Arduino : Introduction & Programming

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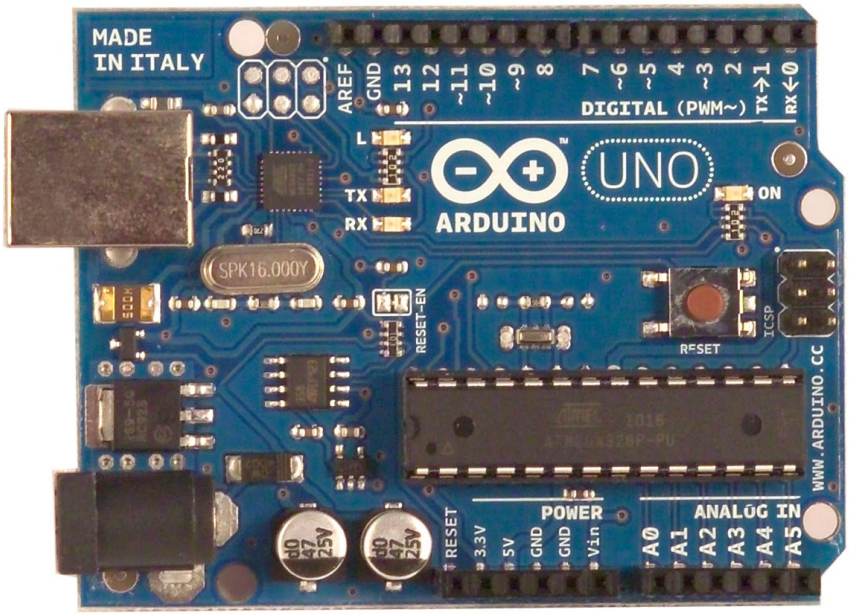
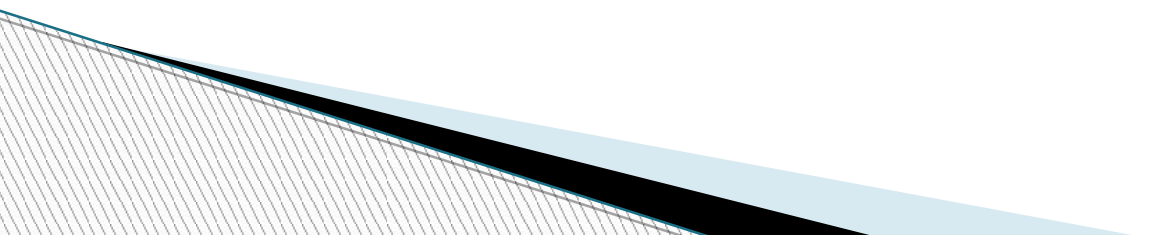
What is an Arduino ?

- **Open Source** electronic prototyping **platform** based on flexible **easy to use** hardware and software.



Uses of Arduino

Getting started with Programming



Bare minimum code

```
void setup() {
    // put your setup code here, to run once:
}

void loop() {
    // put your main code here, to run
  repeatedly:
}
```

Bare minimum code

- setup : It is called only when the Arduino is powered on or reset. It is used to initialize variables and pin modes

- loop : The loop functions runs continuously till the device is powered off. The main logic of the code goes here. Similar to while (1) for micro-controller programming.

PinMode

- A pin on arduino can be set as input or output by using pinMode function.
- pinMode(13, OUTPUT); // sets pin 13 as output pin
- pinMode(13, INPUT); // sets pin 13 as input pin

Reading/writing digital values

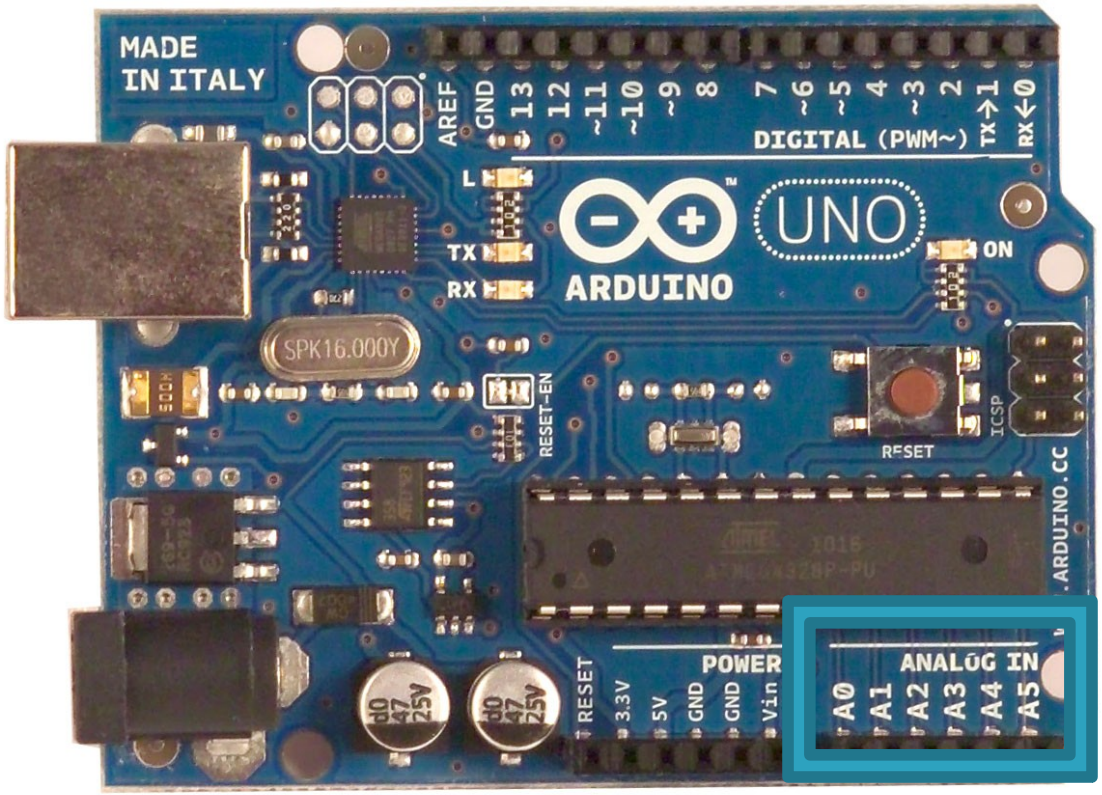
- digitalWrite(13, LOW); // Makes the output voltage on pin 13 , 0V
- digitalWrite(13, HIGH); // Makes the output voltage on pin 13 , 5V
- int buttonState = digitalRead(2); // reads the value of pin 2 in buttonState

Analog to Digital Coversion

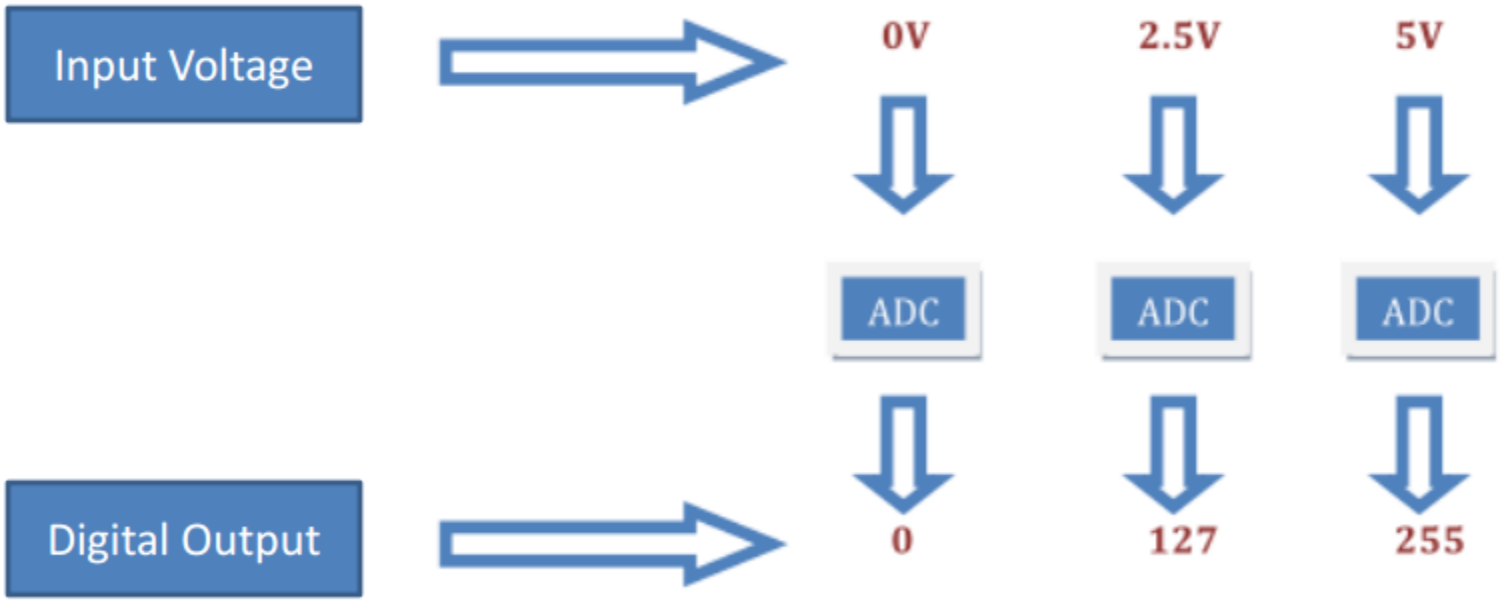
- What is analog ?
- It is continuous range of voltage values (not just 0 or 5V)

- Why convert to digital ?
- Because our microcontroller only understands digital.

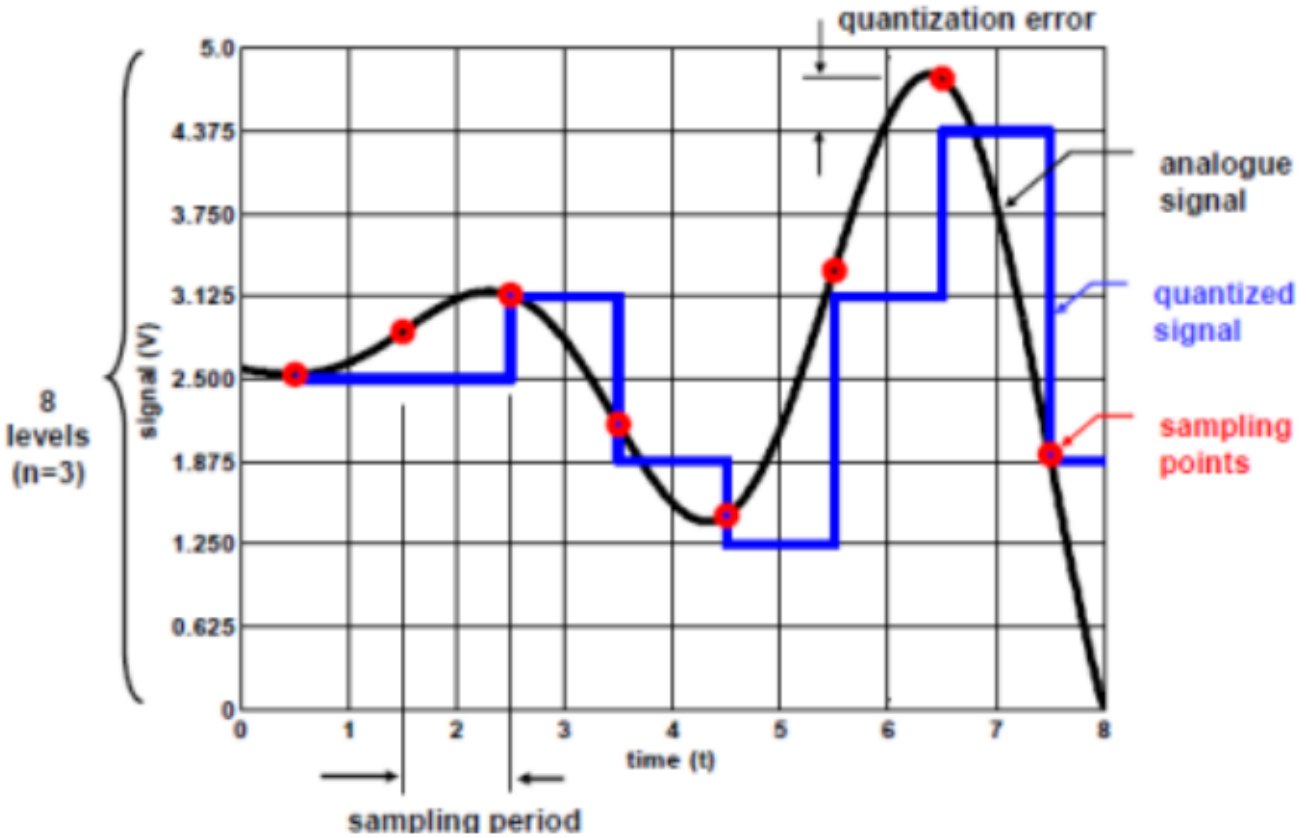
ADC in Arduino Uno



Converting Analog Value to Digital



Quantanization the signal



ADC in Arduino

- The Arduino Uno board contains 6 pins for ADC
- 10-bit analog to digital converter
- This means that it will map input voltages between 0 and 5 volts into integer values between 0 and 1023

Reading/Writing Analog Values

- analogRead(A0); // used to read the analog value from the pin A0

- analogWrite(2,128);

ADC Example

```
// These constants won't change.  They're used to give names to the pins used:
const int analogInPin = A0;  // Analog input pin that the potentiometer is attached to
const int analogOutPin = 9; // Analog output pin that the LED is attached to

int sensorValue = 0;        // value read from the pot
int outputValue = 0;        // value output to the PWM (analog out)

void setup() {
  // initialize serial communications at 9600 bps:
  Serial.begin(9600);
}

void loop() {
  // read the analog in value:
  sensorValue = analogRead(analogInPin);
  // map it to the range of the analog out:
  outputValue = map(sensorValue, 0, 1023, 0, 255);
  // change the analog out value:
  analogWrite(analogOutPin, outputValue);

  // print the results to the serial monitor:
  Serial.print("sensor = " );
  Serial.print(sensorValue);
  Serial.print("\t output = ");
  Serial.println(outputValue);

  // wait 2 milliseconds before the next loop
  // for the analog-to-digital converter to settle
  // after the last reading:
  delay(2);
}
```