CHAPTER 1

INTRODUCTION

The treadmill bicycle is completely a new way of movement completely designed for runners. Typically using a treadmill basically is similar to running, hiking or walking.

Think about the last time you were riding a bike over some kind of obstacles such as train tracks, potholes, speed bumps. Possibilities are you stood up on the pedals to improve your balance when crossing the obstacle. Basically, the treadmill bicycle will provide the rider a well-balanced position the entire time. It is a combination of amalgamation of DC motor with different components upgrading your walking speed to a much higher pace.

Since it uses no fuel it a very conventional option for people in their busy schedule to take care of their health completely. People with a busy schedule will also be able to take care of their health and physical fitness. Above all, it is not a conventional treadmill to make use of only in closed rooms, person using treadmill bicycle can roam on roads also.

This project overcomes the drawback of the conventional treadmill which is stationary which in fact does not provide the jogger to get exposed to the natural atmosphere. So this proposed methodology provides an ultimate solution by making use of wheels and making the treadmill bicycle a walking cycle.

CHAPTER 2

PROJECT IN BRIEF

AIM:

The main aim of this project is to help the people to commute in a cost effective mode of transportation without the use of renewable energy sources and eco-friendly to nature.

OBJECTIVES:

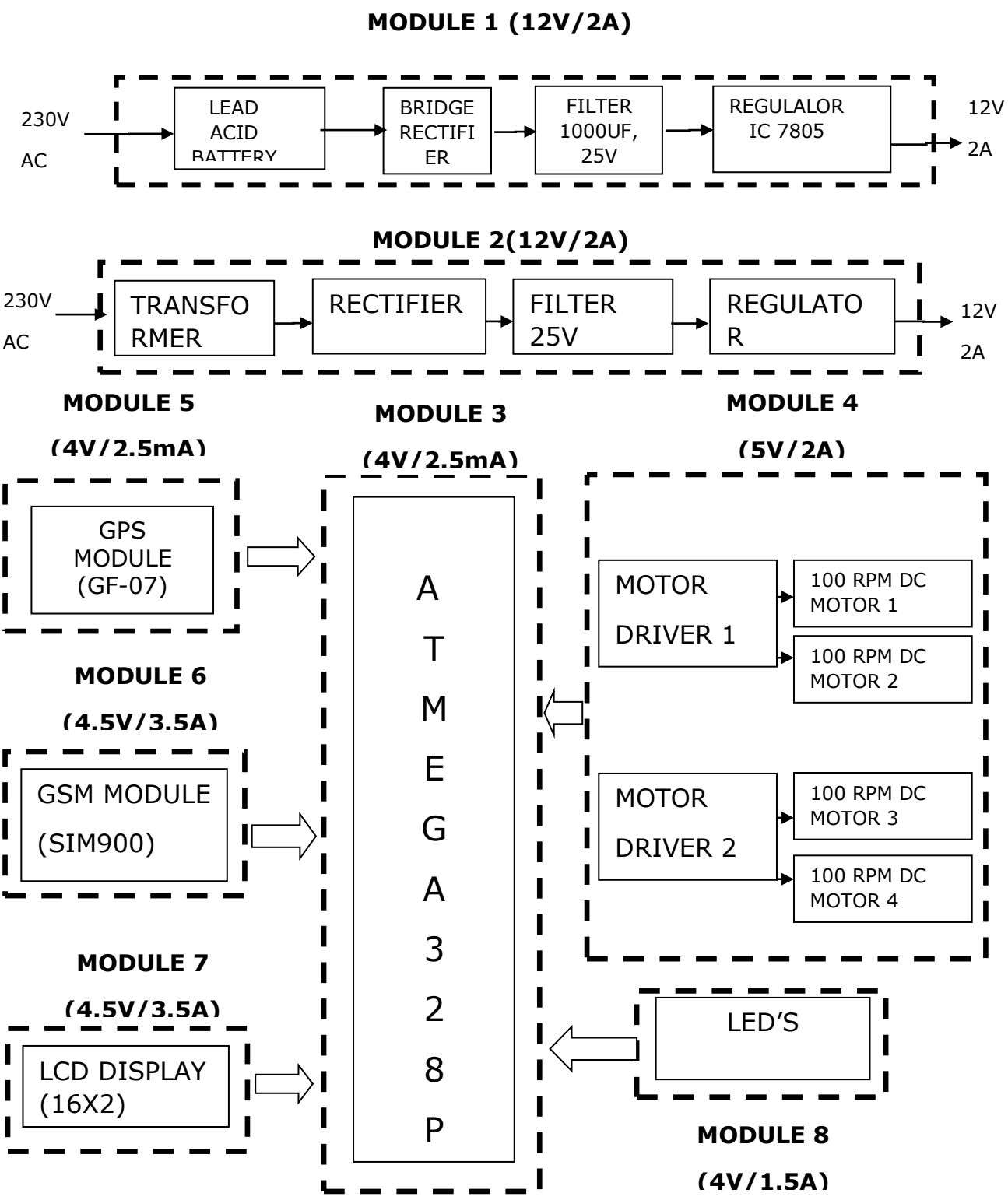
The treadmill bicycle is a totally new way of moving. With the electric assist it takes less effort to walk then "a walk in the park". It is the combination of the DC motor, Hall Effect Sensor and amplifier boosting your walking pace up to the higher speed. Increased use of fuel has resulted in increase of pollution and degradation of natural resources. With increasing population and their need, it has become necessary to control the use of fuel and decrease the pollution; so asto make it avail it's important to our coming generation. Due to heavy busy schedule people are not able to give attention to their health and physical fitness. As it uses no fuel so it saves energy simultaneously it can be used as treadmill and Bicycle. No need to use it as conventional treadmill in closed room; you can roam on roads also.

PROJECT TARGET:

To implement the project to help the people to commute in a cost effective mode of transportation without the use of renewable energy sources.

CHAPTER-3

MODULAR DIAGRAM



CHAPTER-4

MODULAR DIAGRAM DESCRIPTION

BLOCK DIAGRAM DESCRIPTION

MODULE 1

CHARGING CIRCUIT

- 12V DC which is used as source of power for gear motor and LED lights.
- A battery charger generally supplies a regulated current first to charge the battery and then switches to a regulated voltage mode.
- **Input:230 AC 50HZ**
- **Output:12v ,2A**

MODULE 2

BATTERY 12V

- In Lopifit, Atmega microcontroller is used to control the input and output of the module.
- In Lopifit. Atmega328P series is used.

Microcontroller is work as main module to control in the Lopifit

MODULE 3

ATMEGA328P

The ATmega328P is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega48P/88P/168P/328P achieves throughputs approaching 1 MIPS per MHz allowing the system designed to optimize power consumption versus processing speed.

MODULE 4

MOTOR & DRIVERS

100RPM 12V DC geared motors for robotics applications. Very easy to use and available in standard size. Nut and threads on shaft to easily connect and internal threaded shaft for easily connecting it to wheel.

Motor drivers are made from discrete components which are integrated inside an IC. The input to the motor driver IC or motor driver circuit is a low current signal. The function of the circuit is to convert the low current signal to a high current signal. This high current signal is then given to the motor

MODULE 5

GPS MODULE

The Global Positioning System (GPS), originally NAVSTAR GPS, is a satellite-based radio navigation system owned by the United States government and operated by the United States Space Force. It is one of the global navigation satellite systems (GNSS) that provides geo location and time information to a GPS receiver anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites. Obstacles such as mountains and buildings block the relatively weak GPS signals

MODULE 6

GSM MODULE

A GSM module or a GPRS module is a chip or circuit that will be used to establish communication between a mobile device or a computing machine and a GSM or GPRS system. The modem (modulator-demodulator) is a critical part here. These modules consist of a GSM module or GPRS modem powered by a power supply circuit and communication interfaces (like RS-232, USB 2.0, and others) for computer. A GSM modem can be a dedicated modem device with a serial, USB or Bluetooth connection, or it can be a mobile phone that provides GSM modem capabilities.

MODULE 7

LCD DISPLAY

LCD (Liquid Crystal Display) is a type of flat panel display which uses liquid crystals in its primary form of operation. LEDs have a large and varying set of use cases for consumers and businesses, as they can be commonly found in Smartphone's, televisions, computer monitors and instrument panels.

MODULE 8

LED'S

A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons.

MODULE-1

CHARGING CIRCUIT

(12V/2A DC)

CONTENTS

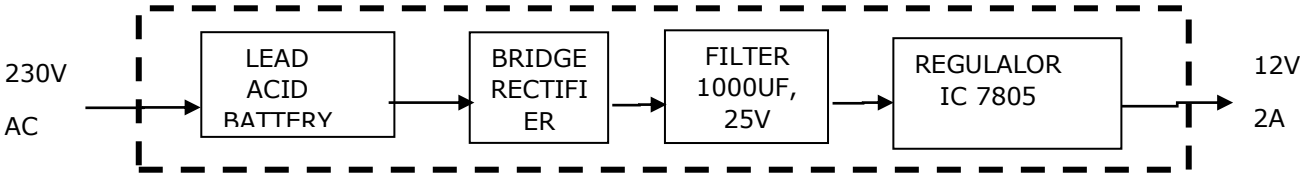
CHAPTER 5

CHARGING CIRCUIT

5.1 DESCRIPTION

A battery charger, or recharger, is a device used to put energy into a secondary cell or rechargeable battery by forcing an electric current through it.

5.2 BLOCK DIAGRAM



BLOCK DIAGRAM DESCRIPTION

INPUT

- The input 230V/50Hz is given to the transformer.

STEPDOWN TRNSFORMER

- Most of the logic and digital circuit will work only a voltage less than 230V. That is why we are using a step-down transformer in a charging circuit.

BRIDGE RECTIFIER

- To convert an AC signal into a DC signal rectifier circuit is used which consists of diodes and the output may contain ripples.

FILTER CIRCUIT

- To remove the ripples, a filter circuit is used, which is buildup of capacitors. The capacitors will give a study discharge as output.

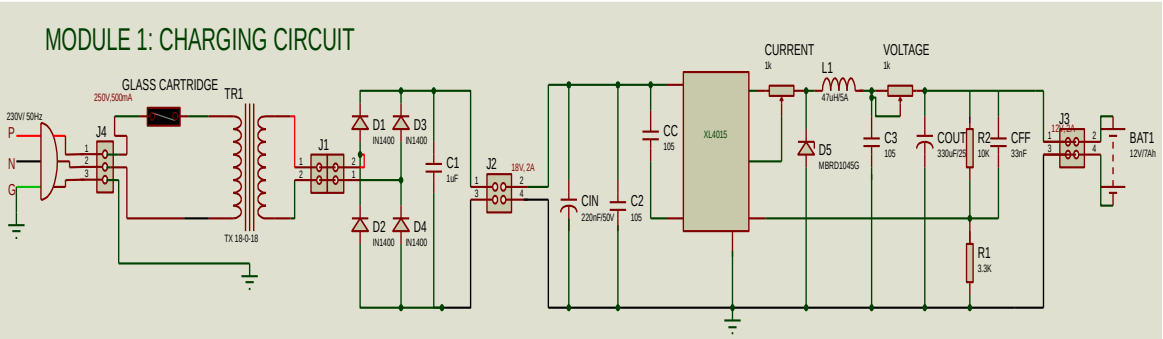
REGULATOR CIRCUIT

- A voltage regulator is a system designed to automatically maintain a constant voltage level. 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.

OUTPUT

- The output of power supply is 12VDC/2A.

5.3 SCHEMATIC DIAGRAM



5.4 DESIGN

Calculation for rectification diode:

Transformer=

Input: 230V, 50Hz AC

Current: 2 Amp

Output: 12-0-12V, 50Hz AC

Current: 2Amp

Consider:

Vout= Transformer output voltage

Iout= Transformer output current

So,

Vout= 12V

Iout= 2Amps

BRIDGE RECTIFIER:

Vdc=Pulsating DC Voltage

Vdc= Vn/√2

Vdc= 13.14

Idc=Iout

Capacitor Calculations:

Cout= Capacitor Value********

Cout=2dc/F* Vripple

Vripple=15% of Vdc

1/50*1.95= 1/97.5

Cout=1000Uf

Working voltage of capacitor=Vdc+15% of Vdc

Vdc+3.75

15+3.75

18.75

Therefore, Working Voltage= 25v

5.5 BILL OF MATERIALS

MODULE 1: POWER SUPPLY

S.NO	ITEM DESCRIPTION	SYMBOL	QUANTITY	PRICE
1	3 PIN POWER CORD 230V/ 10A (2.5m)	U	1	60
2	5A - 3 WAY TERMINAL BLOCK 230V/ 5A	T1	1	30
3	GLASS CARTRIDGE FUSE 5*20mm	F	1	25
4	FUSE BLOCK 5*20mm	F	1	12
5	CENTER TAP TRANSFORMER 15-0-15/ 2A	TR1	1	450
6	POWER DIODE 1N5400(-50 TO 150 °C)	D1,D2,D3,D4	4	12 each
7	ELECTROLYTIC CAPACITOR 220nF/50V(-30 TO 70 °C)	C1	1	20
8	BUCK CONVERTER 30V/2A	BC	1	150
9	LEAD ACID BATTERY 12V/7Ah	BATTERY	1	750
10	BATTERY CLIPS MINI TYPE	BATTERY CLIPS	2	15 each

MODULE 02

BATTERY (LEAD-ACID)

(12V/2A)

- 6.1 DESCRIPTION
- 6.2 CIRCUIT DIAGRAM
- 6.3 SCHEMATIC DIAGRAM
- 6.4 BILL OF MATERIALS

CHAPTER 6

BATTERY (12V,2A)

6.1 DESCRIPTION

Battery is a collection of one more cell whose chemical reaction three basic components: an anode (the- side), a cathode (the + side) and some kind of electrolyte.

When the anode and cathode of a battery is connected to a circuit, a chemical reaction takes place between the anode and the

Electrolyte. This reaction causes electrons to flow through the circuit and back into cathode where another chemical reaction takes place.

When the material in the cathode or anode is consumed or no longer able to be used in the reaction, the battery is unable to produce electricity. At that point, your battery is "dead"

Batteries that must be thrown away after use are known as primary batteries. Batteries that can be recharged are called secondary batteries.

6.2 LEAD-ACID BATTERY

The lead-acid battery was invented in 1859 by French physicist Gaston and is the oldest type of rechargeable battery. Despite having a very low energy- to -weight ratio and a low energy- to- volume ratio, its ability to supply high surge current means that the cells have a relatively large power-to-weight ratio. These features, along with their low cost, make them attractive for use in motor vehicles to provide the high current required by automobile starter motors.

As they are inexpensive compared to newer technologies, lead-acid Batteries are widely used even when surge current is not important and other designs could provide higher energy densities. In 1999 lead-acid battery sales accounted for 40-45% of the value from batteries sold worldwide excluding china and Russia, and a manufacturing market value of about $15 billion.[8] large-format lead-acid designs are widely used for storage in backup power supplies in call phone towers, high-availability settings like hospitals, and stand-along power-systems.

For these roles, modified version of the standard call may be used to improve storage times and reduce maintenance requirements.Gel-cells and absorbed glass-mat batteries are common in those roles, collectively known as VRLA batteries.

The electrical energy produced by a discharging lead-acid battery can be attributed to the energy released when the strong chemical bonds of water molecules are formed from H^+ ions of the acid and o^{2-} ions of Pb The lead-acid battery was invented in 1859 by French physicist Gaston Planet and is the older type of rechargeable battery. Despite having a very low energy-to-weight ratio and a low energy-to-volume ratio, its ability to supply high surge current means that the cells have a relatively large power-to-weight ratio.

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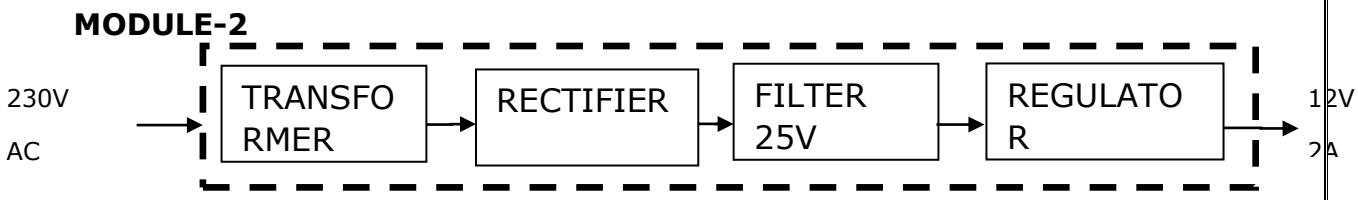
In 1999 lead-acid batter sales accounted for 40-45% of the value from batter sold worldwide excluding china and Russia, and manufacturing market value of about 15 billion. Larger –format lead-Acid designs are widely used for storage in backup power supplies in cell phone towers, high-availability setting like hospitals, and stand –lone power, systems, for these role, modified versions of the standard cell may be used to improve storage times and reduce maintenance requirement.

BLOCK DIAGRAM



BLOCK DIAGRAM DESCRTIPTION

INPUT

- The input 230v/50Hz is given to the transformer.

BRIDGE RECTIFIER

- TO convert an AC signal into a DC signal we are using rectifier circuit. Which is build-up of diodes and the circuit contains ripples

FILTER CIRCUIT

- To remove the ripples we are using filter circuit is built-up of capacitors.

REGULATOR

- We are using regulator ICs to maintain a constant output voltage in a power supply circuit. We using regulator IC LM 317 for getting 12V respectively.
- The LM317 is simply to use. Connect the positive lead for regulated DC power supply to the input pin, connect the negative lead to the common pin and then turn on the power, a 12V supply from the output pin will be obtained.

OUTPUT

- The output of power supply 12VDC, 2A.

DESIGN

For finding value of C2=C4 =0.1uF

Unregulated DC= voltage drop

=5V+3v

=8v

Diode drop= 0.7+0.7

=1.4V

Overall drop = (8+1.4)v

=9.4v

Battery Output in DC=Vrms

Vrms=Vo/0.9

=10.4V

Input from Battery: 12V/7Ah

Finding capacitor value C1, C3:

F=50Hz

T=1/F

T=20ms

Hence, Time F=10ms is required to regain loss of energy

Time required to charge capacitor

T=R*c (T= Time is constant)

(R= internal resistance)

To find R value

R=Vo/Io= 5V/1=5Ω

T= 10ms

C=T/R

=10ms/5

C=2uF

C=2000mF

C1=C3=2000mF

Finding resister value R1:

According to Ohm's law V=I*R

So, for finding R=V/I

R=3V/10mA

=300Ω

6.3 SCHEMATIC DIAGRAM

6.4 BILL OF MATERIALS

SL NO	ITEM DESCRIPTION	SPECIFICATION	SYMBOL	QUANTITY
1	CAPACITOR ELECTROLYTIC	470uF(-30 TO 70 °C)	C1	1
2	CAPACITOR ELECTROLYTIC	10uF(-30 TO 70 °C)	C3, C4	2
3	CAPACITOR CERAMIC	0,1uF(-30 TO 125 °C)	C2,C5,C7	4
4	RESISTOR CFR	1K,1/4W(100TO120°C)	R1	1
5	DIODE 1N4007, AXIAL LEAD	1000V,1A(-55°CTO 150°C)	D1-D4	4
6	REGULATOR 7805	5V,1.5A	RE1	1
7	REGULATOR 7812	12V, 1.5A	RE2	1
8	2 WAY TERMINAL BLOCK	5A	T2-T3	2
9	LED 3mm, RED	1.5V/2V(-3.8TO 60 °C)	L1	1
10	SWITCH,	230V/5A (SPDT)	S2	1

MODULE-3

ATMEGA328P MICROCONTROLLER

(12V/2A)

- 7.1 DESCRIPTION
- 7.2 SCHEMATIC DIAGRAM
- 7.3 BILL OF MATERIALS

CHAPTER 7

ATMEGA328P MICROCONTROLLER

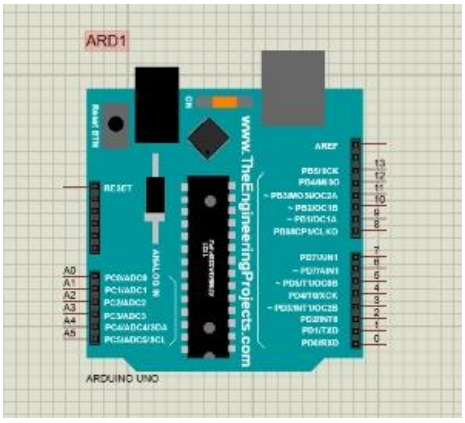
7.1 DESCRIPITION

ATmega-328 is basically an Advanced Virtual RISC (AVR) micro-controller. It supports the data up to eight (8) bits. ATmega-328 has 32KB internal built-in memory. This micro-controller has a lot of other characteristics. AT mega 328 has 1KB Electrically Erasable Programmable Read Only Memory (EEPROM). This property shows if the electric supply supplied to the micro-controller is removed, even then it can store the data and can provide results after providing it with the electric supply. Moreover, ATmega-328 has 2KB Static Random Access Memory (SRAM). Other characteristics will be explained later. AT mega 328 have several different features which make it the most popular device in today's market. These features consist of advanced RISC architecture, good performance, low power consumption, real timer counter having separate oscillator, 6 PWM pins, programmable Serial USART, programming lock for software security, throughput up to 20 MIPS etc. ATmega-328 is mostly used in Arduino. The further details about ATmega 328 will be given later in this section.

SPECIFICATION

- **ATmega328p** is an 8-bit and 28 Pins AVR Microcontroller, manufactured by Microchip, follows RISC Architecture and has a flash type program memory of 32KB.
- It has an EEPROM memory of 1KB and its SRAM memory is of 2KB.
- It has 8 Pin for ADC operations, which all combines to form PortA (PA0 – PA7).
- It also has 3 built-inTimers; two of them are 8 Bit timers while the third one is 16-Bit Timer.
- You must have heard of Arduino UNO, UNO is based on atmega328 Microcontroller. It's UNO's heart.
- It operates ranging from 3.3V to 5.5V but normally we use 5V as a standard.
- Its excellent features include the cost efficiency, low power dissipation, programming lock for security purposes, and real timer counter with separate oscillator.
- It's normally used in Embedded Systems applications. You should have a look at these Real Life Examples of Embedded Systems, we can design all of them using this Microcontroller.

7.2 SCHEMATIC DIAGRAM:



7.3 BILL OF MATERIALS:

SL NO	ITEM DESCRIPTION	SPECIFICATION	SYMBOL	QUANTITY
1	ATMEGA 328P	12V DC	A1 -	1

MODULE-4

MOTORDRIVER (L293D)& 100RPM DC MOTOR

(5V/2A)

- 8.1 DESCRIPTION
- 8.2 SCHEMATIC DIAGRAM
- 8.3 BILL OF MATERIALS

CHAPTER 8

MOTORDRIVER (L293D) & 100RPM DC MOTOR

8.1.1DESCRIPTION

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. Dual H-bridge *Motor Driver integrated circuit* (*IC*).The l293d can drive small and quiet big motors as well, check the Voltage Specification at the end of this page for more info.

You can Buy L293D IC in any electronic shop very easily and it costs around 70 Rupees (INR) or around 1 $ Dollar (approx Cost) or even lesser cost. You can find the necessary pin diagram, working, a circuit diagram, Logic description.

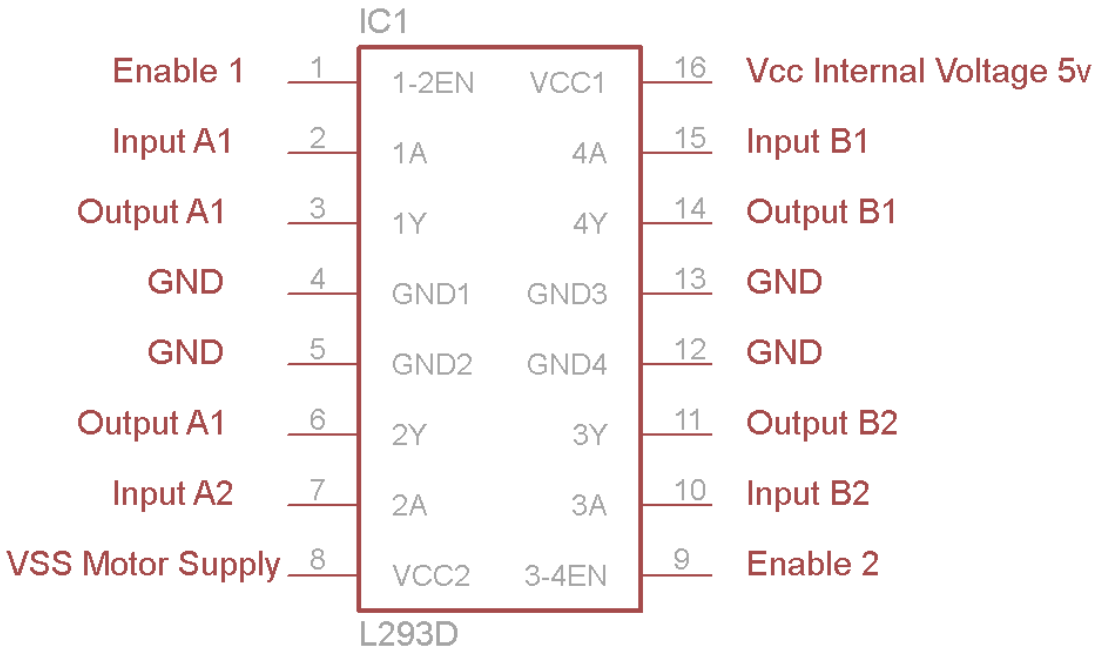
WORKING

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 voltage need to change 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.

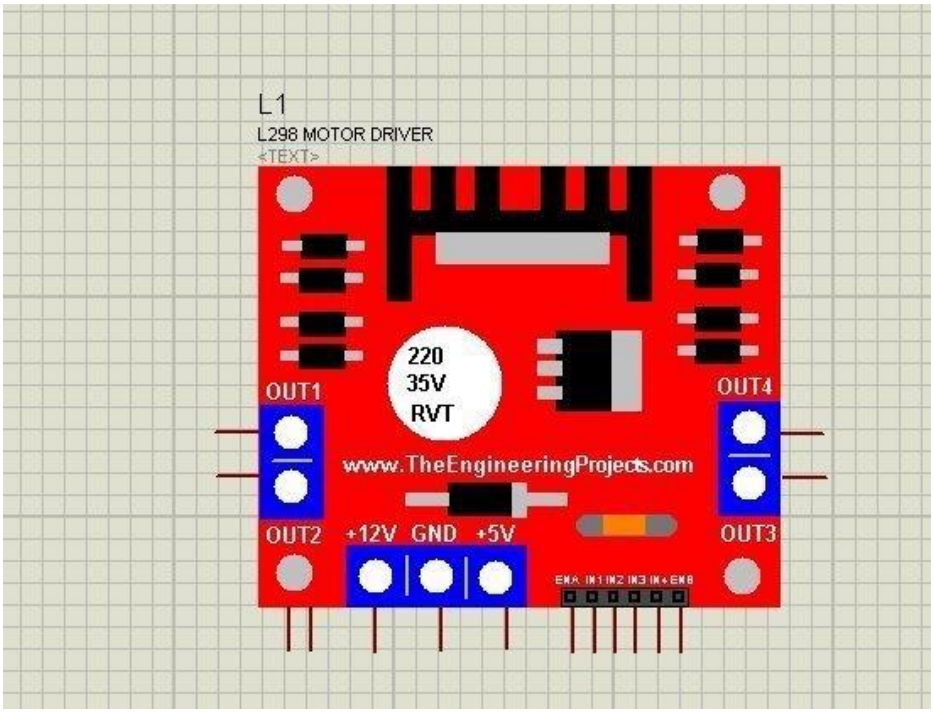
In a single L293D chip there are two h-Bridge circuit inside the IC which can rotate two dc motor independently. Due its size it is very much used in robotic application for controlling DC motors. Given below is the pin diagram of a L293D motor controller.

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 pin 9 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.

L293D PIN DIAGRAM



8.2.1 SCHEMATIC DIAGRAM



8.1.2 100RPM DC MOTOR

DESCRIPTION

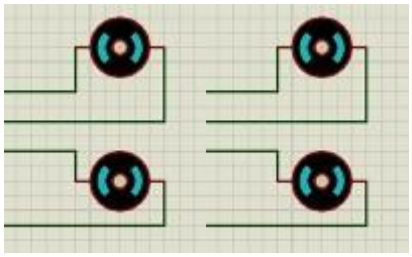
100RPM Centre Shaft Economy Series DC Motor is high quality low cost DC geared motor. It has steel gears and pinions to ensure longer life and better wear and tear properties. The gears are fixed on hardened steel spindles polished to a mirror finish. The output shaft rotates in a plastic bushing. The whole assembly is covered with a plastic ring. Gearbox is sealed and lubricated with lithium grease and require no maintenance. The motor is screwed to the gear box from inside. Although motor gives 100 RPM at 12V but motor runs smoothly from 4V to 12V and gives wide range of RPM, and torque. Tables below gives fairly good idea of the motor's performance in terms of RPM and no load current as a function of voltage and stall torque, stall current as a function of voltage.

For compatible wheels refer to Wheels and Accessories product category. You can also mount this motor on the chassis using Motor Mount for Centre Shaft Economy Series DC MotorFor adding Position Encoder, refer to Encoder Kit for Centre Shaft Economy Series DC Motor

SPECIFICATION

- DC supply: 4 to 12V
- RPM: 100 at 12V
- Total length: 46mm
- Motor diameter: 36mm
- Motor length: 25mm
- Brush type: Precious metal
- Gear head diameter: 37mm
- Gear head length: 21mm
- Output shaft: Centered
- Shaft diameter: 6mm
- Shaft length: 22mm
- Gear assembly: Spur
- Motor weight: 100gms

8.2.2 SCHEMATIC DIAGRAM



8.3 BILL OF MATERIALS

SL NO	ITEM DESCRIPTION	`SPECIFICATIONS	SYMBOL	QUANTITY
1	MOTOR DRIVER	L293D	D1	1
2	DC MOTOR	100 RPM	M1,M2,M3, M4	4

MODULE-5

GPS MODULE

(GF-07)

- 10.1 DESCRIPTION
- 10.2 SCHEMATIC DIAGRAM

CHAPTER-9

GPS MODULE (GF-07)

9.1 DESCRIPTION

These are found in most smart phones, many new automobiles, and they are used to track commerce all over the globe. These tiny devices can instantaneously give your exact position and time, almost anywhere on the planet, for free! All you need is a GPS receiver, and receivers are getting less expensive and smaller every day.

There are decades of engineering that went in to giving you accurate position anytime, anywhere. Dozens of GPS satellites, all containing extremely accurate atomic clocks, have been launched since the late 70's, and launches continue to this day. The satellites continuously send data down to earth over dedicated RF frequencies. Our pocket-sized GPS receivers have tiny processors and antennas that directly receive the data sent by the satellites and compute your position and time on the fly. Simply amazing.

SPECIFICATIONS

Type: Magnetic GPS Locator
Material: Plastic
Size(approx):35*20*14mm
Quantity: 1pc
Color: Black
Talk Time: 150 -180 minutes
Standby Time: 12 days
Working Time: 4 - 6 days
Expansion Card: Mini TF card
Network: GSM/GPRS
GSM Band: 850/900/1800/1900Mhz
GMS Locating Time: 25 Seconds
Power Input: AC 110-220V 50/60Hz
Power Output: DC5V 300 - 500mA
Battery Capacity: 3.7V 400mAh Li-ion Battery
Working Voltage: 3.4 - 4.2V DC
Storage Temp.: -40 to 85 Celsius
Operation Temp.: -20 to 55 Celsius
Humidity: 5%-95% non-condensing
Warning: Must insert SIM card before charging.

FEATURES:

1. Small size and light weight, easy for carry.
2. Black shell, easy to hide, perfect for tracking vehicles, teens, spouses, elderly persons or assets. With two powerful magnets inside, easy to attach to vehicle firmly, no extra installation need.
3. All you need is a working SIM card (NOT included!) to insert into the device, then you can track and map (with Google Maps) in real-time over the Internet.
4. Dial SIM card number, then you can hear voice around this tracker, with no light and no noise, you can monitoring and spy what's going on around the tracker silently and secretly.

ADVANTAGES

1.It is the only similar products of all mobile phones on the map to view the query to the location and computer platform position trajectory, also can be directly reply messages in Chinese position.

2. In the first base station positioning on the basis of the original joined Google maps positioning, greatly reduces the error range of the product.

3. Due to the joined Google positioning mode, the product positioning function now support abroad.

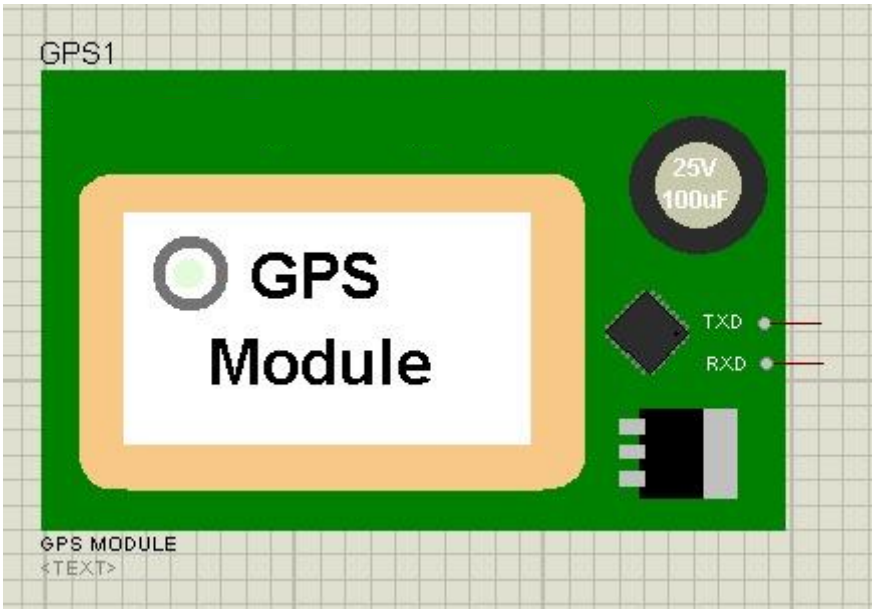
4. If we can call 10086 opened around listening to sound more friendship number per month, it's only a number five year a month to check how long doesn't have money.

5. This product does not need to cost platform, life-long free of charge. Just send a message to the alarm locator, can respond to the following address information in Chinese and Google maps connection, simple operation, one pace reaches the designated position.

6. This product built-in powerful magnet adsorption function, need not you worry again put problem, as long as there is metal, you can directly put up, the magnet will automatically adsorption, more convenient installation you put the position

7. This product is the only market with the function of charge automatically boot, connect the power supply, when the alarm locator electricity used up and products after shutdown, call the product will be automatically switched on and continue to recharge, warning, charging must insert SIM card Regardless of alarm locator on the cart, children bag, the old man's pocket, valuables bag, can through the mobile phone to send SMS alarm locator, query alarm locator location, convenient you to monitor all the way, to master the location of the object in real time.

9.2 SCHEMATIC DIAGRAM



9.3 BILL OF MATERIALS

SL NO	ITEM DESCRIPTION	`SPECIFICATION	SYMBOL	QUANTITY
1	GPS MODULE	GF-07	G1	1

MODULE-6

GSM MODULE

(SIM900)

- 9.1 DESCRIPTION
- 9.2 SCHEMATIC DIAGRAM
- 9.3 BILL OF MATERIALS

CHAPTER 10

GSM MODULE

10.1 DESCRIPTION

The SIM900 is a complete Quad-band GSM/GPRS solution in a SMT module which can be embedded in the customer applications. Featuring an industry-standard interface, the SIM900 delivers GSM/GPRS 850/900/1800/1900MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption. With a tiny configuration of 24mm x 24mm x 3 mm, SIM900 can fit almost all the space requirements in your M2M application, especially for slim and compact demand of design.

FEATURES:

- SIM900 is designed with a very powerful single-chip processor integrating AMR926EJ-S core
- Quad - band GSM/GPRS module with a size of 24mmx24mmx3mm
- SMT type suit for customer application
- An embedded Powerful TCP/IP protocol stack
- Based upon mature and field-proven platform, backed up by our support service, from definition to design and production

SPECIFICATION:

- Quad-Band 850/ 900/ 1800/ 1900 MHz
- GPRS multi-slot class 10/8
- GPRS mobile station class B
- Compliant to GSM phase 2/2+
    - Class 4 (2 W @ 900 MHz)
    - Class 1 (1 W @ 1800MHz)
- Dimensions: 24x24x3mm
- Weight: 3.4g
- Control via AT commands (GSM 07.07 ,07.05 and SIMCOM enhanced AT Commands)
- SIM application toolkit
- Supply voltage range : 3.4V to 4.5V
- Low power consumption: 1.0mA(sleep mode)
- Operation temperature: -40°C to +85 °C

ADVANTAGES:

- GSM technology has been matured since long and hence GSM mobile phones and modems are widely available across the world. It provides very cost effective products and solutions.

- The GSM based networks (i.e. base stations) are deployed across the world and hence same mobile phone works across the globe. This leverages cost benefits as well as provides seamless wireless connectivity. This will help users avail data and voice services without any disruption. Hence international roaming is not a concern.

- Advanced versions of GSM with higher number of antennas will provide high speed download and upload of data. SAIC and DAIC techniques provide very high transmission quality. SAIC stands for Single Antenna Interference Cancellation technique while DAIC stands for Dual antenna interference cancellation. It is easy to maintain GSM networks due to availability of large number of network engineers at affordable cost.

- The GSM signal does not have any deterioration inside the office and home premises. It is easy to integrate GSM with other wireless technology based devices such as CDMA, LTE etc.

DISADVANTAGES:

- Many of the GSM technologies are patented by Qualcomm and hence licenses need to be obtained from them.
- In order to increase the coverage repeaters are required to be installed.
- GSM provides limited data rate capability, for higher data rate GSM advanced version devices are used.
- GSM uses FTDMA access scheme. Here multiple users share same bandwidth and hence will lead to interference when more number of users are using the GSM service. In order to avoid this situation, robust frequency correction algorithms are used in mobile phones and base stations.
- GSM uses pulse based burst transmission technology and hence it interferes with certain electronics. Due to this fact airplanes, petrol bunks and hospitals prevent use of GSM based mobile or other gadgets.

10.2 SCHEMATIC DIAGRAM

10.3 BILL OF MATERIALS

SL NO	ITEM DESCRIPTION	`SPECIFICATION	SYMBOL	QUANTITY
1	GSM MODULE	SIM900	GS1	1

MODULE-7

LCD DISPLAY

(16X2)

- 11.1 DESCRIPTION
- 11.2 SCHEMATIC DIAGRAM
- 11.3 BILL OF MATERIALS

CHAPTER-11

LCD DISPLAY (16X2)

11.1 DESCRIPTION

LCD modules are very commonly used in most embedded projects, the reason being its cheap price, availability and programmer friendly. Most of us would have come across these displays in our day to day life, either at PCO's or calculators. The appearance and the pinouts have already been visualized above now let us get a bit technical.

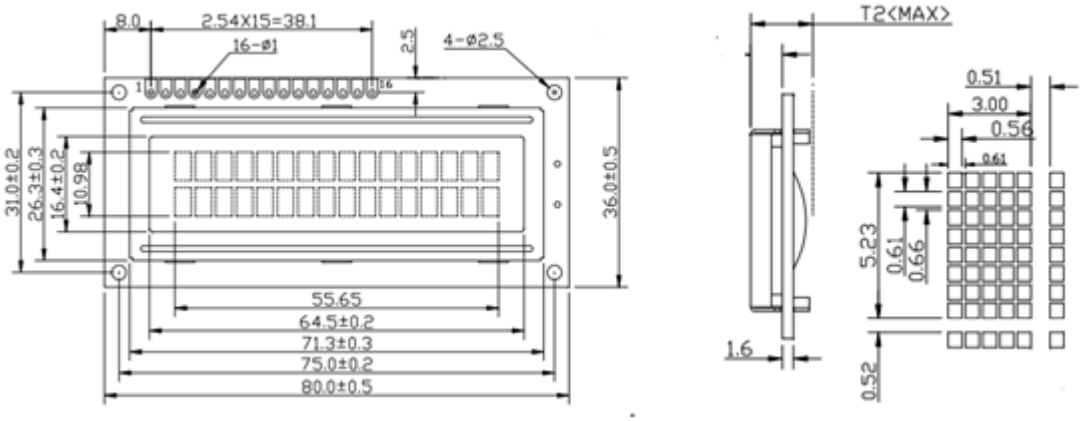
16×2 LCD is named so because; it has 16 Columns and 2 Rows. There are a lot of combinations available like, 8×1, 8×2, 10×2, 16×1, etc. but the most used one is the 16×2 LCD. So, it will have (16×2=32) 32 characters in total and each character will be made of 5×8 Pixel Dots. A Single character with all its Pixels is shown in the below picture.

Now, we know that each character has (5×8=40) 40 Pixels and for 32 Characters we will have (32×40) 1280 Pixels. Further, the LCD should also be instructed about the Position of the Pixels. Hence it will be a hectic task to handle everything with the help of MCU, hence an Interface IC likeHD44780is used, which is mounted on the backside of the LCD Module itself. The function of this IC is to get the Commands and Data from the MCU and process them to display meaningful information onto our LCD Screen. You can learn how to interface an LCD using the above mentioned links. If you are an advanced programmer and would like to create your own library for interfacing your Microcontroller with this LCD module then you have to understand the HD44780 IC is working and commands which can be found its datasheet.

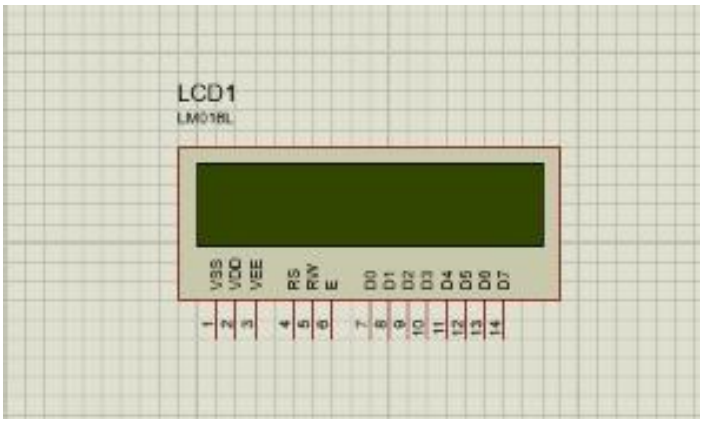
FEATURES:

- Operating Voltage is 4.7V to 5.3V
- Current consumption is 1mA without backlight
- Alphanumeric LCD display module, meaning can display alphabets and numbers
- Consists of two rows and each row can print 16 characters.
- Each character is build by a 5×8 pixel box
- Can work on both 8-bit and 4-bit mode
- It can also display any custom generated characters
- Available in Green and Blue Backlight

2D MODEL OF 16×2 LCD MODULES:



11.2 SCHEMATIC DIAGRAM



11.3 BILL OF MATERIALS:

SL NO	ITEM DESCRIPTION	`SPECIFICATION	SYMBOL	QUANTITY
1	LCD DISPLAY	16X2	D1	1

MODULE-8

LED'S

(T-1 3/4)

- 12.1 DESCRIPTION
- 12.2 SCHEMATIC DIAGRAM
- 12.3 BILL OF MATERIALS

CHAPTER-12

LED'S (T-1 3/4)

12.1 DESCRIPTION

A Light Emitting Diode (LED) is one of the latest inventions and is extensively used these days. From your cell phone to the large advertising display boards, the wide range of applications of these magical light bulbs can be witnessed almost everywhere. Today their popularity and applications are increasing rapidly due to some remarkable properties they have. Specifically, LEDs are very small in size and consume very little power. The magnificent, beautiful, dazzling colors involved with LEDs may be quite picturesque, but do you really know how these effects are actually created in them.

LED (Light Emitting Diode) is basically a small light emitting device that comes under "active" semiconductor electronic components. It's quite comparable to the normal general purpose diode, with the only big difference being its capability to emit light in different colors. The two terminals (anode and cathode) of a LED when connected to a voltage source in the correct polarity, may produce lights of different colors, as per the semiconductor substance used inside it.

WORKING PRINCIPLE:

A light-emitting diode is a two-lead semiconductor light source. It is a p–n junction diode that emits light when activated. When a suitable voltage is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons. This effect is called electroluminescence, and the color of the light (corresponding to the energy of the photon) is determined by the energy band gap of the semiconductor.

ADVANTAGES :

1. Very low voltage and current are enough to drive the LED.

Voltage range – 1 to 2 volts. Current – 5 to 20 Millie amperes.

2. Total power output will be less than 150 mille watts.

3. The response time is very less – only about 10 nanoseconds.

4. The device does not need any heating and warm up time.

5. Miniature in size and hence lightweight.

6. Have a rugged construction and hence can withstand shock and vibrations.

7. An LED has a lifespan of more than 20 years.

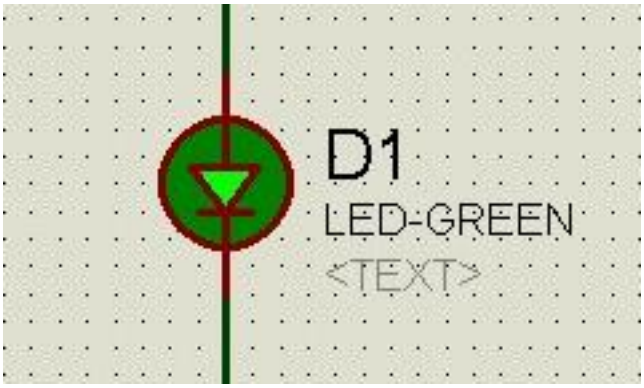
DISADVANTAGES:

1. A slight excess of voltage or current can damage the device.

2. The device is known to have a much wider bandwidth compared to the laser.

3. The temperature depends on the radiant output power and wavelength.

12.2 SCHEMATIC DIAGRAM

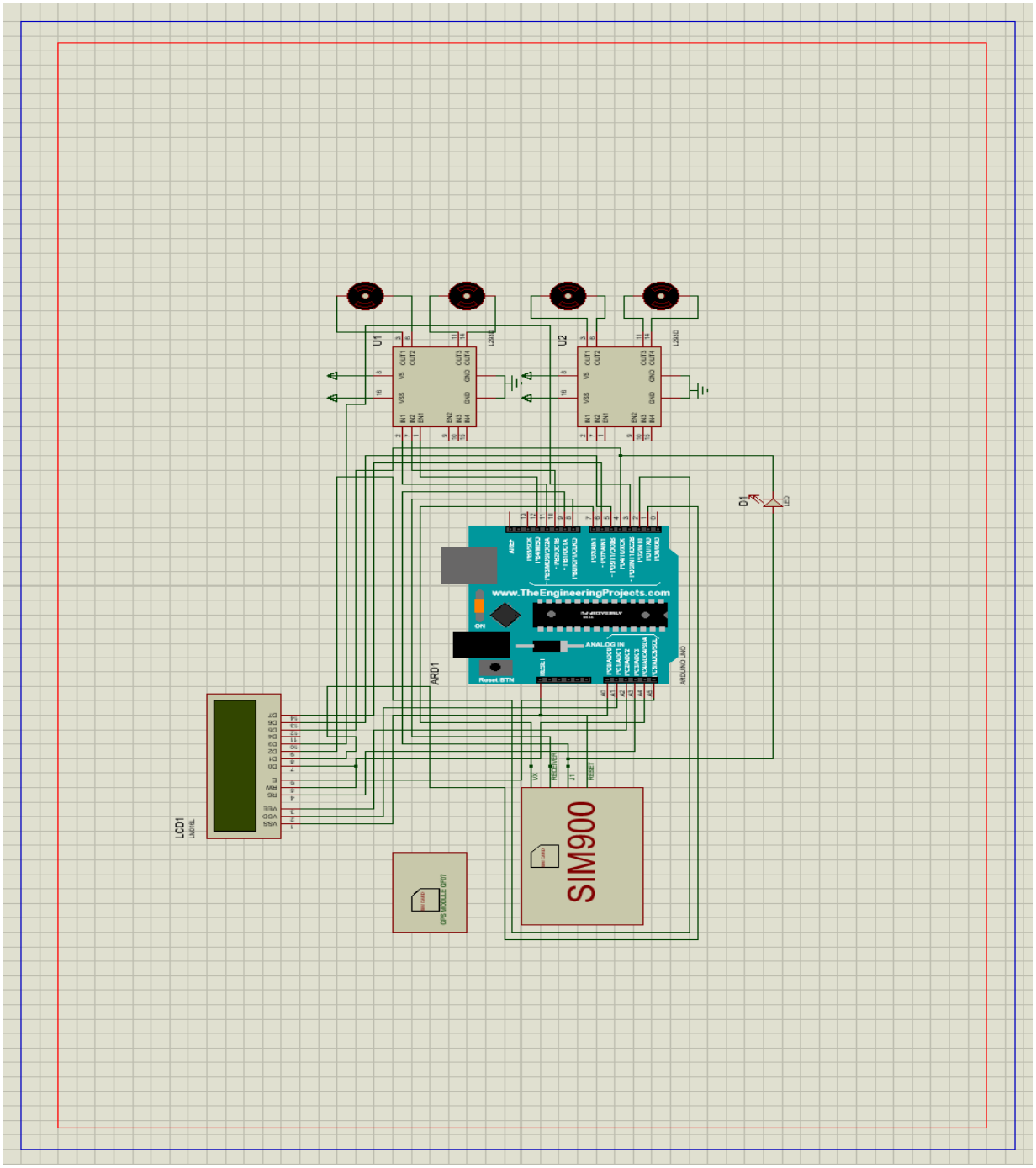


12.3 BILL OF MATERIAL

SL NO	ITEM DESCRIPTION	`SPECIFICATION	SYMBOL	QUANTITY
1	LED	5V DC	**L1**	1

CHAPTER-13

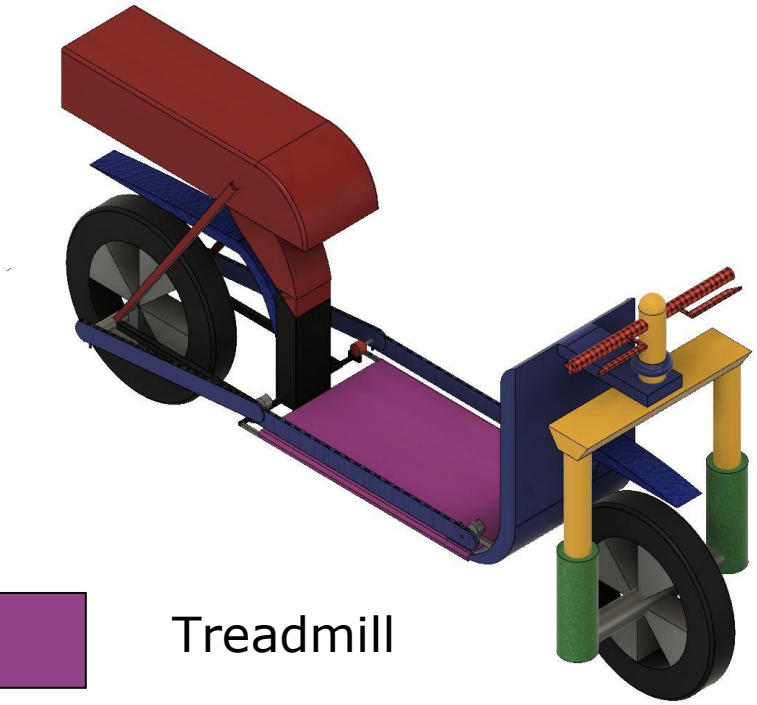
13.1 SCHEMATIC DIAGRAM



CHAPTER-14

MECHANICAL DESIGN

14.1 ISOMETRIC VIEW



Treadmill

Suspension

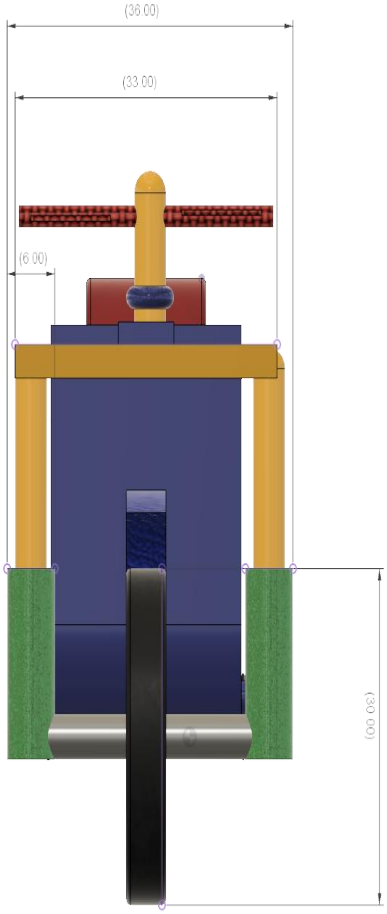
Head Tube

Frame

Battery Box

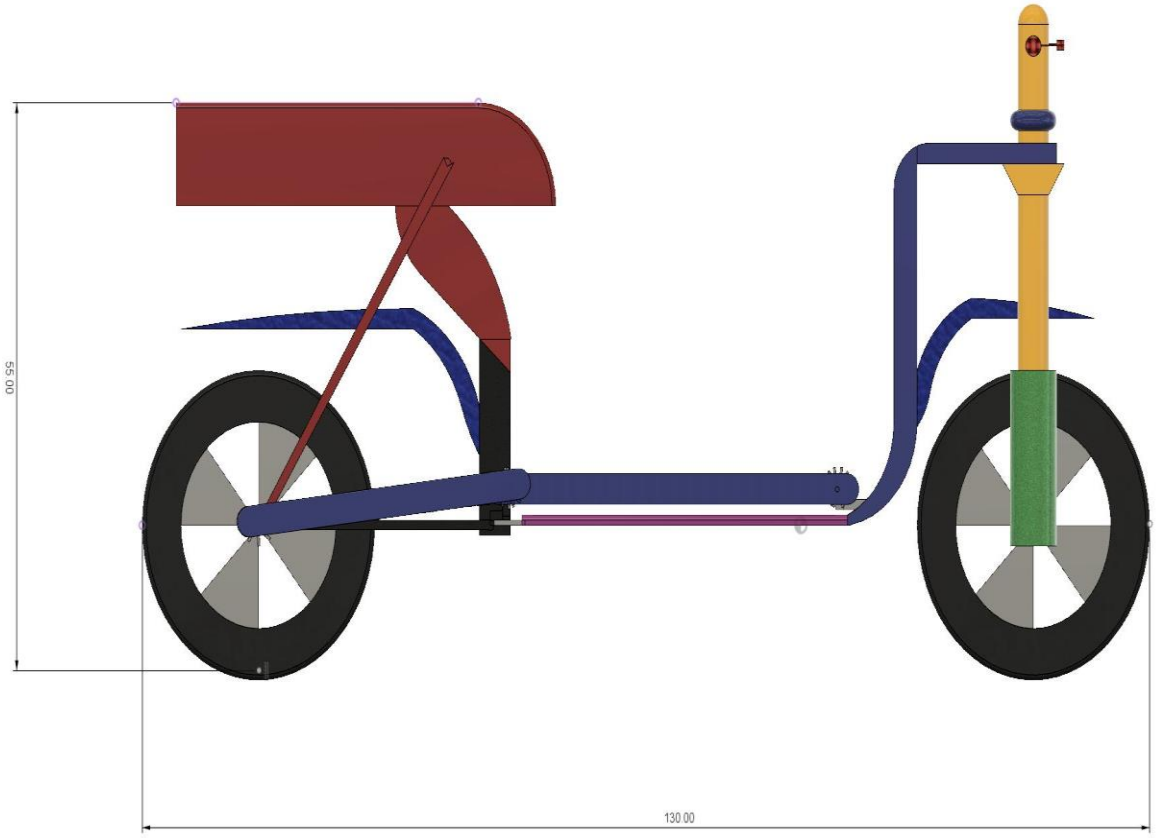
Tires

14.2 FRONT VIEW



All dimensions are in mm

14.3 SIDE VIEW



All dimensions are in mm

CHAPTER-15

BILL OF MATERIALS

ELECTRICAL COMPONENTS

SL NO	MODULES	SPECIFICATION	QUANTITY (NO'S)	PRICE (INR)
1	MODULE1:Battery	7.5AH	1	**830**
2	MODULE2:Charging circuit (15v/1a)	CC	1	**635**
3	MODULE3: Arduino mega2560 (5v/1.5A)	ATMEGA328P	1	**450**
4	MODULES4: GPS MODULE(GF-07)	GF-07	1	**900**
5	MODULE 5 : Motor driver L298N & Motors(12v/1.5A)	L298N,100RPM	2,4	**250**
6	MODULE6: GSM MODULE(SIM900)	SIM900	1	**900**
7	MODULE7: LED DISPLAY3(P10)	32X16	1	**500**
8	MODULE8:LED'S	3V DC	1	**50**
9	Tool Kit	_	1	**AVAILABLE**
TOTAL				**4515/-**

MECHANICAL COMPONENTS

SL NO	COMPONENTS	MATERIAL	QUANTITY (NO'S)	PRICE (INR)
1	Frame	M.S	1	**900**
2	Wheels	Rubber	2	**1200**
3	Treadmill Belt	Rubber	1	**900**
4	Roller	M.S	2	**1000**
5	Hub Motor	_	1	**500**
6	Battery	Lead acid	1	**950**
7	Sprocket	Steel	2	**550**
8	Chain	Steel	1	**560**
9	Solar Panel	Silicon	1	**200**
10	Bearing With Bearing Cap	M.S	6	**500**
11	Spur Gear	C.I	2	**650**
	TOTAL			**7910/-**

GRAND TOTAL

TYPE	PRICE (INR)
ELECTRICAL	**4515/-**
MECHANICAL	**7910/-**
TOTAL	**12425/-**

CHAPTER-16

16.1 FUSION 360

The mechanical design work was carried out using this software. The mechanical design could be drawn in 3 dimensions using this software.

16.2 PROTEUS 8 PROFESSIONAL

This software was used to draw the Schematic diagram, Circuit diagram and the interconnection diagram. It was also used to simulate and test certain programs.

16.3 ARDUINO IDE

The programming part of this project was done using this software. Debugging of the program was also done with this software.

ARDUINO IDE is free software which solves many of the pain points for the program developer. This software is an integrated development environment (IDE), which integrated a text editor to write programs, a compiler. Here is simple guide to start working with ARDUINOIDE which can be used for

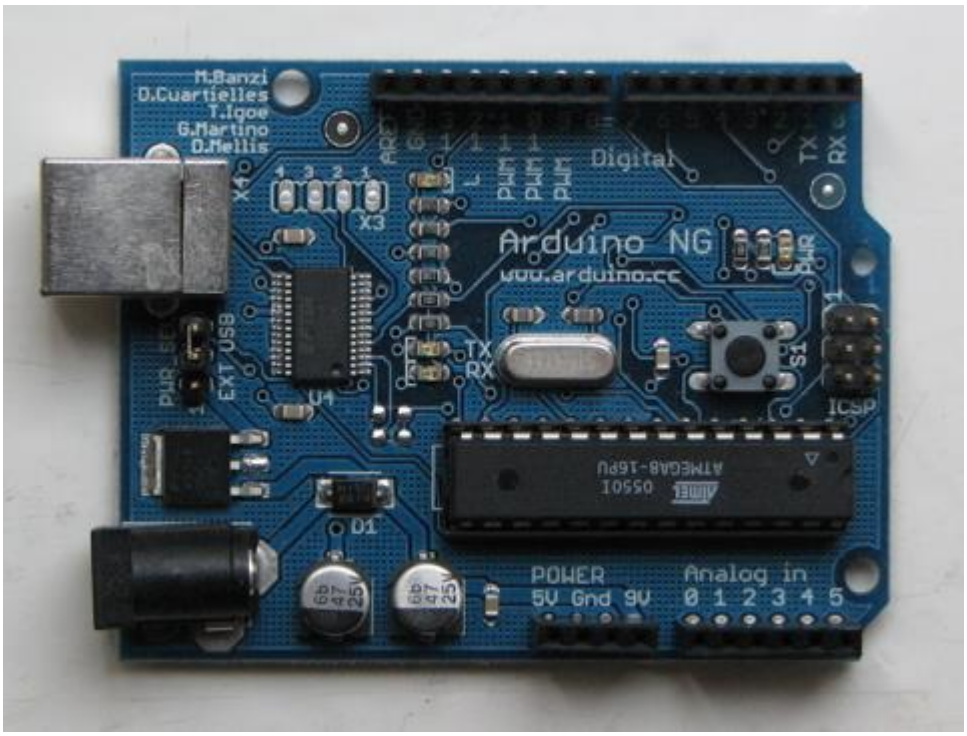
- Writing programs in C/C++ or in python x
- Compiling and Assembling Programs
- Debugging program
- This is simple guide on 4 though also applicable on previous versions also. These are the simple steps to get off the mark your inning!

These are the steps you need to follow in order to be up and running:

1. Get an Arduino board
2. Download the Arduino environment
3. Install the USB drivers
4. Connect the board
5. Upload a program

1 | Get an Arduino Board

The ArduinoI/O board is a simple circuit featuring the ATmega8 processor from Atmel. The board is composed of a printed circuit board (PCB) and electronic parts.

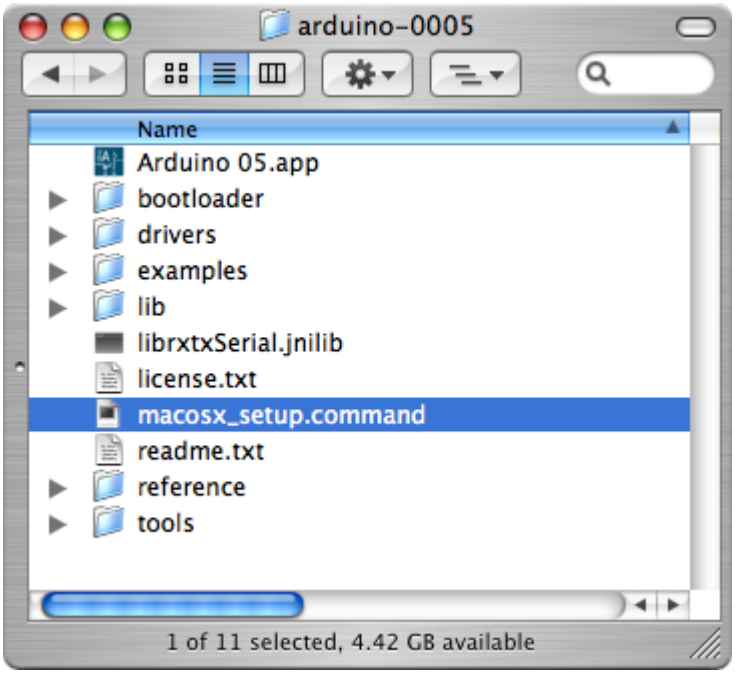


There are a few ways to get an Arduino board:

- Buy a readymade board: See how you can buy a board or just the PCB.
- European distributor or US distributor
- Build your own board: If you want you can build your own PCB just by downloading the CAD files from the Hardware page. Extract the .brd file and send it to a PCB manufacturer. Be aware that manufacturing a single PCB will be very expensive. It's better to get together with other people and make 20 or 30 at a time. Since you get the full CAD files you can make your own customized version of Arduino. If you make modifications or fix bugs please send us your changes!
  - Purchase parts: Purchase the parts from any electronics store. The Serial version in particular has been designed to use the most basic parts that can be found anywhere in the world. The USB version on the other hand requires some advanced soldering skills because of the FTDI chip that is asmd part. Here is a list of parts for the serial board.
  - Assemble the board: We put together a step by step guide on how to build an arduino board.
  - Newbie's: never soldered before? Afraid of trashing thousands of boards before getting one properly soldered? Fear not :) learns to master the art of soldering.
  - Program the boot loader: In order for the development environment to be able to program the chip, this has to be programmed with a piece of code called boot loader. See the boot loader page on how to program it on your chip.

2 | Download the Arduino environment

- To program the Arduino board you need the Arduino environment.
- Download Arduino: From the software page.
- Linux note*: For help getting the Arduino IDE running on Debi an, please see the FAQ ("How can I run the Arduino IDE under Linux?").*



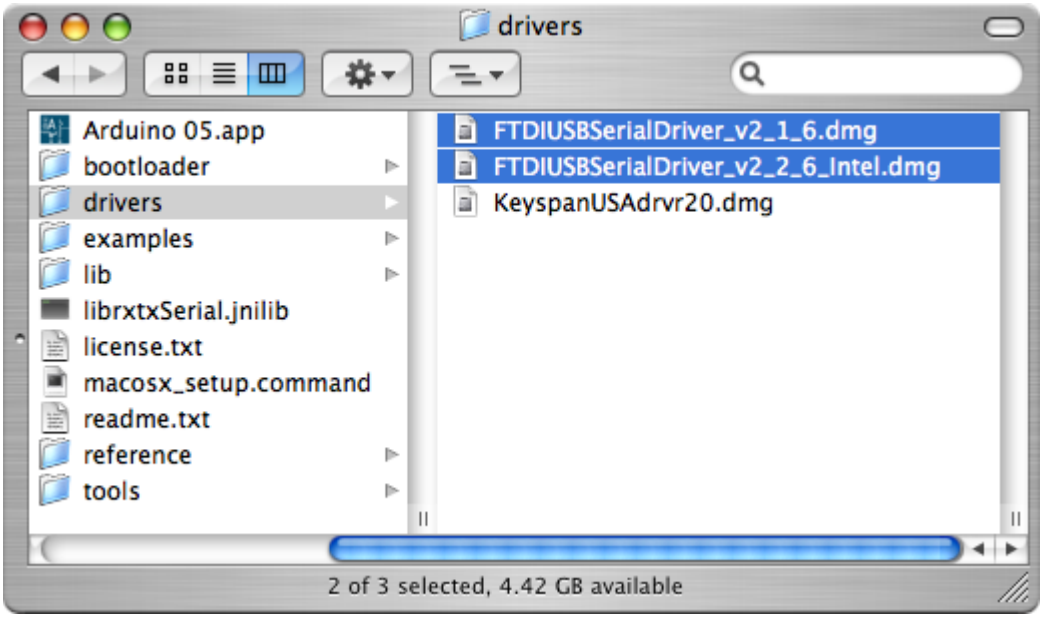
For more information, see the guide to the Arduino environment.

3 | Install the USB drivers

If you are using a USB Arduino, you will need to install the drivers for the FTDI chip on the board. These can be found in the driver's directory of the Arduino distribution.

On Windows, you will need to unzip FTDI USB Drivers.zip. Then, when you plug in the Arduino board, point the Windows *Add Hardware* wizard to the FTDI USB Drivers directory.

On the Mac, mount the FTDIUSBSerialDriver_v2_1_6.dmg (on PPC machines) or the FTDIUSBSerialDriver_v2_2_6_Intel.dmg (on Intel machines) disk image and run the included FTDIUSBSerialDriver.pkg.



The latest version of the drivers can be found on the FTDI website.

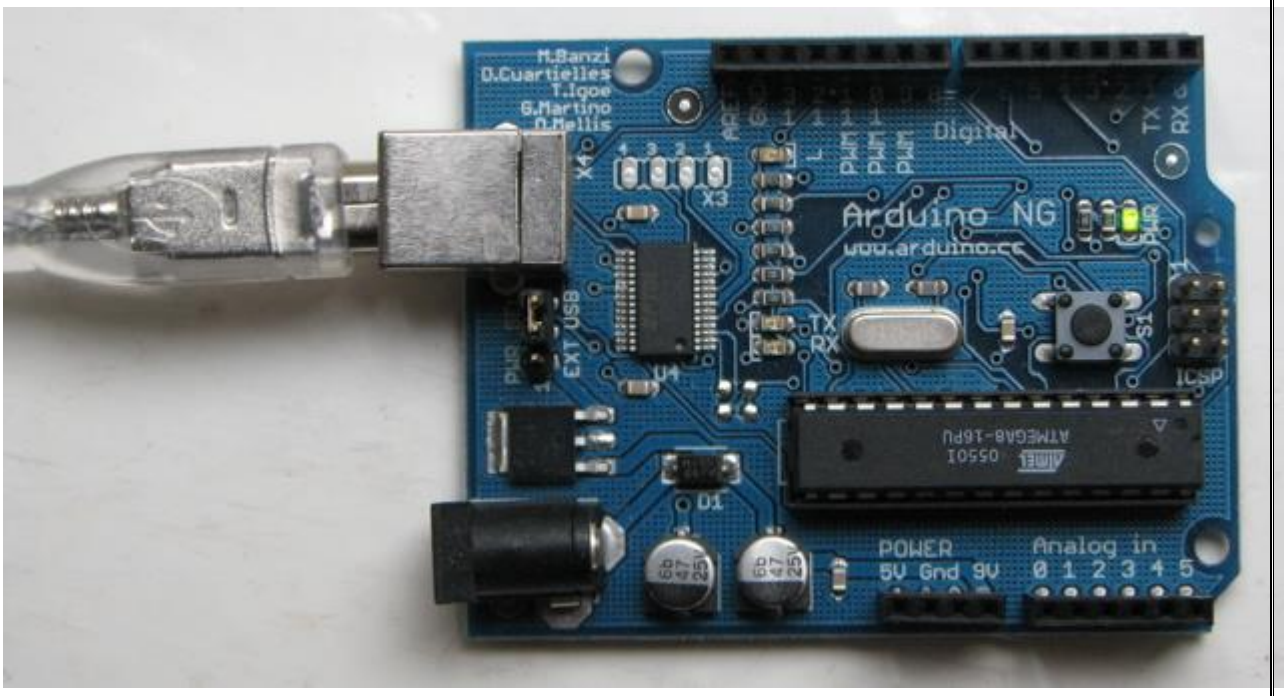
4 | Connect the board

If you're using a serial board, power the board with an external power supply (6 to 25 volts DC, with the core of the connector positive). Connect the board to a serial port on your computer.

On the USB boards, the power source is selected by the jumper between the USB and power plugs. To power the board from the USB port (good for controlling low power devices like LEDs), place the jumper on the two pins closest to the USB plug. To power the board from an external power supply (needed for motors and other high current devices), place the

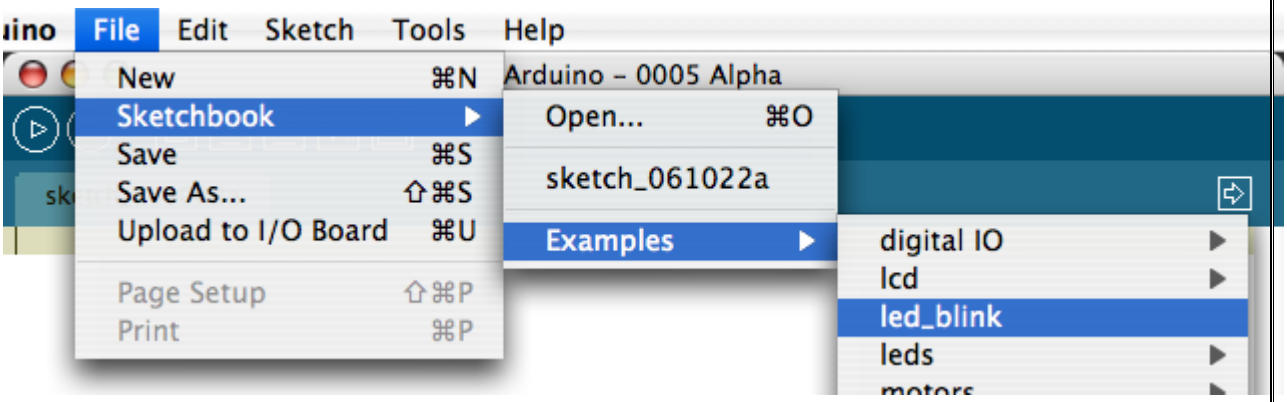
jumper on the two pins closest to the power plug. Either way, connect the board to a USB port on your computer. On Windows, the Add New Hardware wizard will open; tell it you want to specify the location to search for drivers and point to the folder containing the USB drivers you unzipped in the previous step.

The power LED should go on.

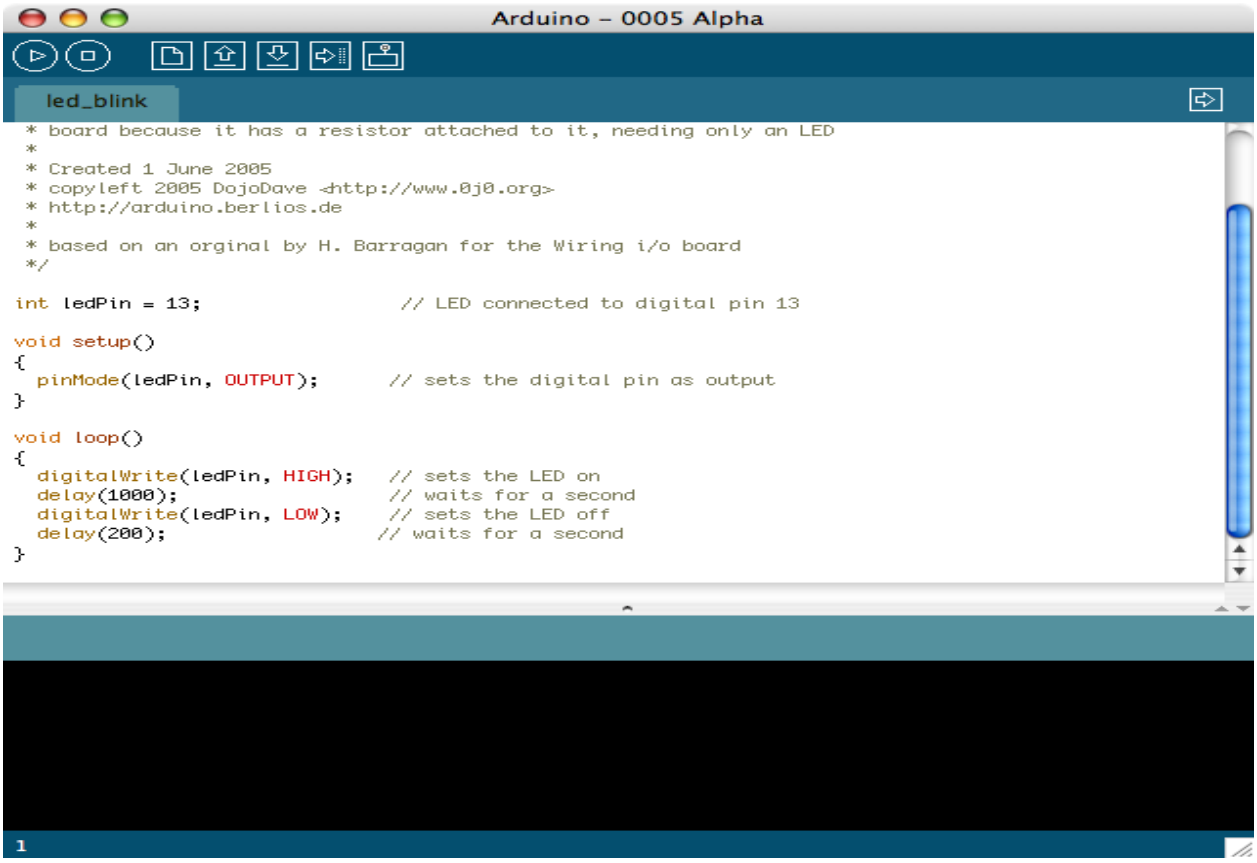


5 | Upload a program

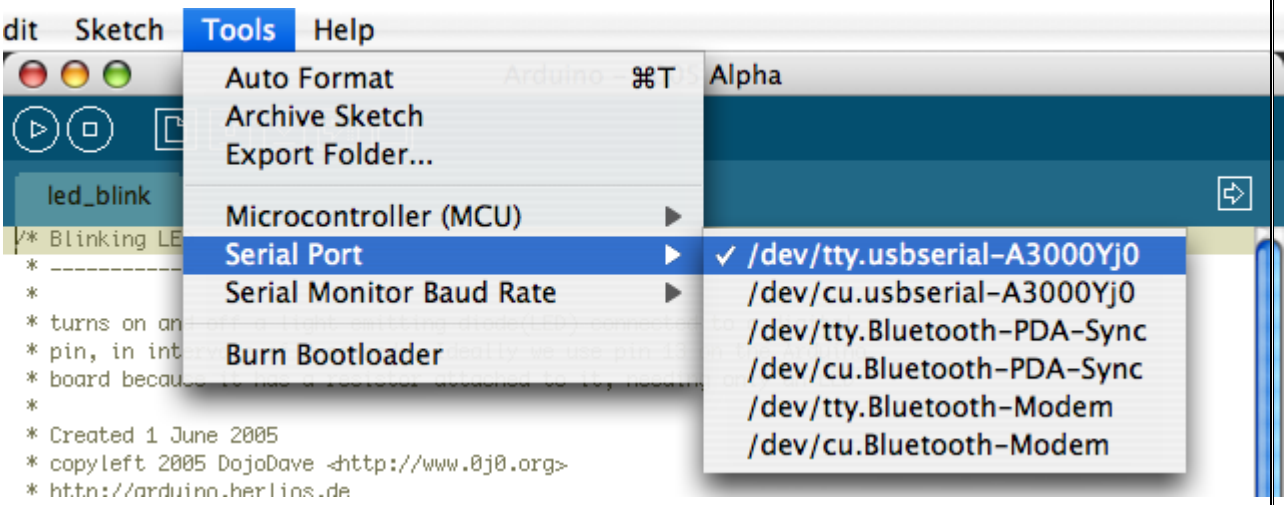
Open the LED blink example sketch: File > Sketchbook > Examples >led blink.



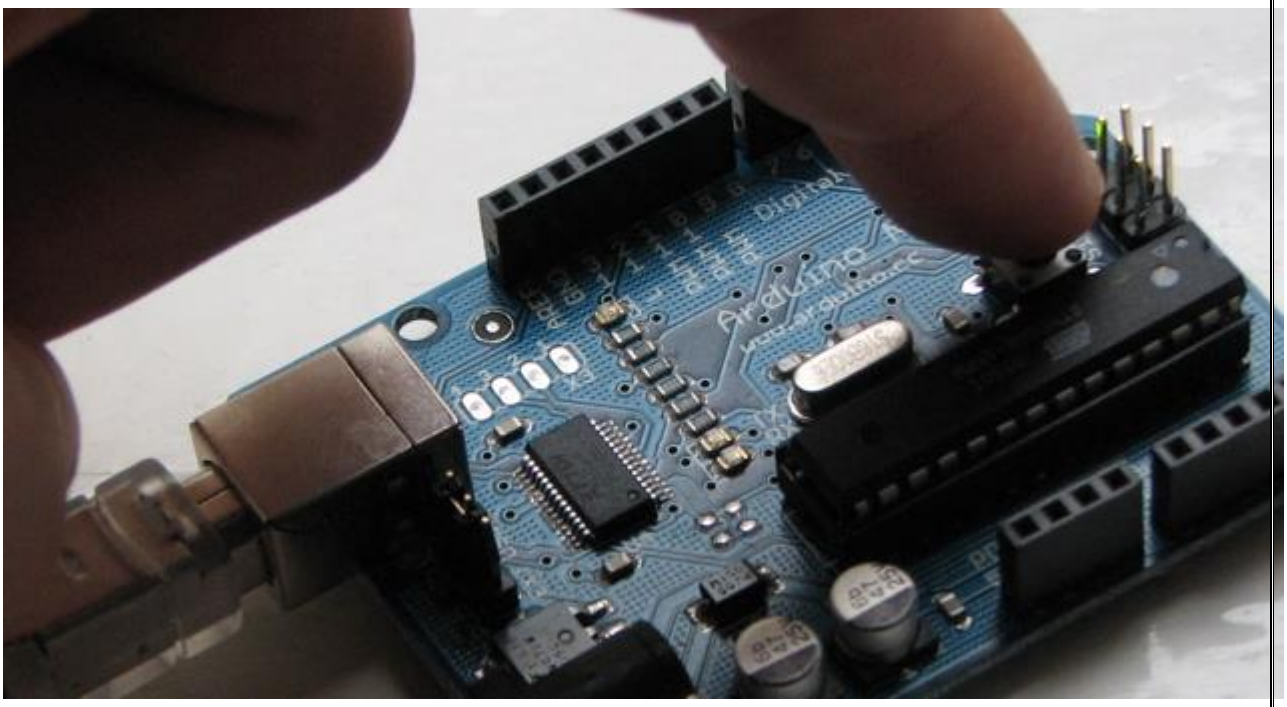
Here's what the code for the LED blink example looks like.

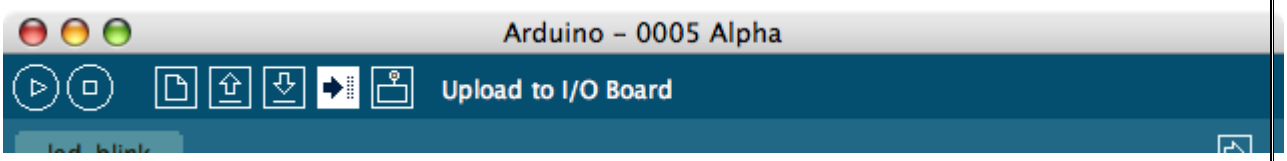


Select the serial device of the Arduino board from the Tools | Serial Port menu. On Windows, this should be COM1 or COM2 for a serial Arduino board, or COM3, COM4, or COM5 for a USB board. On the Mac, this should be something like /dev/cu.usbserial-1B1 for a USB board, or something like /dev/cu.USA19QW1b1P1.1 if using a Key span adapter with a serial board (other USB-to-serial adapters use different names).



Push the reset button on the board then click the *Upload* button in the IDE. Wait a few seconds. If successful, the message "Done uploading." will appear in the status bar.





If the Arduino board doesn't show up in the Tools | Serial Port menu, or you get an error while uploading, please see the FAQ for troubleshooting suggestions.A few seconds after the upload finishes, you should see the amber (yellow) LED on the board start to blink.

CHAPTER -17

FLOW CHART

17.2 PROGRAM

```
#include<Liquidcrystal.h>

void setup() {
    pinMode(2, OUTPUT);
    pinMode(3, OUTPUT);
    pinMode(4, OUTPUT);


}
void loop() {
  digitalWrite(2, LOW);
  delay(500);

  digitalWrite(2, HIGH);
  delay(500);

  digitalWrite(3, LOW);
  delay(500);

  digitalWrite(3, HIGH);
  delay(500);

  digitalWrite(4, LOW);
  delay(500);

  digitalWrite(4, HIGH);
  delay(500);
}
```

```
Liquidcrystal lcd(12,11,5,4,3)
Voidsetup()
{
Lcd.begin(16,2);
Lcd.print("MSD TEAM 8");
}
Void loop(){
}
//Motor1
const int MotorPin1 = 5;
const int MotorPin2 = 6;
//Motor2
const int MotorPin3 = 10;
const int MotorPin4 = 9;

void setup() {
  // put your setup code here, to run once:
  pinMode(MotorPin1, OUTPUT);
  pinMode(MotorPin2, OUTPUT);
  pinMode(MotorPin3, OUTPUT);
  pinMode(MotorPin4, OUTPUT);
}

void loop() {
  // put your main the code here, to run repeatedly:
  //Turn on Motor1 in clockwise for 3 second
  digitalWrite(MotorPin1, HIGH);
  digitalWrite(MotorPin2, LOW);
  digitalWrite(MotorPin3, LOW);
  digitalWrite(MotorPin4, LOW);
delay(2000);
```

```
  //Turn on Motor1 in anti-clockwise for 3 second
  digitalWrite(MotorPin1, LOW);
  digitalWrite(MotorPin2, HIGH);
  digitalWrite(MotorPin3, LOW);
  digitalWrite(MotorPin4, LOW);
delay(2000);

  //Turn on Motor2 in clockwise for 3 second
  digitalWrite(MotorPin1, LOW);
  digitalWrite(MotorPin2, LOW);
  digitalWrite(MotorPin3, HIGH);
  digitalWrite(MotorPin4, LOW);
delay(2000);

  //Turn on motor2 in Anti-clockwise for 3 second
  digitalWrite(MotorPin1, LOW);
  digitalWrite(MotorPin2, LOW);
  digitalWrite(MotorPin3, LOW);
  digitalWrite(MotorPin4, HIGH);
delay(2000);

//Turn on motor1 and motor2 in clockwise for 3 second
  digitalWrite(MotorPin1, HIGH);
  digitalWrite(MotorPin2, LOW);
  digitalWrite(MotorPin3, HIGH);
  digitalWrite(MotorPin4, LOW);
delay(2000);

//Turn on motor1 and motor2 in anti-clockwise for 3 second
  digitalWrite(MotorPin1, LOW);
```

```
  digitalWrite(MotorPin2, HIGH);
  digitalWrite(MotorPin3, LOW);
  digitalWrite(MotorPin4, HIGH);
delay(2000);

//Turn off motor1 and motor2 for 5 second
  digitalWrite(MotorPin1, LOW);
  digitalWrite(MotorPin2, LOW);
  digitalWrite(MotorPin3, LOW);
  digitalWrite(MotorPin4, LOW);s
}
```

CHAPTER-18

18.1 ADVANTAGES

- Battery Operated
- Easy to design
- User friendly
- Low cost
- Compact in size

18.2 LIMITATIONS

- Suitable for short distances only
- Not suitable for off road travelling
- Maintenance is needed.

18.3 APPLICATIONS

- Can be used as domestic purpose vehicles.
- Can be used in Corporate Offices for the internal transportation.
- Can be used in Educational intuitions.

PROJECT PHOTOGRAPH

BIBLIOGRAPHY

WEBSITES

- www.electronicshub.com
- www.wikipedia.com
- www.electronicscircuits.com
- www.lopifit.us
- www.circuitdigest.com

CONCLUSION

To make sure that our project "LOPIFIT" is based on the technical idea of the combination of all the process in one machine using microcontroller.

We have gathered more knowledge on our core subject Mechatronics, the combination of mechanical, electrical, computer, microcontroller programming and through the medium of this project. While doing this project, we had faced many problems but we have trouble-shooted one by one.