

Arduino is an open source electronics platform which take input and can give output first we will learn out the various components which is on the arduino and why are these components there on the board and what are their functions

USB B TYPE - use to upload code in arduino (A->B) cable

POLY FUSE - act as a fuse for the board to prevent overloading in case of excess current and protect the board

AT-MEGA 16U2 - convert for usb to ttl because microcontroller does not understand our language so it convert it to the machine language

ICMP (IN-CIRCUIT SERIAL PROGRAMMER) - If want to program using another microcontroller then we connect cable with it

Microcontroller - micro-controller is a **single integrated circuit**, commonly with the following features: **central processing unit – ranging from small and simple 4-bit processors to complex 32-bit or 64-bit processors** **volatile memory (RAM)** for data storage **ROM, EPROM, EEPROM or Flash memory** for program

AT Mega 328 Microcontroller - it is the brain of the board

Crystal oscillator - it provide clock frequency to the board to perform the task

Dc jack - to give power to the board safe range is (6-12) v

Voltage regulator - since arduino need 5 volts to operate but by dc jack we can get 6-12 v so it convert it to 5 volts for proper functioning of the board

Comparator - its function is to compare two voltages when the board is connected to USB B type and DC jack then it pass the supply which is sufficient to run the board

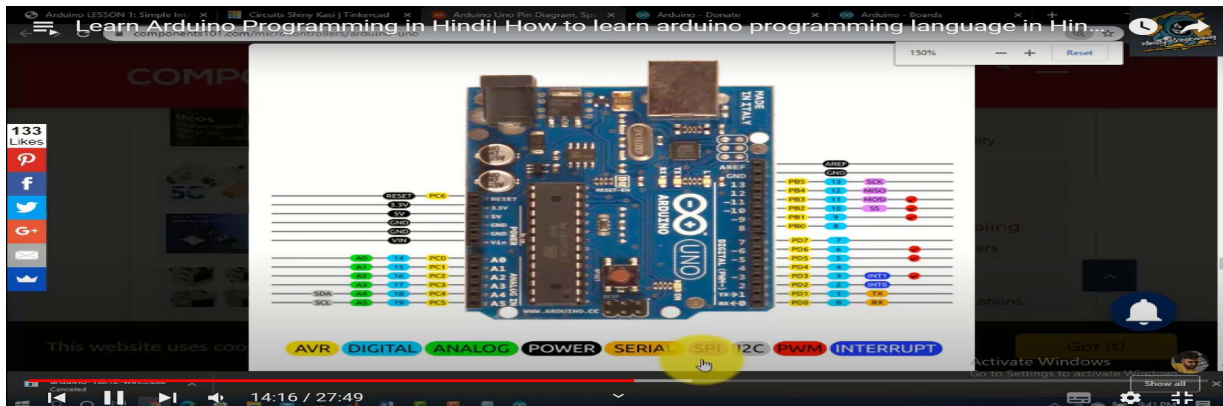
Capacitor - to remove repulse in the voltage

Protection diode - sometimes the polarity of the adaptor in the Dc jack may be different so it protect from the polarity damage cause due to it

We can take supply from external sources through pin 3 v and 5 v

Analog input and Output pins - used to take Analog input and output from the Board

IN-CIRCUIT SERIAL PROGRAMMER - it enable us to use multiple board OR MICRO CONTROLLER connect in series together at same time



->**PIN NO (11,10,9,3,5,7)** - These pins are known as Pulse width modulation in these pins we can varie quantities

The common use of PWM pins includes controlling LEDs and DC Motors. The PWM in LED controls the frequency of the light. It means the LED will be ON/OFF at a frequency detectable by our eyes. The PWM in DC Motors acts like a pulse train of a DC signal.

->**Pin no (14,15,16,17,18,19) (Analog pins)** - these pins take Analog input from the sensors . They take actual values from the sensor

->**Pin no(1-12)** - These are the output or the digital pins which show the output we receive it as 0 or 1

->**Pin (0and1)** - these pins have dual purpose these are digitals pins

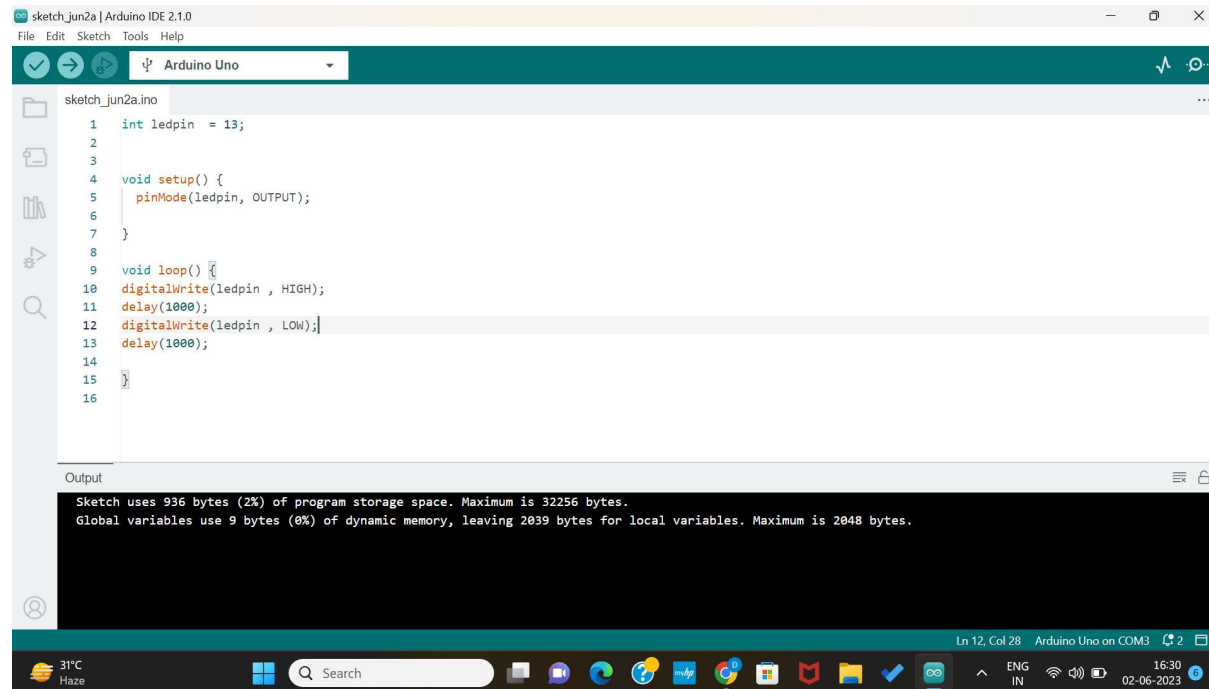
The Rx pin is used to receive data. The Tx pin is used to transmit data. When two devices are connected using a **UART, or universal asynchronous receiver-transmitter**

, the Rx pin of one device is connected to the Tx pin of the second device.

->**POWER pins** - these pins supply power to other device connected with the board . It consists of 3v and 5 v pins along with GND pins

PIN 13 - The special thing about this pin is that this pin is connected to the internal led which is connected to it

OUR FIRST ARDUINO PROGRAM TO BLINK THE INTERNAL LED OF THE BOARD



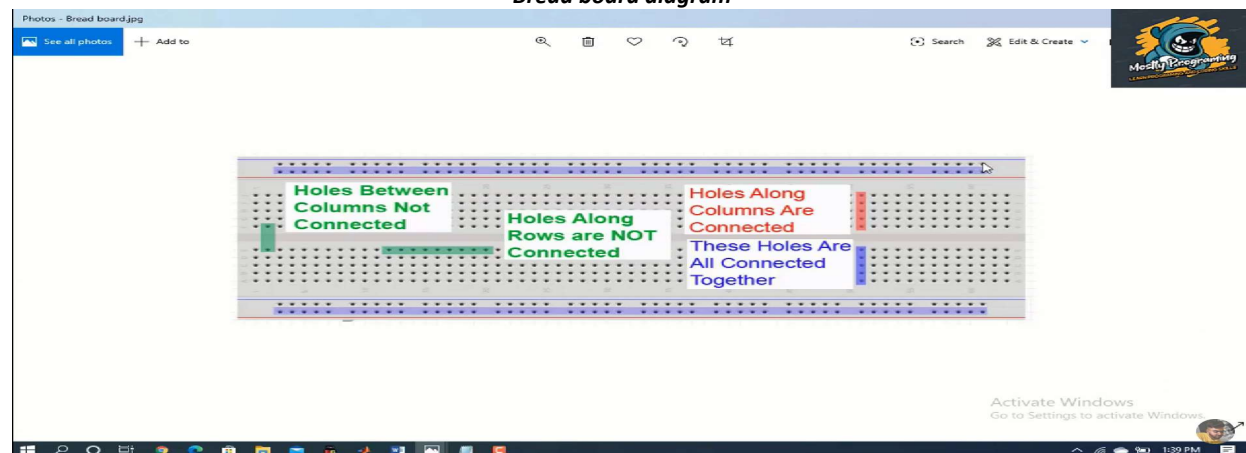
```
1 int ledpin = 13;
2
3
4 void setup() {
5   pinMode(ledpin, OUTPUT);
6 }
7
8
9 void loop() {
10  digitalWrite(ledpin, HIGH);
11  delay(1000);
12  digitalWrite(ledpin, LOW);
13  delay(1000);
14 }
15
16
```

Output

Sketch uses 936 bytes (2%) of program storage space. Maximum is 32256 bytes.
Global variables use 9 bytes (0%) of dynamic memory, leaving 2039 bytes for local variables. Maximum is 2048 bytes.

There are 2 sections while doing programming of the board , setup section and loop section ,as the name suggest in the setup section is use set the mode of the pin whether it is used for input or output Whereas in loop section the code is written which executed again and again The programming in arduino is case sensitive so it must be taken care of

Blinking external led using bread board Bread board diagram



Note - while blinking external led no resistance is required because the digital pins have internal pull up resistance Connections in Bread board is self explainable in upper part mention with blue part , in this connection is horizontally where as part mention in green is connected vertically if power is supplied in one hole same power will available horizontally in case of blue holes where as in case of green holes same is available in vertical holes

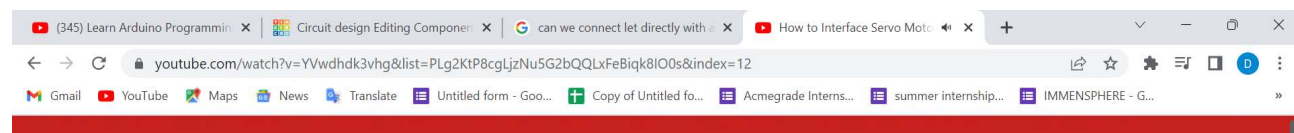
SERVO MOTORS INTERFACING (SG90) (IMP COMPONENT)

Servo motors are those motors which allow rotation of 0-180 degree this motors have gears in it , it is mainly have 3 parts to connect for coding part library must be included for servo motor `#include<servo.h>`

1-> Power

2->PWD signal (Pulse width modulation)

3-> Ground



youtube.com/watch?v=YVwdhdk3vhg&list=PLg2KtP8cgLjzNu5G2bQQxLxFeBiqk8IO0s&index=12

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Servo Motor Pinout (Wires)

Capacitor
KEMET's R76H radial film capacitor automotive-grade AEC-Q200 options.

Littelfuse 881F Series
Littelfuse's Nano2 881 protection from overload and short events.

TDK B43707/B4372
EPCOS TDK B43707/B4372 capacitors have high reliability.

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in coding part for the declaration part we use objects as we use in c++ of class Servo
Here is the sample code

tinkercad.com/things/23yG98GngXd-editing-components/editel?lessonid=EFU6PEHIXGFUR1J&projectid=OGK4Q7VL20FZRV9&coll...

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Text

1 (Arduino Uno R3)

```

1 #include<Servo.h>
2 int pwm = 3;
3 Servo amd;
4 void setup() {
5   amd.attach(3);
6 }
7 void loop() {
8   amd.write(0);
9   delay(1000);
10  amd.write(27);
11  delay(1000);
12  amd.write(180);
13  delay(1000);
14
15
16

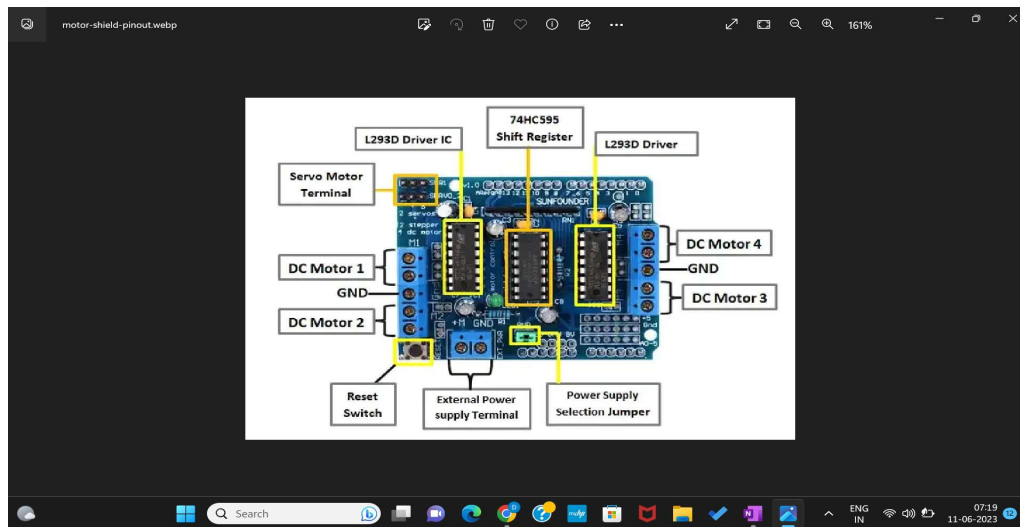
```

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MOTOR DRIVER SHEILD

We use motor driver when we need to operate multiple motor at a same time because arduino board is not able to generate enough power to operate all motors at the same time

We can operate 4 DC motors and two servo motors at a same time with using motor driver sheild , it is easily mount on the arduino board easily



To use its functions such as

1 -> `run()` ->> To give directions of rotation to the motor

2-> `setSpeed()` ->> To set the speed of motor

We have to include `<AFMotor.h>`

Note never give supply power from dc jack and and external power supply simultaneously as it may damage aur board

Whereas you can coonect board with usb and external power jack but make sure you remove the jumper first