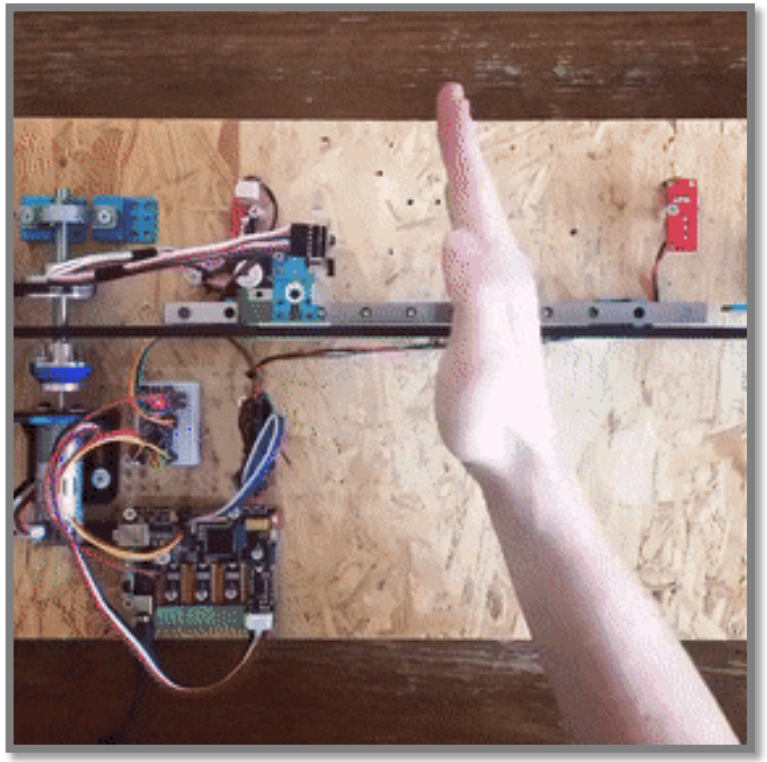
Virtual Instrumentation

Sensors and Arduino board



https://gfycat.com/gifs/tag/arduino

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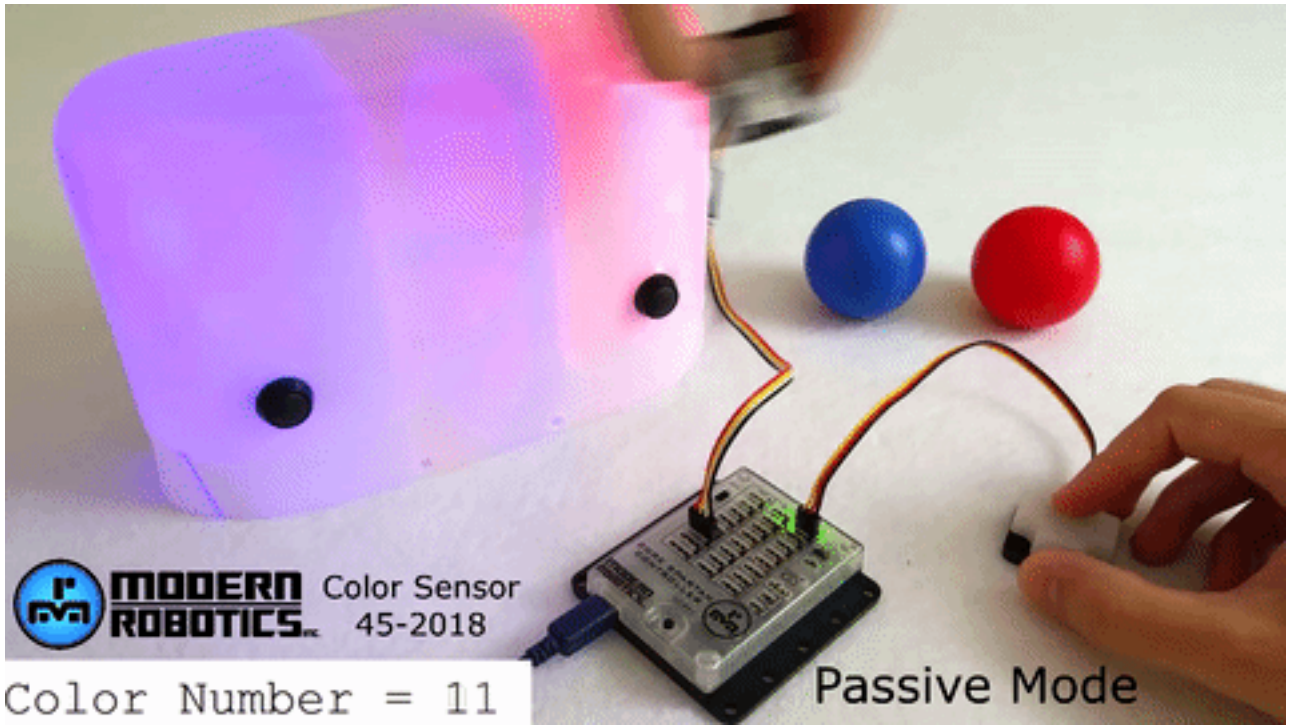
Scope

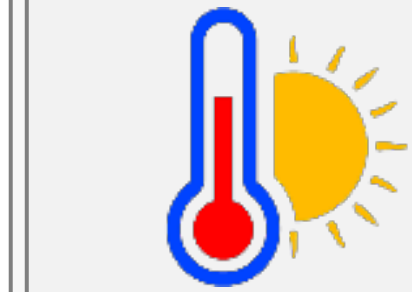
- *Sensors definition*
- *Types of sensors*

- *Arduino board*
- *Basic concepts and functions*

Sensors

The sensor is a converter, its main purpose is to obtain the information of a physical or chemical stimulus and convert it into an **electrical** signal.





Sensor

- The **Arduino board <u>only</u> sends and receives information** through its ports and processes it if necessary.
- The **data stored in the Arduino comes from** the software sent from a computer through a USB port or from different **accessories/complements added to the board** to increase its <u>"functionality"</u>.
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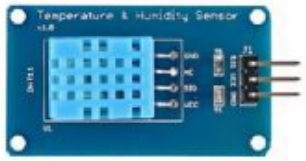
- Sensors are useful complements widely used for Arduino board project development to obtain information from the environment or external elements.

CCS811 Digital Gas sensor

Touch sensor

Hall Magnetics

Light Dependent Resistor(LDR)



Humidity sensor

Moisture sensor

Top 10 Sensors + Projects

eTechnophiles

The variety of sensors in the market depends mainly on the type of information we want to collect.

Rain sensor

Accelerometer sensor

IR sensor Obstacle avoidance

Ultrasonic sensor

Pyroelectric Infrared sensor (PIR)

The most common sensors measure the following variables

Variable	Functionality
Temperature	Measure the temperature difference between two objects (relative) or a specific point on the absolute temperature scale.
Light	It detects electromagnetic radiation in a range of wave frequencies emitted by the light.
Flow	It measures flow rates, the amount of fluid that passes through a medium in a given time.
Pressure	It measures the force that is continuously exerted on an object (solid, liquid, or gas).
Humidity	measures the humidity in its environment (concentration of water) and converts its findings into a corresponding eléctrica.
Sound	Waves of mechanical pressure. It detects sound and acoustic waves formed by changes in the air pressure of sound.
Force	Tension and compression exerted by one object on another (the sensor). They can be qualitative, measure force, or quantitative, which indicates whether or not the magnitude of the pressure exceeds a predetermined threshold (ON / OFF).
Velocity	The speed that an object moves relative to a reference point (the sensor itself). The position change can be in a straight line (linear speed) or rotating (angular velocity).
Acceleration	It measures how fast the speed of an object changes.

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Arduino board

TX and RX LEDs: Communication between your computer and the Arduino board.

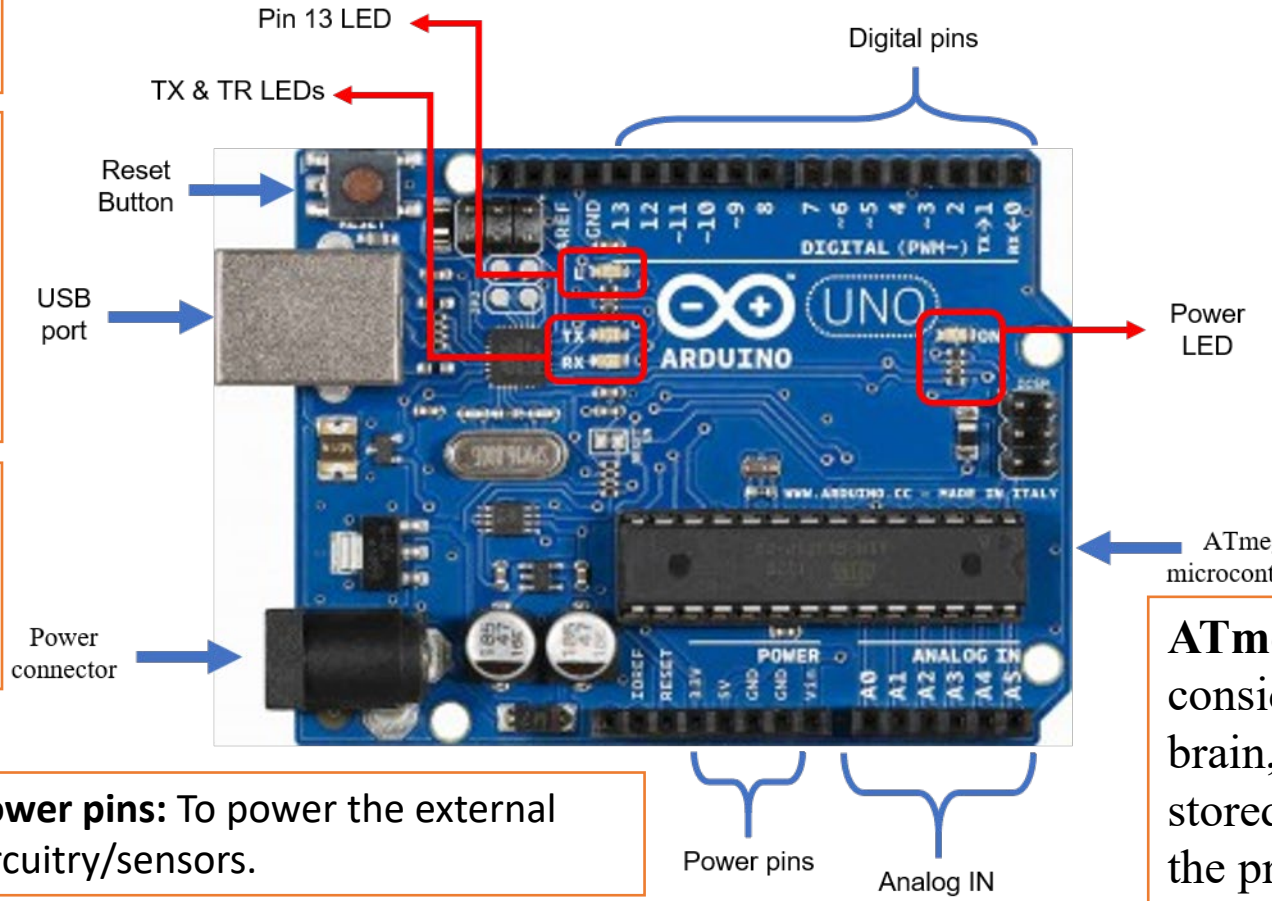
Pin 13 LED: It is the only actuator built into the Arduino UNO.

Digital Pins: This set of pins can be configured for data input or output with the following functions: *digitalRead (), digitalWrite (), analogWrite ()*. The analog function is only used for PWM pins.

Reset button: Restarts the ATmega microcontroller.

USB port: It is the power supply of the Arduino. It is also how the code is loaded, and communication is established with the software (Arduino Sketch), with the *Serial.println ()* function, etc).

Power connector: It is the power supply of the Arduino when it is not connected to the USB port. It accepts voltages between 7-12V.



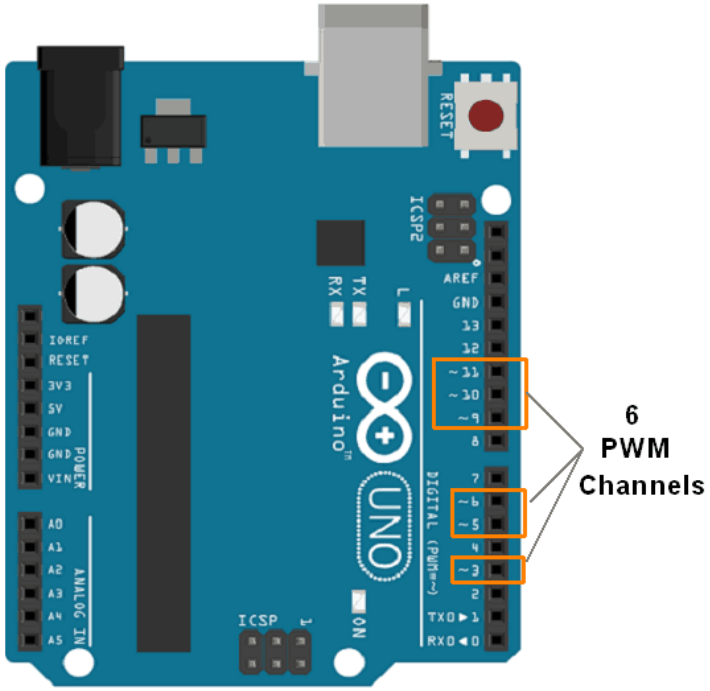
Power LED: Indicates that the Arduino is being powered. Useful for debugging.

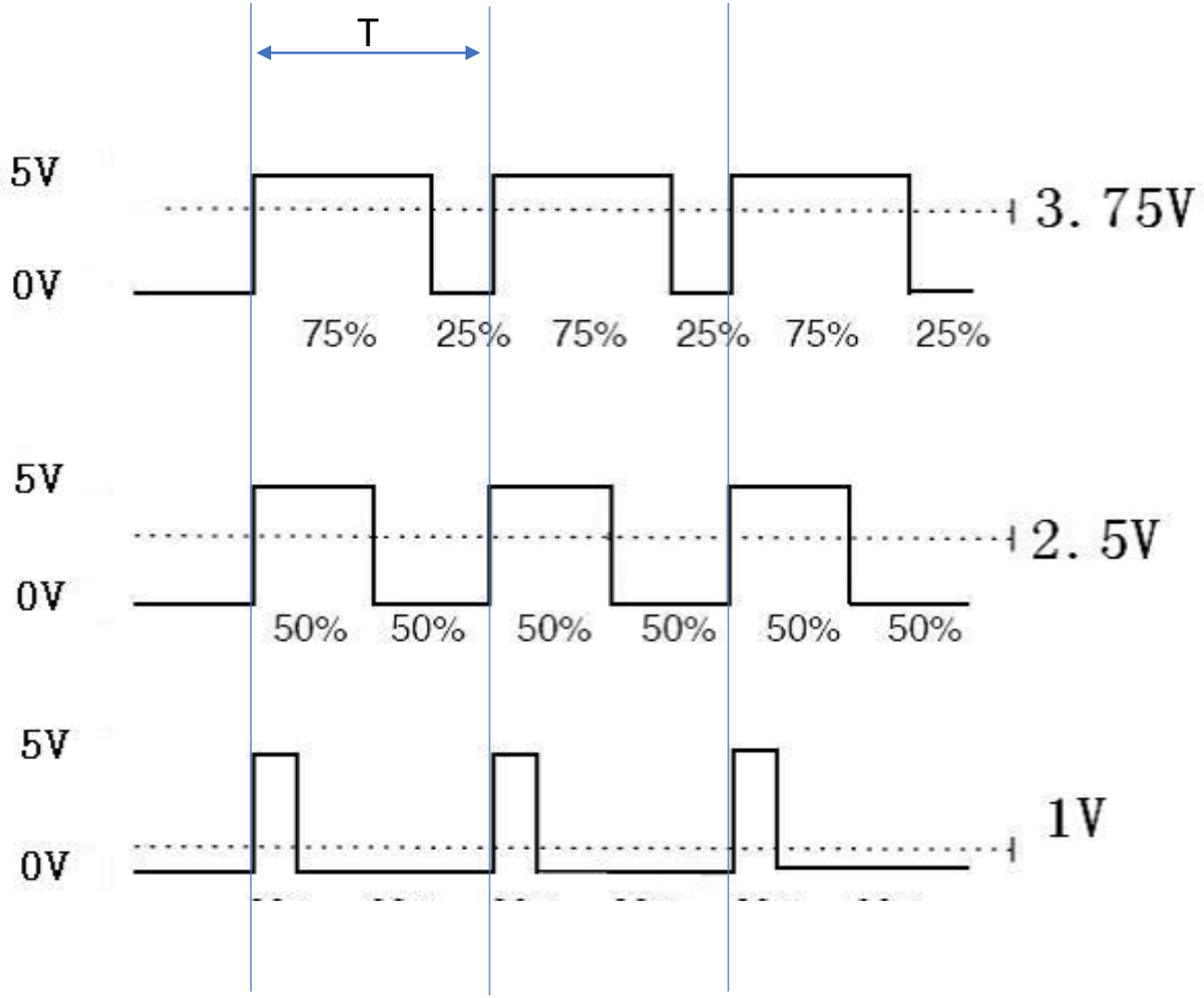
Power pins: To power the external circuitry/sensors.

ATmega microcontroller: It is considered the Arduino UNO's brain, where the information is stored and processed following the previously entered code's indications.

Analog Inputs: These are the **inputs** for analog signals and are configured using the *analogRead ()* function. The *analogRead ()* function uses a range of 0-1023 to use 0-5Volts.

PWM pins





0-5 volts

Digital inputs/outputs:
0 - 255 (8 bits)

Analog inputs:
0 - 1023 (10 bits)