

# Introduction to Arduino

## A hands on Workshop

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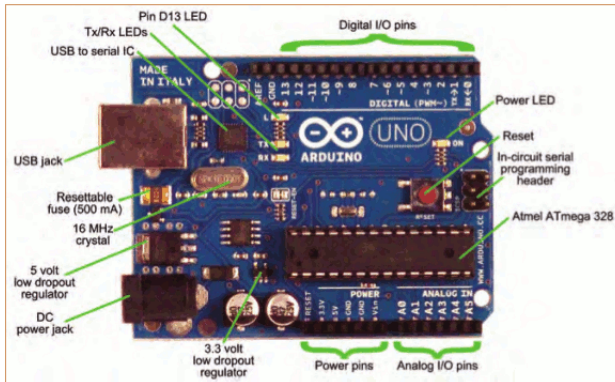
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# Overview of Arduino Platform

- Software Support
  - Windows
  - Linux
  - Mac
- Hardware Variants
  - Arduino Uno
  - Arduino Mega
  - Arduino Mini
  - Many more

# Let us meet Arduino Uno



# Getting started

## Get hardware

Get hold of an arduino from amazon, ebay or a local vendor

## Download software

Check out: <http://arduino.cc/en/Guide/HomePage>

## Play

Download & install the Arduino environment (IDE) (not needed in Linux )

Connect the board to your computer via the USB cable

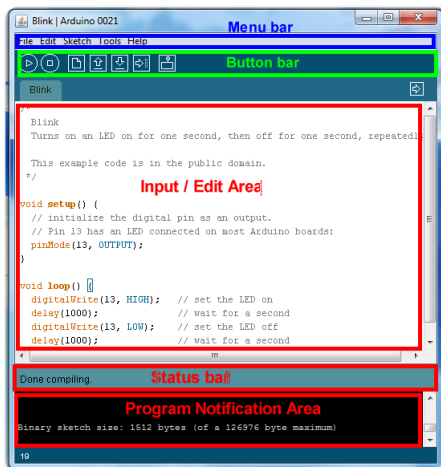
Launch the Arduino IDE

Select your board

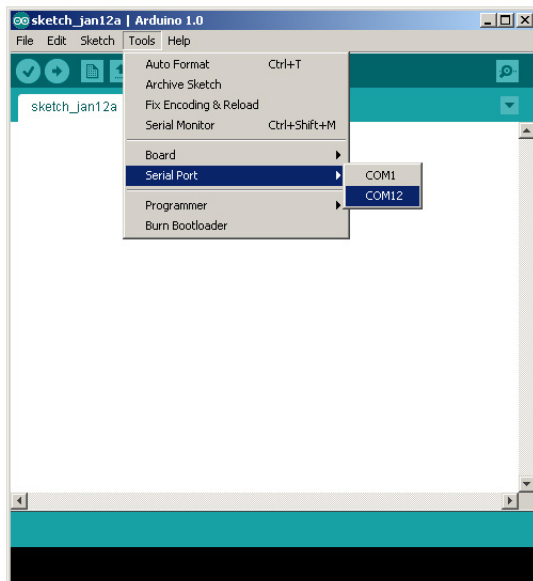
Select your serial port

Open the blink example

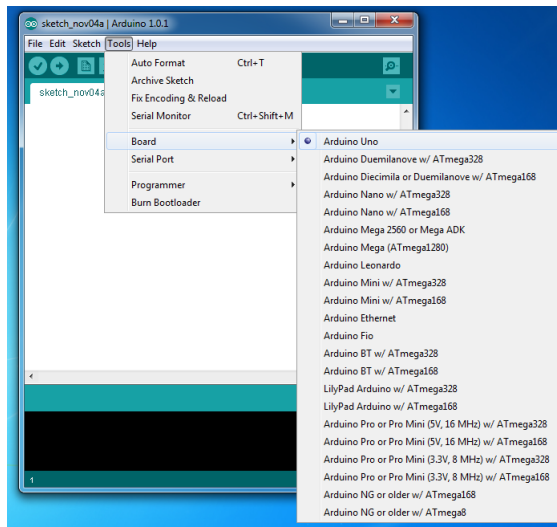
# Arduino IDE



# Selecting Serial Port



# Selecting Board



# Using Arduino

- Write your sketch
- Press Compile button (to check for errors)
- Press Upload button to program Arduino board with your sketch

Try it out with the “Blink” sketch!

Load “File/Sketchbook/Examples/Digital/Blink”

```
void setup() {  
  pinMode(ledPin, OUTPUT); // sets t  
}  
void loop() {  
  digitalWrite(ledPin, HIGH); // sets t  
  delay(1000); // waits  
  digitalWrite(ledPin, LOW); // sets t  
  delay(1000); // waits  
}
```



compile

Done compiling.



upload



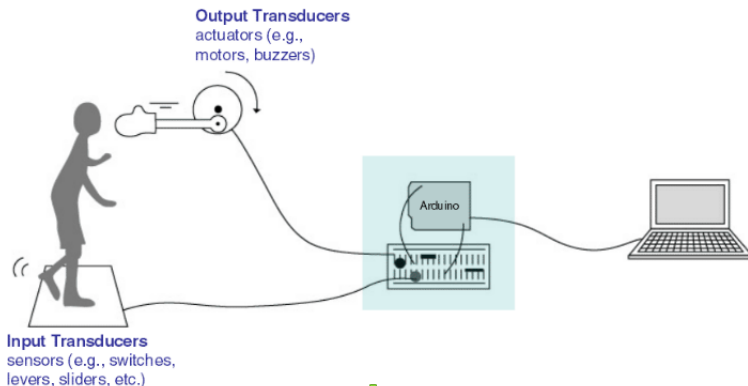
TX/RX flash



*blink blink*  
sketch runs



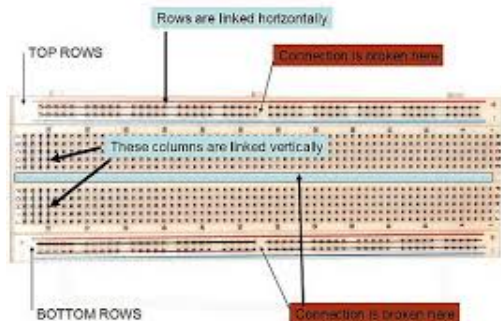
# What you can do with arduino



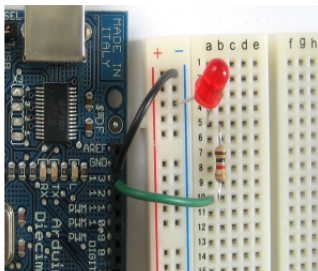
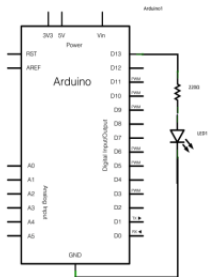
# Structure of typical sketch



# Know your prototyping board



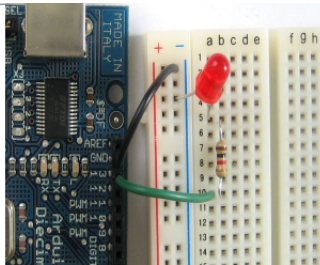
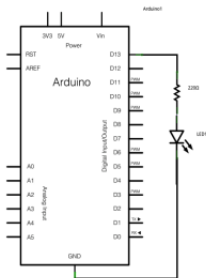
# Let us turn on an LED



```
void setup()
{
  pinMode(13, OUTPUT);
  digitalWrite(13, HIGH);
}

void loop()
{
}
```

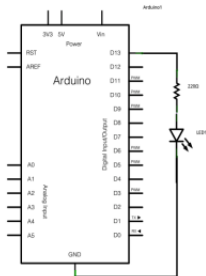
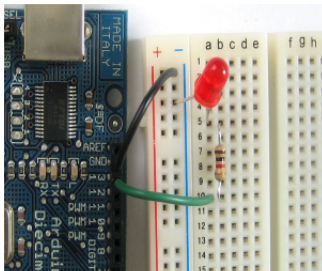
# Now turn it off



```
void setup()
{
  pinMode(13, OUTPUT);
  digitalWrite(13, LOW);
}

void loop()
{
}
```

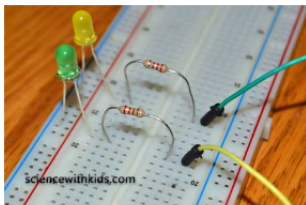
# Blink



```
void setup()
{
  pinMode(13, OUTPUT);
}

void loop()
{
  digitalWrite(13, HIGH);
  delay(1000);
  digitalWrite(13, LOW);
  delay(1000);
}
```

# Project 1 -Build a dancing light



```
void setup()
{
  pinMode(10, OUTPUT);
  pinMode(11, OUTPUT);
}

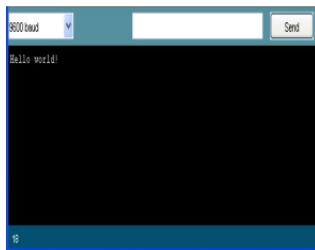
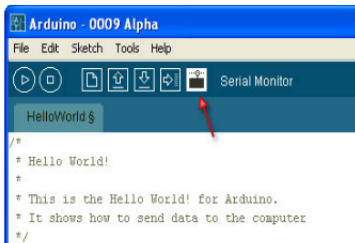
void loop()
{
  digitalWrite(10, HIGH);
  digitalWrite(11, HIGH);
  delay(1000);
  digitalWrite(10, LOW);
  digitalWrite(11, LOW);
  delay(1000);
}
```

# Serial Monitor

```
void setup()
{
  Serial.begin(9600);

  Serial.println("Hello world!");
}

void loop()
{
}
```



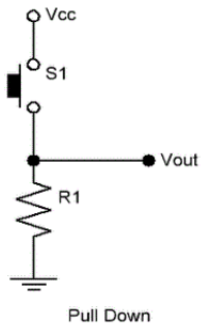


# Serial Monitor

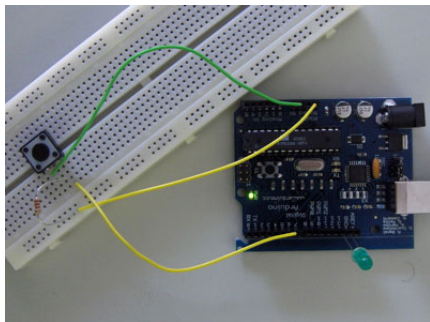
```
void setup()
{
  Serial.begin(9600);    // set up Serial library at 9600 bps
}

void loop()
{
  Serial.println("Hello world!"); // prints hello with ending line break
  delay(1000);
}
```

# Reading switch

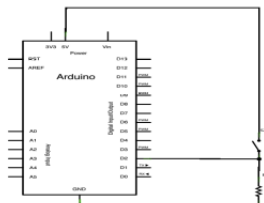
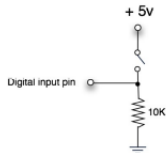


# Reading switch



# Reading switch

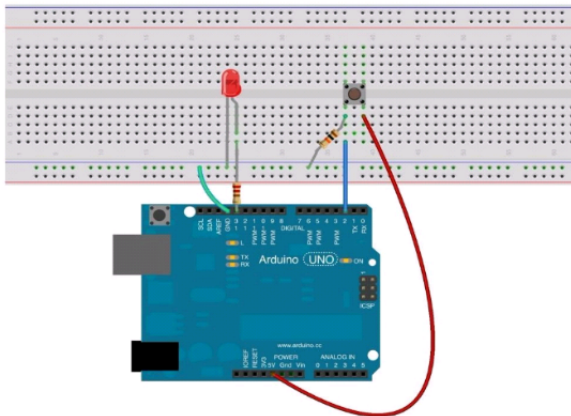
Switch connected to a digital input on the arduino



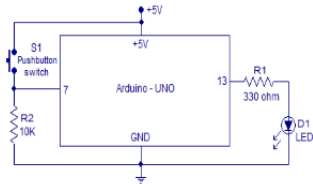
```
void setup()
{
  Serial.begin(9600);
  pinMode(2, INPUT);
}

void loop()
{
  Serial.print("Read switch input: ");
  Serial.println(digitalRead(2));
  delay(100);
}
```

# Switch with LED



# Switch with LED



Push button controlled LED

```
int val;  
  
void setup() {  
  pinMode(12, OUTPUT);  
  pinMode(2, INPUT);  
}  
  
void loop(){  
  val = digitalRead(2);  
  if (val == LOW) {  
    digitalWrite(12, LOW);  
  }  
  if (val == HIGH) {  
    digitalWrite(12, HIGH);  
  }  
}
```

# Digital IO vs Analog IO

## I/O Pins

### Digital I/O

Standard I/O levels

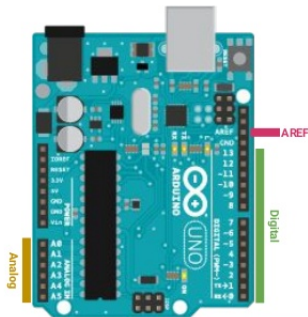
5 volts

### Analog Input

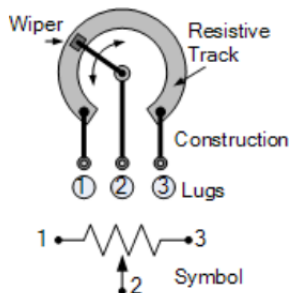
10-bit ADC

0-5 volts adjusted via AREF

Can be used as Digital I/O

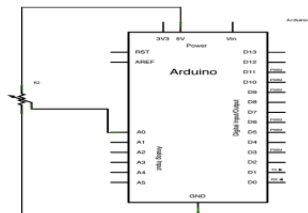


# Know your potentiometer





# Analog Read



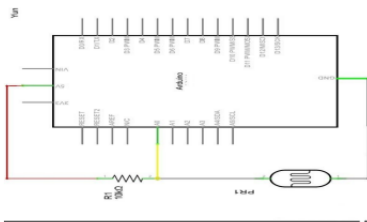
```
void setup()
{
  Serial.begin(9600);
}

void loop() {
  int sensorValue = analogRead(A0);
  Serial.println(sensorValue);
  delay(10); }
```

# Analog Read

```
void setup() {  
  
    Serial.begin(9600);  
}  
void loop() {  
  
    int sensorValue = analogRead(A0);  
  
    float voltage = sensorValue * (5.0 / 1023.0);  
  
    Serial.println(voltage);  
    delay(100);  
}
```

## Project 2 - Reading Light intensity



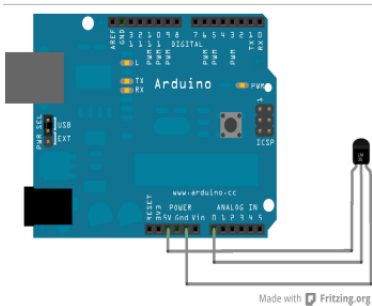
```
void setup()
{
  Serial.begin(9600);
}
void loop() {

  int lightLevel = analogRead(A0);

  float lux = lightLevel * (5.0 / 1024.0);

  Serial.println(lux);
}
```

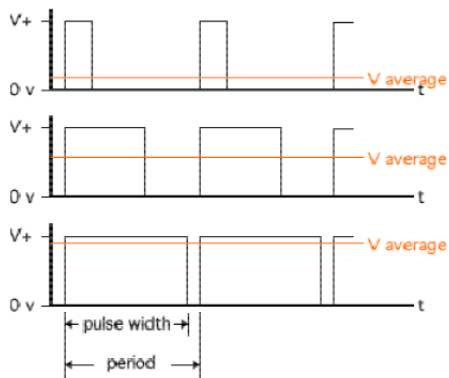
## Project 3 - Thermometer



## Temperature Measurement Using LM35

```
int val;  
  
void setup()  
{  
  Serial.begin(9600);  
}  
void loop()  
{  
  val = analogRead(A0);  
  float mv = ( val/1024.0)*5000;  
  float cel = mv/10;  
  //float farh = (cel*9)/5 + 32;  
  
  Serial.print("TEMPRATURE =");  
  Serial.print(cel);  
  Serial.print("°C");  
  Serial.println();  
  delay(1000);  
}
```

# PWM



# PWM-Example: Fading light

```
int led = 9;           // the pin that the LED is attached to
int brightness = 0;    // how bright the LED is
int fadeAmount = 5;    // how many points to fade the LED by

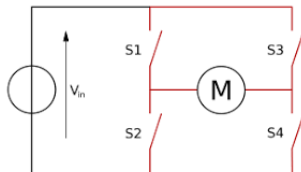
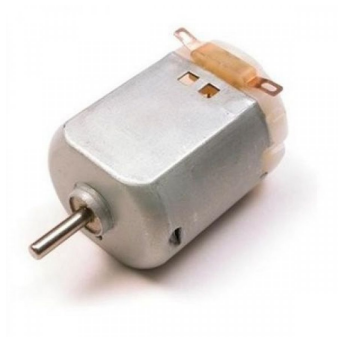
// the setup routine runs once when you press reset:
void setup() {
  // declare pin 9 to be an output:
  pinMode(led, OUTPUT);
}

// the loop routine runs over and over again forever:
void loop() {
  // set the brightness of pin 9:
  analogWrite(led, brightness);

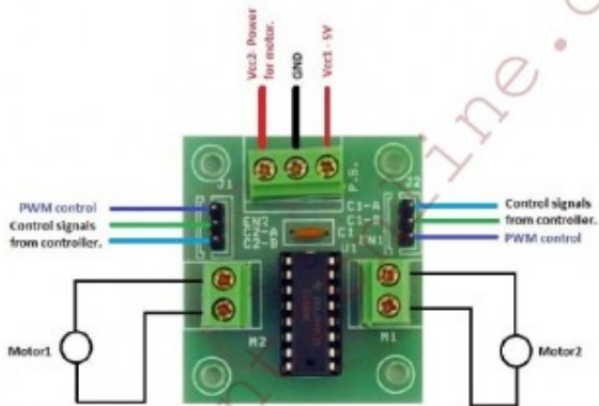
  // change the brightness for next time through the loop:
  brightness = brightness + fadeAmount;

  // reverse the direction of the fading at the ends of the fade:
  if (brightness == 0 || brightness == 255) {
    fadeAmount = -fadeAmount ;
  }
  // wait for 30 milliseconds to see the dimming effect
  delay(30);
}
```

# DC motor and H bridge

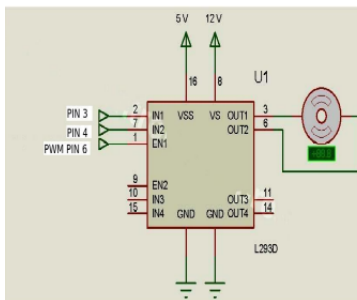


# H-Bridge board





# Motor Control



Interfacing DC Motor with Arduino

```
void setup() {  
    pinMode(3, OUTPUT);  
    pinMode(4, OUTPUT);  
}  
  
void loop() {  
  
    digitalWrite(3, HIGH);  
    digitalWrite(4, LOW);  
  
    delay(5000);  
    // stop  
    digitalWrite(3, LOW);  
    digitalWrite(4, LOW);  
    // change direction  
    delay(5000);  
    digitalWrite(3, LOW);  
    digitalWrite(4, HIGH);  
  
    delay(5000);  
}
```

# The Road ahead

- Interfacing LCD displays
- Interfacing sensors like ultra sound PIR
- Ethernet and bluetooth

# Other IOT platforms

- Raspberry PI
- ESP 8266

# MQTT Protocol

- Installation
- Programming

# Cloud and Big data

# Thank you