an obstacle is encountered, the output of IR receiver goes low, IR signal is reflected from the obstacle surface. This drives the output of the comparator low. This output is connected to the cathode of the LED, then it turns ON.

c) Features

- IR obstacle.based detector.
- Adjustable range with POT.
- Logic output 1 or 0.
- Sensitivity up to 30cm adjustable.
- Input voltage. 5VDC
- Sensing Range. 5cm
- Output signal. analog voltage
- Emitting element. Infrared LED

d) Using the Sensor.

- Connect regulated DC power supply of 5 Volts to pin 3 and GND to pin2.
- When gas is detected LED is ON or else it is OFF.
- The output from pin1 can be given directly to microcontroller for interfacing applications.

e) Applications

- Industrial safety devices
- Wheel encoder
- Contact less tachometer
- Obstacle detection
- Shaft encoder
- Fixed frequency detection

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6) Buzzer

The electric buzzer was invented in 1831 by Joseph Henry. Those are mainly used in early doorbells until they were phased out in the early 1930s in favor of musical chimes, which have a softer tone. The image representation of buzzer is shown in Figure.2.17.

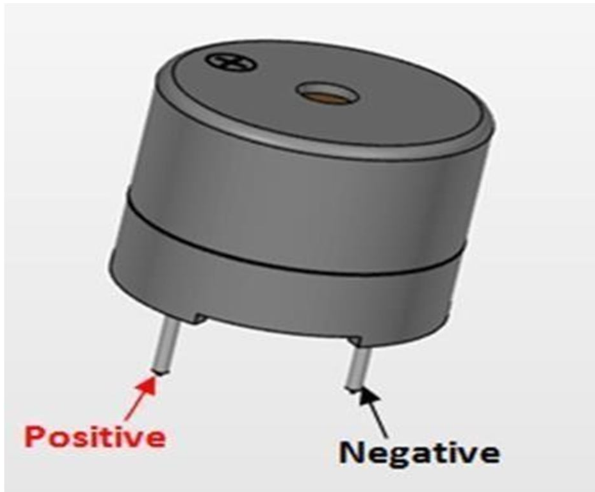

Fig.2.17. Image representation of Buzzer

a) Piezoelectric

Piezoelectric buzzers, or piezo buzzers, as they are sometimes called, were invented by Japanese manufacturers and fitted into a wide range of products during the 1970s to 1980s. This advancement mainly came about because of cooperative efforts by Japanese manufacturing companies. In 1951, they established the Barium Titanite Application Research Committee, which allowed the companies to be "competitively cooperative" and bring about several piezoelectric innovations and inventions.

b) Electromechanical

Early devices were based on an electromechanical system identical to an electric bell without the metal gong. Similarly, a relay may be connected to interrupt its own actuating current, causing the contacts to buzz. Often these units were anchored to a wall or ceiling to use it as a sounding board. The word "buzzer" comes from the rasping noise that electromechanical buzzers made.

c) Mechanical

A joy buzzer is an example of a purely mechanical buzzer and they require drivers. Other examples of them are doorbells. The two most common technologies used in buzzer designs are magnetic and piezo. Many applications use either a magnetic or a piezo buzzer, but the decision regarding which of the two technologies to use is based upon many different constraints. Magnetic buzzers operate at lower voltages and higher currents (1.5~12 V, > 20 mA) compared to piezo buzzers (12~220V, < 20 mA), while piezo buzzers often have greater maximum sound pressure level (SPL) capability than magnetic buzzers.

Piezo buzzers are used in similar applications as magnetic buzzers. Piezo buzzers are constructed by placing electrical contacts on the two faces of a disk of piezoelectric material and then supporting the disk at the edges in an enclosure. When a voltage is applied across the two electrodes, the piezoelectric material mechanically deforms due to the applied voltage. This movement of the piezo disk within the buzzer creates sound in a similar manner as the movement of the ferromagnetic disk in a magnetic buzzer or the speaker aforementioned above.

d) Construction

A piezo buzzer differs from a magnetic buzzer in that it is driven by a voltage rather than a current. A piezo buzzer is modelled as a capacitor while a magnetic buzzer is modelled as a coilin series with a resistor. The frequency of the sound produced by both magnetic and piezo buzzers can be controlled over a wide range by the frequency of the signal driving the buzzer. The construction of buzzer is shown in Fig 2.18. A piezo buzzer exhibits a reasonably linear relationship between the input drive signal strength and the output audio power while a magnetic buzzer's audio output declines rapidly with a decreasing input drive signal.

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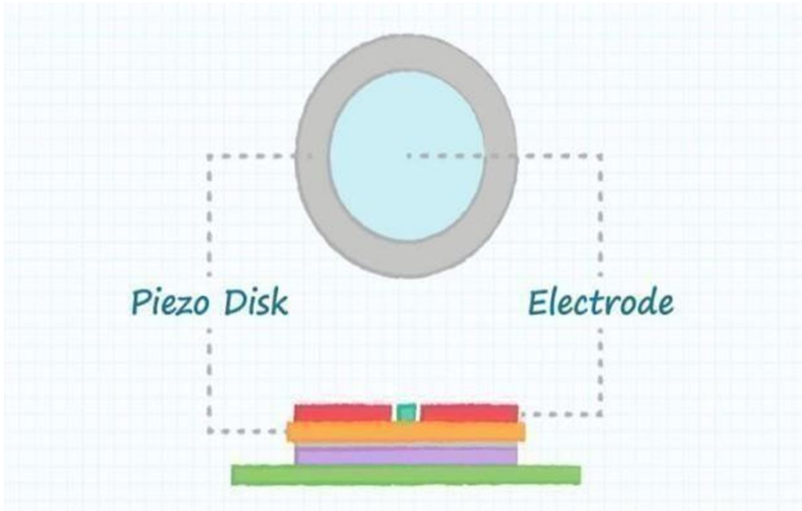

Fig.2.18. Construction of buzzer

III. SOFTWARE TOOLS

A. Arduino IDE

1) Introduction

Arduino is an open-source electronics platform based on easy to use hardware and software. Arduino boards are able to read inputs . light on a sensor, a finger on a button, or a Twitter message . and turn it into an output . activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

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. All Arduino boards are completely open-source, empowering users to build them independently and eventually adapt them to their particular needs. The software, is open-source, and it is growing through the contributions of worldwide users.

2) Hardware Specifications

- 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. 40 mA.
- DC Current for 3.3V Pin. 50 mA.
- Flash Memory. 32 KB (ATmega328).
- SRAM. 2 KB (ATmega328).

3) Types of Arduino Boards

Various kinds of Arduino boards are available depending on different microcontrollers used. However, all Arduino boards have one thing in common. They are.

Programmed through the Arduino IDE. The differences are based on the number of inputs and outputs (the number of sensors, LEDs, and buttons you can use on a single board), speed, operating voltage, form factor etc. Some boards are designed to be embedded and have no programming interface (hardware), which you would need to buy separately. Some can run directly from a 3.7V battery, others need at least 5V.

The list of different Arduino boards that are available are mentioned in the table 3.1.

Table.3.1. Various types of Arduino boards.

Board Name	Operating Voltage	Clock Speed	Digital i/o	Analog Inputs	PWM	UART	Programming Interface
Arduino Uno R3	5V	16MHz	14	6	6	1	USB via ATMega16U2
Arduino Uno R3 SMD	5V	16MHz	14	6	6	1	USB via ATMega16U2
Red Board	5V	16MHz	14	6	6	1	USB via FTDI
Arduino Pro 3.3v/8 MHz	3.3V 8	8 MHz	14	6	6	1	FTDI Compatible Header
Arduino Pro 5V/16MHz	5V	16MHz	14	6	6	1	FTDI Compatible Header
Arduino mini 05	5V	16MHz	14	8	6	1	FTDI Compatible Header
Arduino Pro mini 3.3v/8MHz	3.3V	8MHz	14	8	6	1	FTDI Compatible Header
Arduino Pro mini 5v/16MHz	5V	16MHz	14	8	6	1	FTDI Compatible Header
Arduino Ethernet	5V	16MHz	14	6	6	1	FTDI Compatible Header
Arduino Fios	3.3V	8MHz	14	8	6	1	FTDI Compatible Header
Lily Pad Arduino 328 main board	3.3V	8MHz	14	6	6	1	FTDI Compatible Header
Lily Pad Arduino simply board	3.3V	8MHz	9	4	5	0	FTDI Compatible Header
Arduino Pro 5V/16MHz	5V	16MHz	14	6	6	1	FTDI Compatibl eHeader
Arduino mini05	5V	16MHz	14	8	6	1	FTDI Compatibl eHeader
Arduino Promini 3.3v/8MHz	3.3V	8MHz	14	8	6	1	FTDI Compatibl eHeader

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4) Arduino Installation

After learning about the main parts of the Arduino IDE board, we are readyto learn how to set up the Arduino IDE. Once we learn this, we will be ready to upload our program on the Arduino board. In this section, we will learn in easy steps, how to set up the Arduino IDE on our computer and prepare the board to receive the program via USB cable.

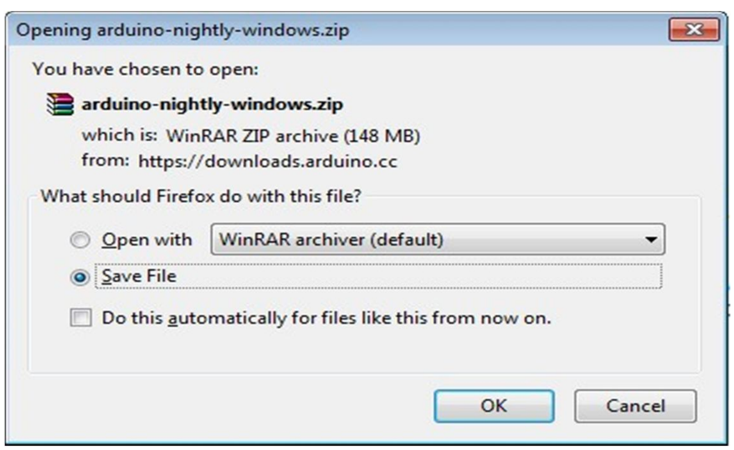
a) Step 1.

First you must have your Arduino board (you can choose your favorite board) and a USB cable. In case you use Arduino UNO, Arduino Demilune, Nano, Arduino Mega 2560, or Decimal, you will need a standard USB cable (A plug to B plug), the kind you would connect a USB printer as shown in the following image.

Fig.3.1. USB Cable

b) Step 2. Download Arduino IDE Software.

You can get different versions of Arduino IDE from the Download page on the Arduino Official website. You must select your software, which is compatible with your operating system (Windows, IOS, or Linux). After your file download is complete, unzip the file.



c) Step 3. Power up Your Board

The Arduino Uno, Mega, demilune and Arduino Nano automatically draw power from either, the USB connection to the computer or an external power supply. If you are using an Arduino Decimal, you have to make sure that the board is configured to draw power from the USB connection. The power source is selected with a jumper, a small piece of plastic that fits onto two of the three pins between the USB and power jacks. Check that it is on the two pins closest to the USB port. Connect the Arduino board to your computer using the USB cable. The green power LED (labeled PWR) should glow.

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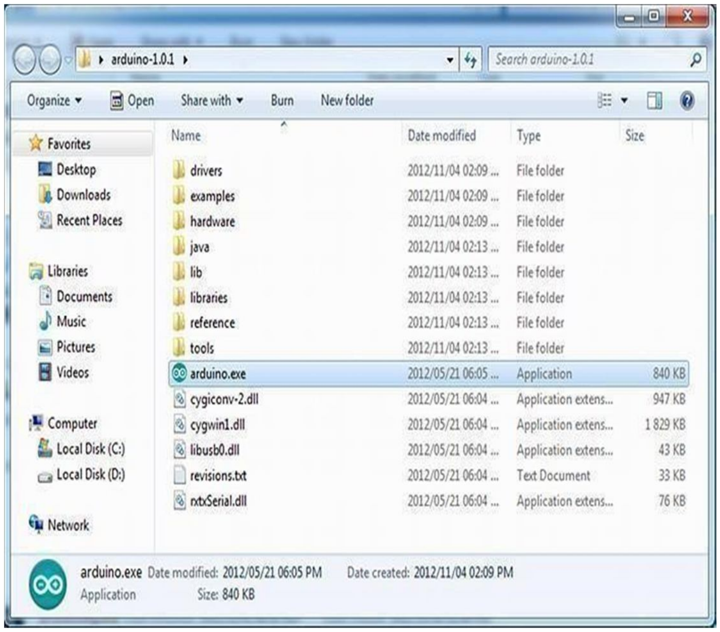
d) Step 4. Launch Arduino IDE

After your Arduino IDE software is downloaded, you need to unzip the folder.

Inside the folder, you can find the application icon with an infinity label (application.exe). Double. click the icon to start the IDE.



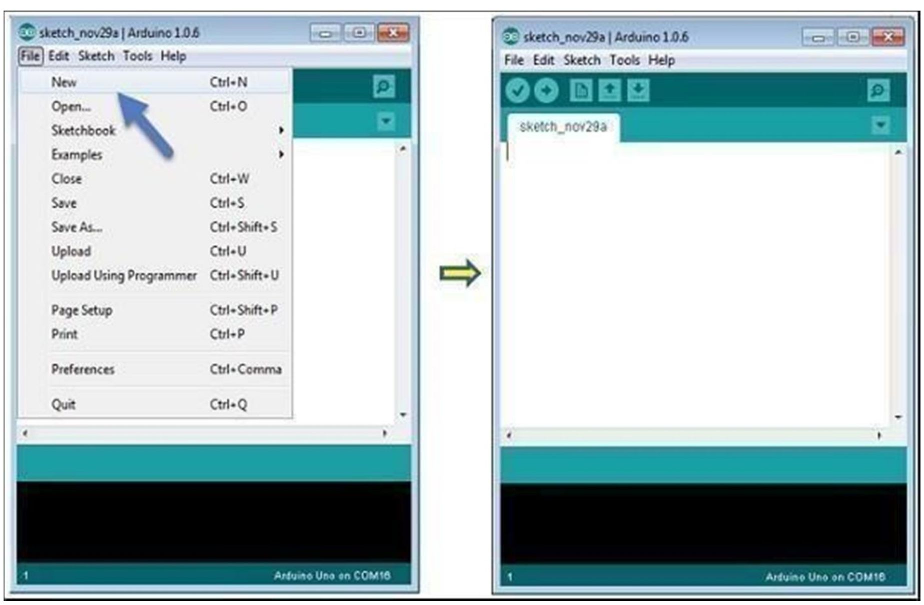
e) Step 5. Open your first project

- Once the software starts, you have two options.

Create a new project.

Open an existing project example.

- To create a new project, select File ..> New.



To open an existing project example, select File .> Example .> Basics .> Blink.

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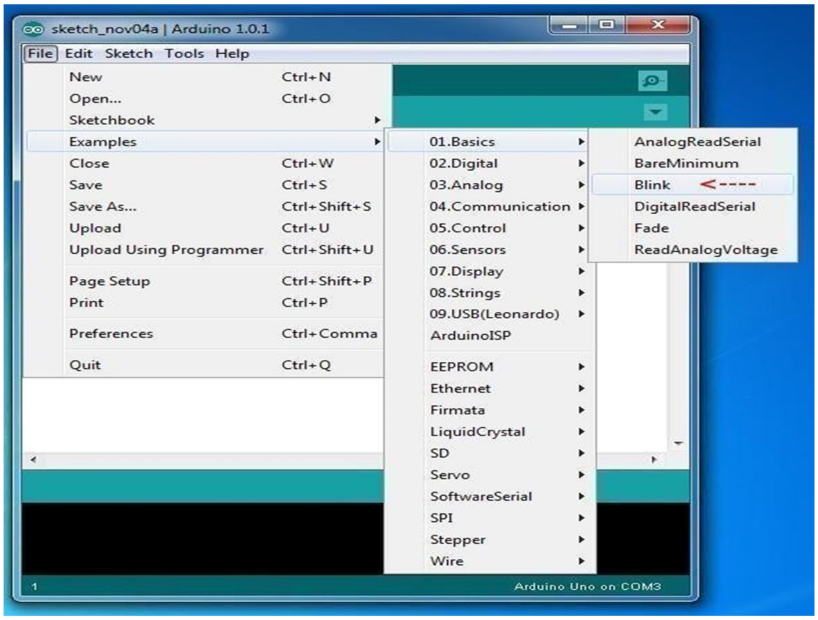
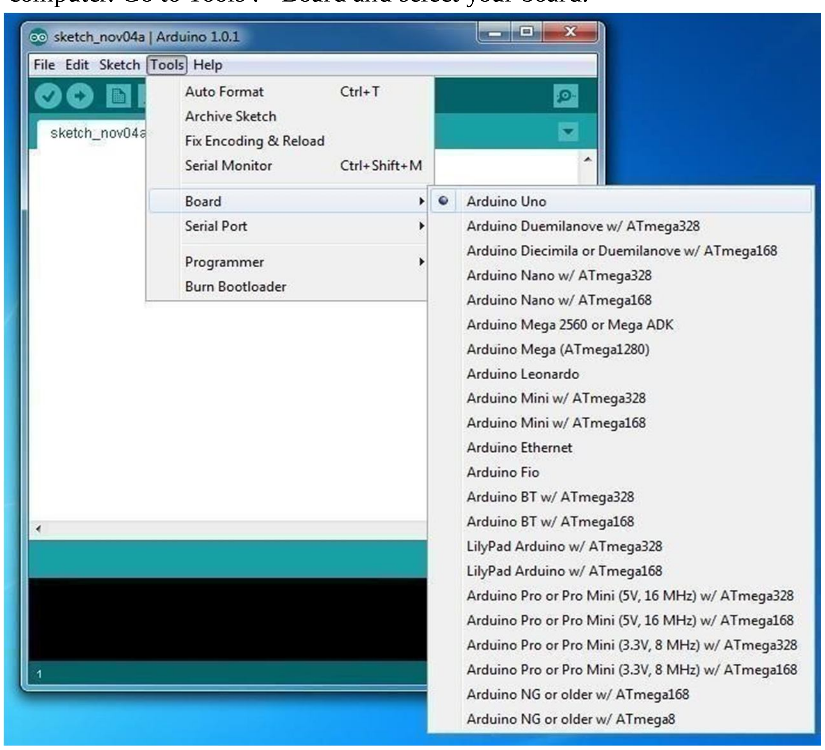


Here, we are selecting just one of the examples with the name Blink. It turns the LED on and off with some time delay. You can select any other example from the list.

f) Step 6. Select your Arduino board.

To avoid any error while uploading your program to the board, you must select the correct Arduino board name, which matches with the board connected to your computer. Go to Tools .> Board and select your board.



Here, we have selected Arduino IDE board according to our tutorial, but you must select the name matching the board that you are using.

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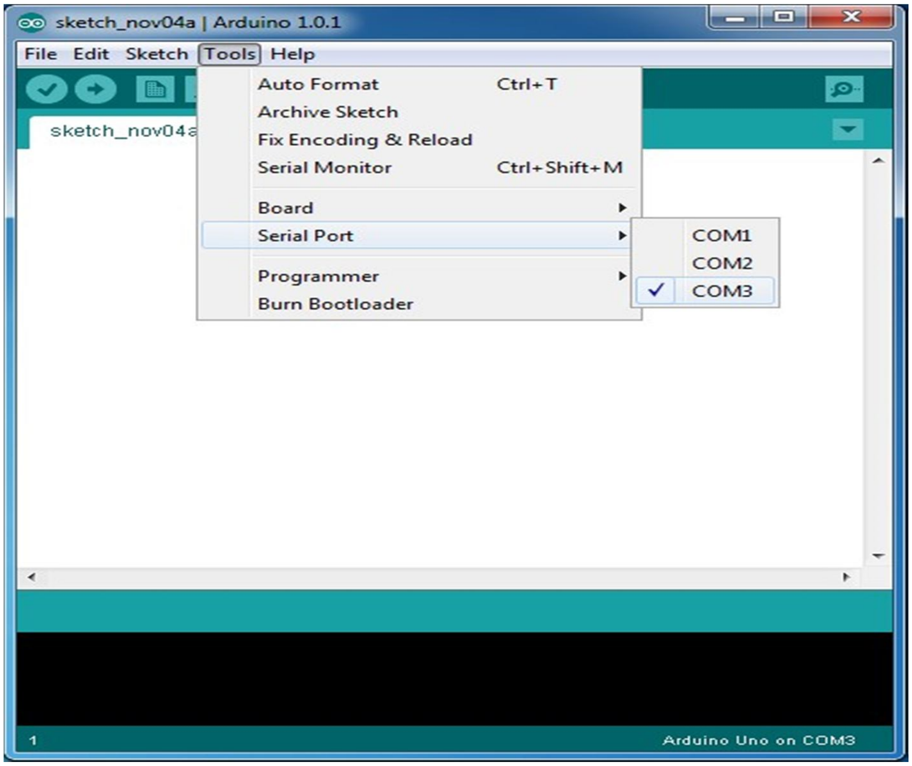
g) Step 7. Select your serial port.

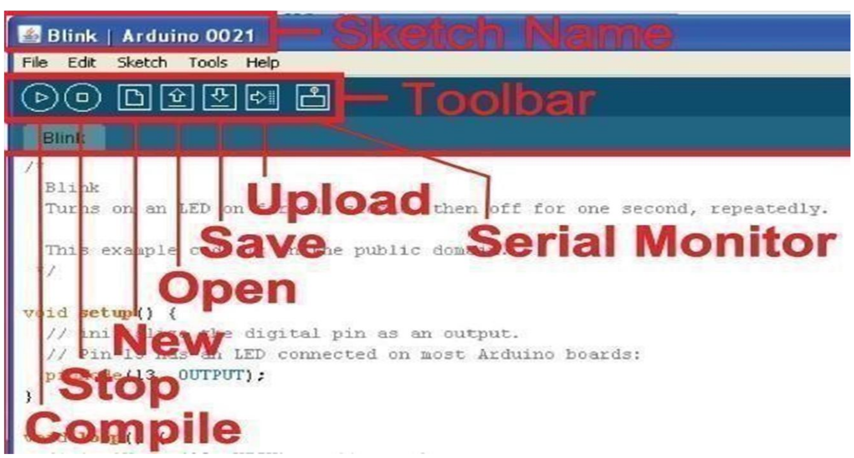
Select the serial device of the Arduino board. Go to Tools .> Serial Port menu. This is likely to be COM3 or higher (COM1 and COM2 are usually reserved for hardware serial ports). To find out, you can disconnect your Arduino board and re.open the menu, the entry that disappears should be of the Arduino board.

Reconnect the board and select that serial port.



h) Step 8. Upload the program to your board.

Before explaining how we can upload our program to the board, we must demonstrate the function of each symbol appearing in the Arduino IDE toolbar.



Now, simply click the "Upload" button in the environment. Wait a few seconds; you will 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.

Note. If you have an Arduino Mini, NG, or other board, you need to press the reset button physically on the board, immediately before clicking the upload button on the Arduino Software.

Now, simply click the "Upload" button in the environment. Wait a few seconds; we will 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.

5) Embedded C

Embedded C Programming is the soul of the processor functioning inside each and every embedded system we come across in our daily life, such as mobile phone, washing machine, and digital camera. Each processor is associated with embedded software. The first and foremost thing is the embedded software that decides functioning of the embedded system. Embedded C language is most frequently used to program the microcontroller. Earlier, many embedded applications were developed using assembly level programming. However, they did not provide portability. This disadvantage was overcome by the advent of various high-level languages like C, Pascal, and COBOL. However, it was the C language that got extensive acceptance for embedded systems, and it continues to do so.

C language was developed by Dennis Ritchie in 1969. It is a collection of one or more functions, and every function is a collection of statements performing a specific task. C language is a middle-level language as it supports high-level applications and low-level applications. Before going into the details of embedded C programming, we should know about RAM memory organization. Salient features of the language.

C language is software designed with different keywords, data types, variables, constants, etc.

- Embedded C is a generic term given to a programming language written in C, which is associated with particular hardware architecture.
- Embedded C is an extension to the C language with some additional header files. These header files may change from controller to controller.
- The microcontroller 8051 #include<reg51.h> is used.
- The embedded system designers must know about the hardware architecture to write programs. These programs play prominent role in monitoring and controlling external devices.
- They also directly operate and use the internal architecture of the microcontroller, such as interrupt handling, timers, serial communication and other available features.

6) The Structure of an Embedded C Program and LUA script.

```
 comments
 pre-processor directives global variables
main() function
 {
 local variables statements
…………..

…………..
 }

fun(1)
{
 local variables
statements
…………..
 …………..

}
```

Comments. In embedded C programming language, we can place comments in our code which helps the reader to understand the code easily.

C = a + b; /* add two variables whose value is stored in another variable C*/ *Pre-processor directives.*

All the functions of the embedded C software are included in the preprocessor library like “#includes<reg51.h>, #defines”. These functions are executed at the time of running the program.

Main () function.

The execution of a program starts with the main function. Every program uses only one main () function.

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Advantages

- It takes less time to develop application program
- It reduces complexity of the program
- It is easy to verify and understand
- It is portable in nature from one controller to another. The code is successfully compiled or any error occurs

B. Blynk Cloud

1) Introduction

Blynk was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data, visualize it and do many other cool things.

Blynk is a platform with iOS and Android apps to control Arduino, Raspberry Pi and the likes over the Internet. It's a digital dashboard where you can build a graphic interface for your project by simply dragging and dropping widgets. It's really simple to set everything up and you'll start tinkering in less than 5 mins. Blynk is not tied to some specific board or shield. Instead, it's supporting hardware of your choice. Whether your Arduino or Raspberry Pi is linked to the Internet over Wi.Fi, Ethernet or this new ESP8266 chip, Blynk will get you online and ready for the Internet Of your Things. Fig 3.2 show the Interface of Blynk app.

Fig.3.2. Blynk app

Blynk was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data, visualize it and do many other cool things. There are three major components in the platform.

- Blynk App . allows to you create amazing interfaces for your projects using various widgets we provide.
- Blynk Server . responsible for all the communications between the Smartphone and hardware. You can use our Blynk Cloud or run your private Blynk server locally. It’s open-source, could easily handle thousands of devices and can even be launched on a Raspberry Pi.
- Blynk Libraries . for all the popular hardware platforms . enable communication with the server and process all the incoming and out coming commands.

Now imagine. every time you press a Button in the Blynk app, the message travels to the Blynk Cloud, where it magically finds its way to your hardware. It works the same in the opposite direction and everything happens in a Blynk of an eye.

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Blynk is a Platform with IOS and Android apps to control Arduino, Raspberry Pi and the likes over the Internet. It's a digital dashboard where we can build a graphic interface for our project by simply dragging and dropping widgets. Blynk application can be found from the following links –

- Android Blynk App
- IOS Blynk App

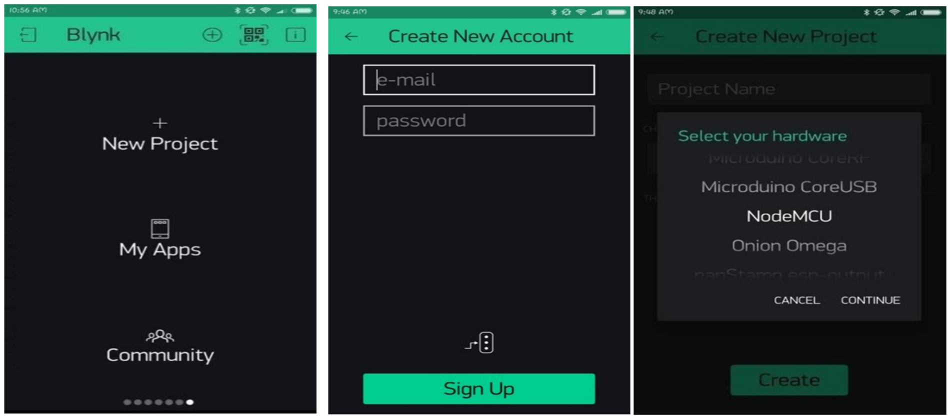
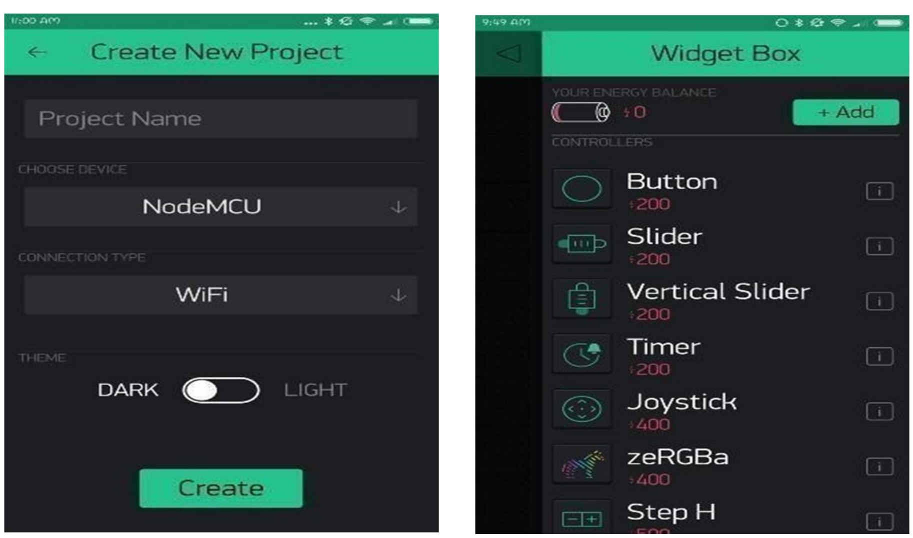


Fig.3.3. Blynk App Setup

After downloading the app, create an account and log in. (If possible then log in with our real mail id for better connectivity later).
We'll also need to install the Blynk Arduino Library, which helps generate the firmware running on our ESP8266. Download the latest release from https.//github.com/blynkkk/blynk. library/releases, and follow along with the directions there to install the required libraries. Click the "Create New Project" in the app to create a new Blynk app. Give it any name.
Blynk works with hundreds of hardware models and connection types. Select the Hardware type. After this, select connection type. In this project we have select Wi. Fi connectivity.
The Auth Token is very important – we'll need to stick it into our ESP8266's firmware. For now, copy it down or use the "E-mail" button to send it to our self.
Then we'll be presented with a blank new project. To open the widget box, click in the project window to open.
We are selecting a button to control Led connected with Nodemcu
Click on Button

- Give name to Button say led
- Under OUTPUT tab. Click pin and select the pin to which led is connected to Nodemcu. Here it is digital pin 2, hence select digital and under pin D2 and click continue



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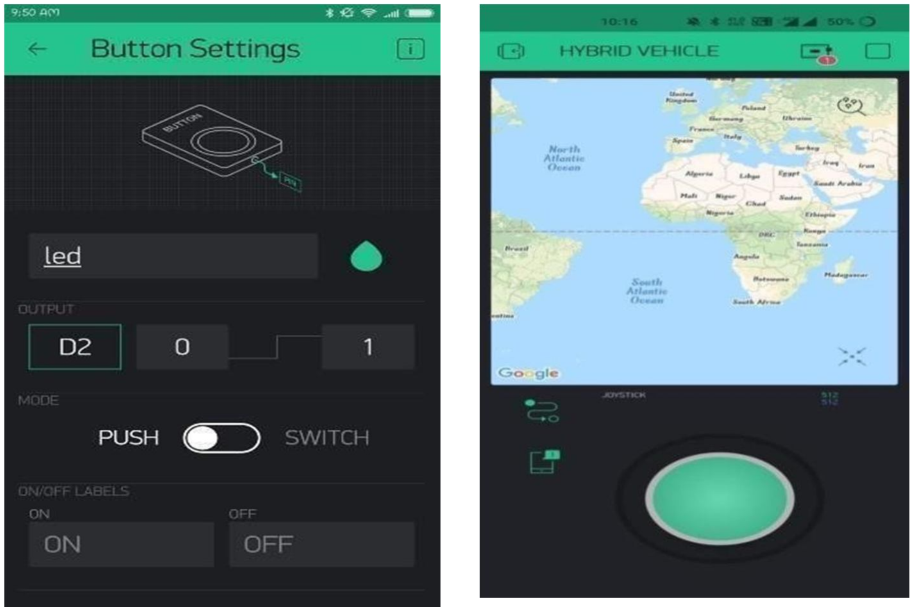

Fig.3.4. Project Creation Using Blynk

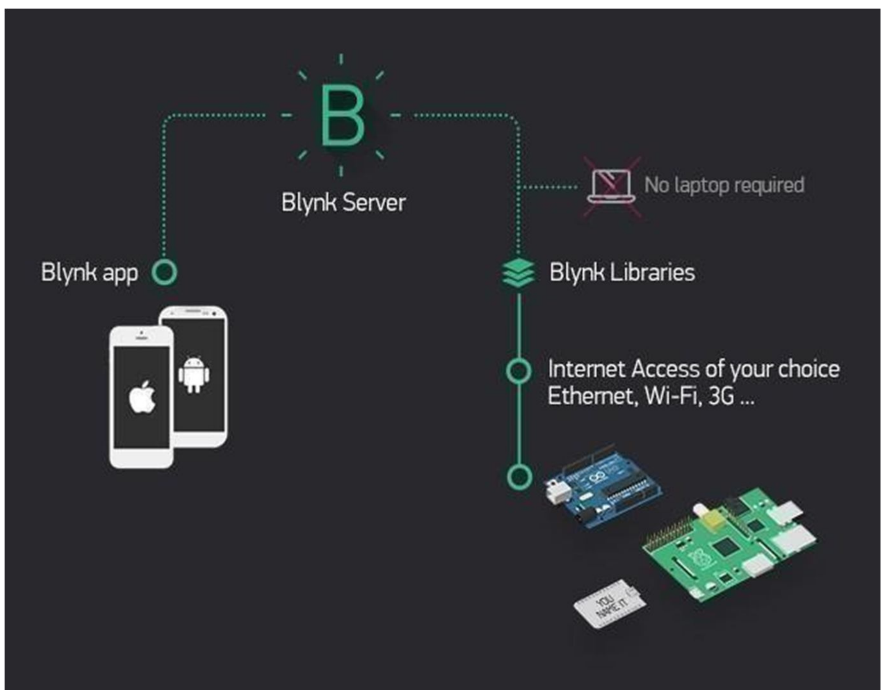

Fig.3.5. Blynk Cloud

1) *Features*
a) Similar API & UI for all supported hardware & devices.
b) Connection to the cloud using.

- Wi.Fi
- Bluetooth and BLE
- Ethernet
- USB (Serial)
- GSM

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Set of easy to use Widgets.

c) Direct pin manipulation with no code writing.
d) Easy to integrate and add new functionality using virtual pins.
e) History data monitoring via History Graph widget.
f) Device to Device communication using Bridge Widget.
g) Sending emails, tweets, push notifications, etc.

IV. RESULTS

1) Step.1. When the device is in OFF state.

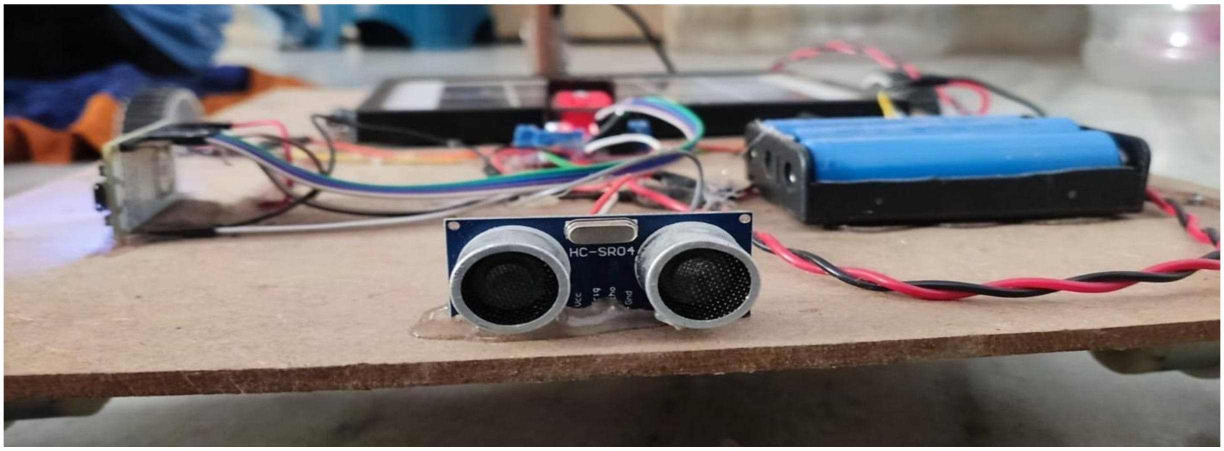

Fig.4.1. Vehicle is in OFF State

2) Step.2. When the device gets turn ON.

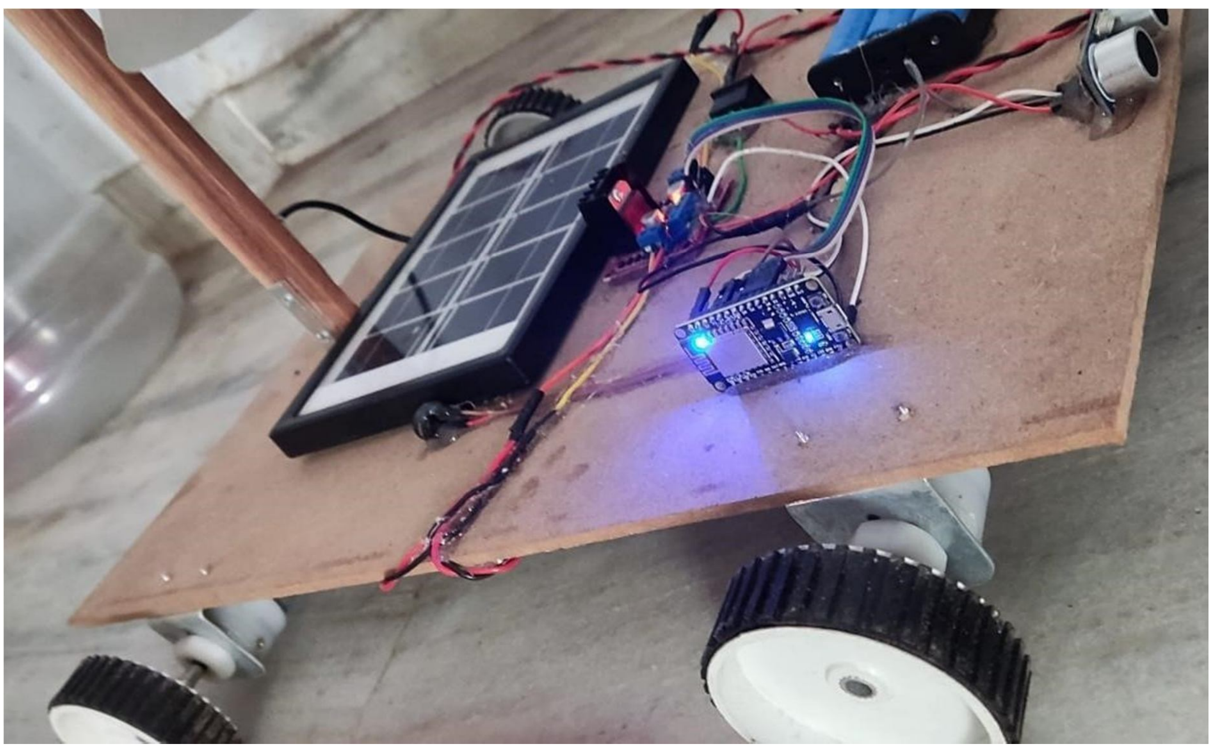

Fig.4.2. Vehicle is in ON State

3) Step.3. When the power is generating from the wind.

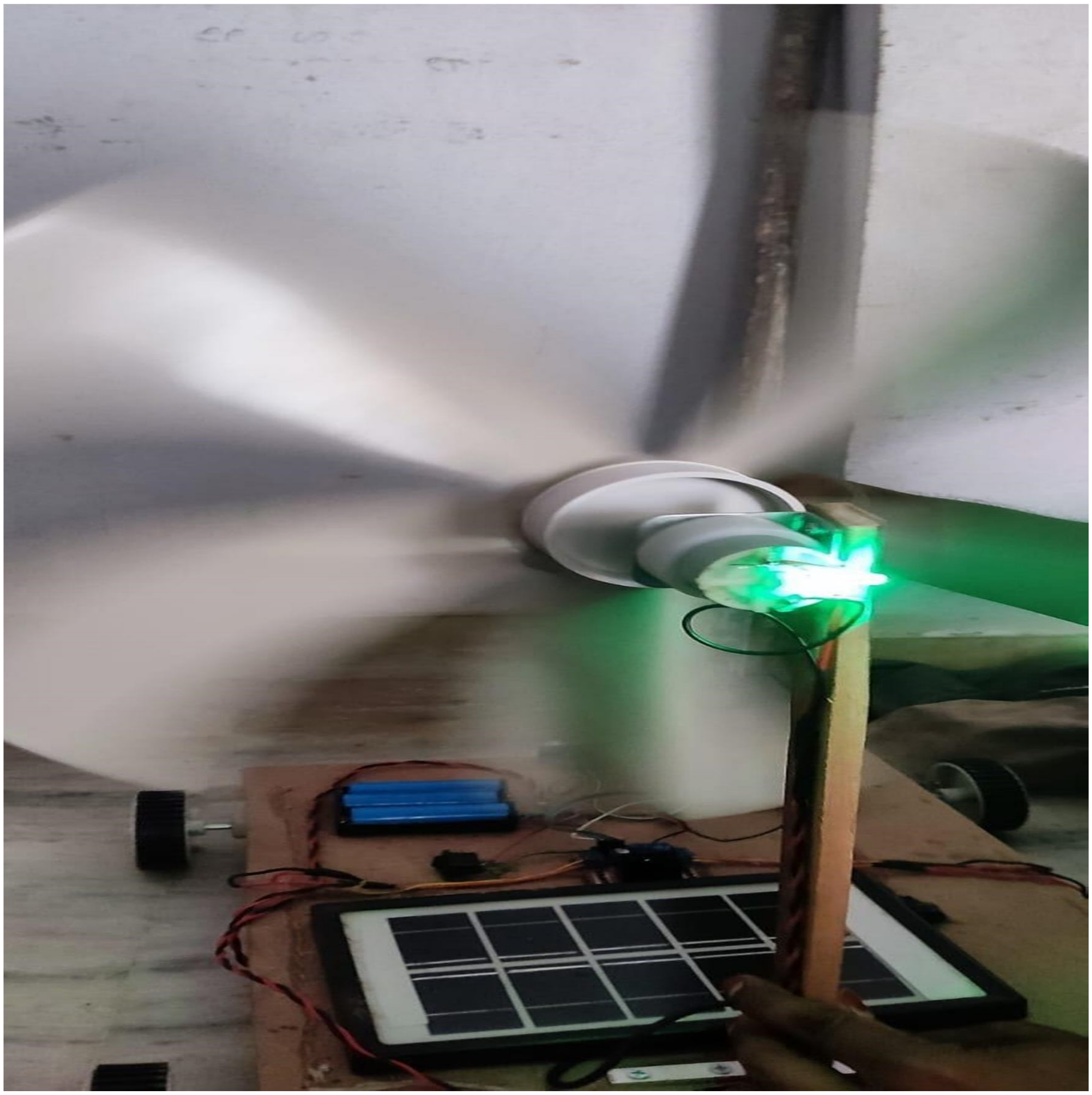

Fig.4.3. Power Generating from Wind

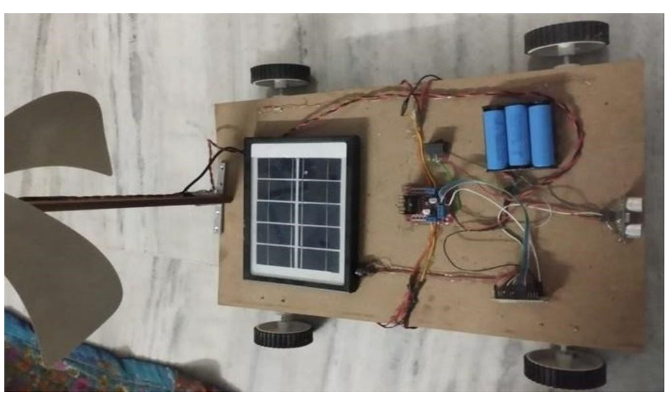

Fig.4.4(b). Front View of vehicle when the Accident Occurred

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4) Step.5. The IR Sensor will send the information to the Buzzer and then it will send the notification alerts.

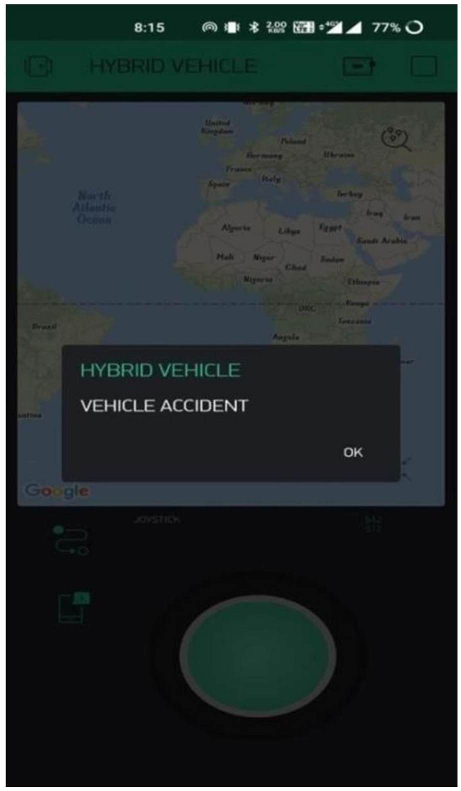

Fig.4.5. Notification Alert

5) Step.6. Sending the accident location to the respective authorities.

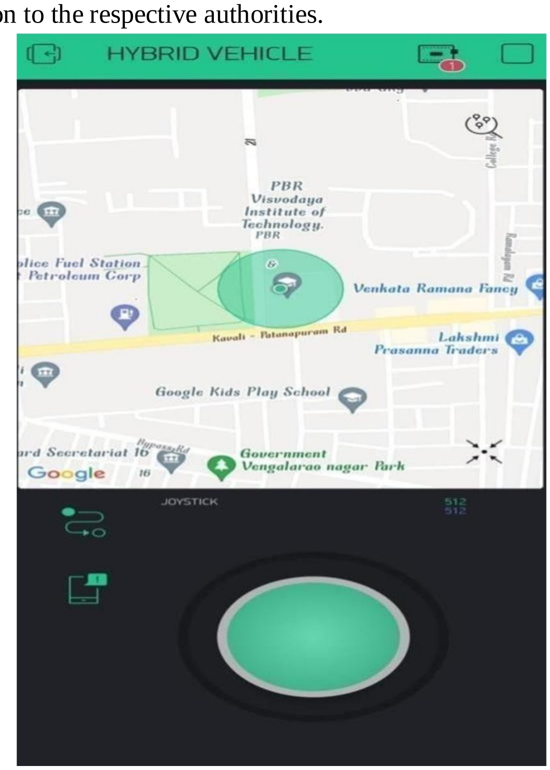

Fig.4.6. Location Sharing

V. CONCLUSION AND FUTURE SCOPE

A. Conclusion

This project uses an optimized energy system namely Hybrid Renewable Energy System (HRES) which helps us to reduce pollution and also to increase the Lifetime of the battery. Here we are using Solar and Wind based charging system through which the entire system depends on Renewable energy system which makes the system feasible to work for a long period. Using These kind of smart hybrid vehicles may assure Sustainable development and also reduce the Global Warning through which our Earth temperature changes Drastically**.**

B. Future Scope

Smart hybrid vehicle is an advanced driving technology, which combines the power generated by the solar and wind energy to enhance the Lifetime of a vehicle. Based on the Atmospheric conditions this kind of vehicle depends on Solar and Wind energies to run the vehicle and generate the power using any of the energy separately (or) simultaneously. Smart hybrid vehicles have the potential to save fuel consumption and reduce the emission of pollutants. The rise in fuel prices and awareness about the vehicle emissions into the atmosphere is boosting the global smart hybrid vehicle market. Hybridization is a method of reducing emission of carbons and complying with the stringent regulatory norms that's to be introduced by various countries that are present in the globe. It is estimated that if the popularity of Hybrid vehicles increases then the sales and production hybrid vehicles could potentially make Fuel/gas cars obsolete in the next 10 to 15 years.

REFERENCES

[1] F. Steinke, P. Wolfram, and C. Hoffmann, "Grid vs. storage in a 100% renewable Europe," Renew. Energy, vol. 50, pp. 826–832, 2013.
[2] B. V. Mathieson, H. Lund, and K. Karlsson, "100% Renewable energy systems, climate mitigation and economic growth," Appl. Energy, vol. 88, pp.488–501, 2011.
[3] H. Lund and B. V. Mathieson, "Energy system analysis of 100% renewable energy systems. The case of Denmark in years 2030 and 2050," Energy, vol. 34, pp. 524–531, 2009.
[4] D. Dillinger, S. Gerda, and M. Weichel, "Integration of intermittent renewable power supply using grid-connected vehicles . A 2030 case study for California and Germany," Appl. Energy, vol. 104, pp. 666– 682, 2013.
[5] W. Liu, W. Hu, H. Lund, and Z. Chen, "Electric vehicles and largescale integration of wind power . The case of Inner Mongolia in China," Appl. Energy, vol. 104, pp. 445–456, 2013.
[6] B. Soares M.C. Boba, A. Sokol, and R. Schaeffer, "Plug.in hybrid electric vehicles as a way to maximize the integration of variable renewable energy in power systems. The case of wind generation in northeastern Brazil," Energy, vol. 37, pp. 469–481, 2012.
[7] S. Belledom, R. Benders, S. Pegram, and H. Moll, "Electric cars and wind energy. Two problems, one solution? A study to combine wind energy and electric cars in 2020 in The Netherlands," Energy, vol. 45, pp. 859–866, 2012.
[8] G. S. Pannu, M. D. Ansari, and P. Gupta, ""design and implementation of autonomous car using raspberry pi." international journal of computer applications 113," no., vol. 9, 2015. V. N. Kumar, V. S. Reddy, and L. P. Sree, ""design and development of accelerometer based system for driver safety." international journal of science," Engineering and Technology Research (IJSETR), vol. 3, p. 12,2014.
[9] C. Hahn, S. Feld, and H. Schroter, "Predictive collision management for time and risk dependent path planning," in Proceedings of the28th International Conference on Advances in Geographic Information Systems, ser. SIGSPATIAL '20. New York, NY, USA: Association for Computing Machinery, 2020, p. 405–408. [Online]. Available:https://doi.org/10.1145/3397536.3422252
[10] G. N. A. H. Yar, A.-B. Noor-ul Hassan, and H. Siddiqui,"Real-time shallow water image retrieval and enhancement for low-cost unmanned underwater vehicle using raspberry pi," in Proceedings of the 36th Annual ACM Symposium on Applied Computing, ser. SAC '21. New York, NY, USA: Association for Computing Machinery, 2021, p. 1891–1899. [Online]. Available: https://doi.org/10.1145/3412841.3442060
[11] A. F. B. A. de Oliveira and L. V. L. Filgueiras, "Developer assistance tools for creating native mobile applications accessible to visually impaired people: A systematic review," in Proceedings of the 17th Brazilian Symposium on Human Factors in Computing Systems, ser. IHC 2018. New York, NY, USA:Association for Computing Machinery, 2018. [Online]. Available:https://doi.org/10.1145/3274192.3274208
[12] S. L. Fong, D. C. W. Yung, F. Y. H. Ahmed, and A. Jamal, "Smart city bus application with quick response (qr) code payment," ser. ICSCA '19.New York, NY, USA: Association for Computing Machinery, 2019, p.248–252. [Online]. Available: https://doi.org/10.1145/3316615.3316718
[13] G. K. Gudur, A. Ramesh, and S. R, "A vision-based deep on-device intelligent bus stop recognition system," in Adjunct Proceedings of the 2019 ACM International Joint Conference on Pervasive and Ubiquitous Computing and Proceedings of the 2019 ACM International Symposium on Wearable Computers, ser. UbiComp/ISWC '19 Adjunct.New York, NY, USA: Association for Computing Machinery, 2019, p.963– 968. [Online]. Available: https://doi.org/10.1145/3341162.3349323
[14] D. Saha, M. Shinde, and S. Thadeshwar, "Iot based air quality monitoring system using wireless sensors deployed inpublic bus services," ser. ICC '17. New York, NY, USA: Association for Computing Machinery, 2017. [Online]. Available:https://doi.org/10.1145/3018896.3025135
[15] M. Kumar, "R., and dr," R. Senthil. Effective control of accidents using routing and tracking system with integrated network of sensors, vol. 2,p. 4, 2013.
[16] R. Liu, Z. Yin, W. Jiang, and T. He, "Wibeacon: Expandingble location-based services via wifi," in Proceedings of the27th Annual International Conference on Mobile Computing and Networking, ser. MobiCom '21. New York, NY, USA: Association for Computing Machinery, 2021, p. 83–96. [Online]. Available:https://doi.org/10.1145/3447993.3448615

[17] J. J. T. Dai, X. Bai, and Z. Shen, “Mobile phone based drunk driving detection pervasive computing technologies for healthcare. 2010, 4thinternational ieee conference,” p, vol. 1, March 2010.
[18] H. Chen, Y. Chiang, F. Chang, and H. Wang, “Toward real-time precise point positioning: Differential gps based on igs ultra rapid product. Sice annual conference,” The Grand Hotel, Taipei, Taiwan, August, vol. 18.
[19] X. Liu, X. Xu, X. Chen, E. Mai, H. Y. Noh, P. Zhang, andL. Zhang, “Individualized calibration of industrial-grade gas sensors inair quality sensing system,” ser. SenSys’17. New York, NY, USA:Association for Computing Machinery, 2017. [Online]. Available:https://doi.org/10.1145/3131672.3136998
[20] A. T. Duchowski, S. J¨org, T. N. Allen, I. Giannopoulos, and K. Krejtz,“Eye movement synthesis,” in Proceedings of the Ninth Biennial ACMSymposium on Eye Tracking Research & Applications, ser. ETRA ’16.New York, NY, USA: Association for Computing Machinery, 2016, p.147–154. [Online]. Available: https://doi.org/10.1145/2857491.2857528