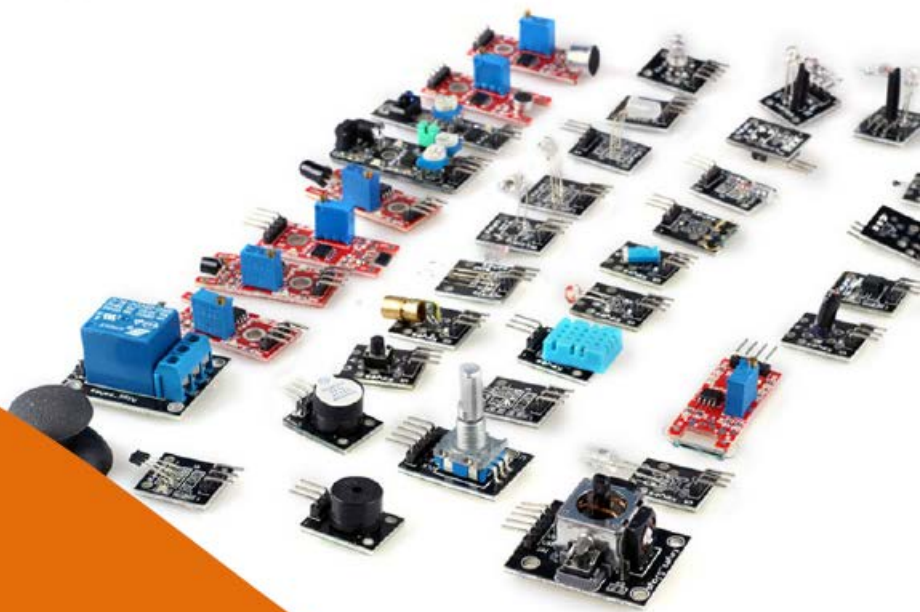


PART

4

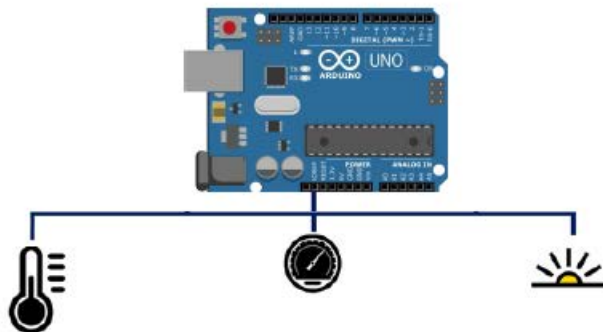
**Sensors
and Actuators**



Sensors and Actuators

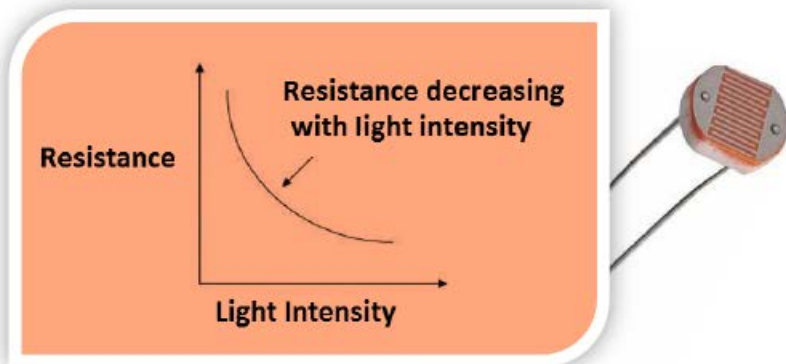
P4-1 Sensors for STEAM

An electronic sensor detects and measures a physical phenomenon, such as temperature, pressure, force, or acceleration, and provides a corresponding output, usually in the form of an electronic signal.



P4-1.1 LDR (Light Dependent Resistor) or Photoresistor

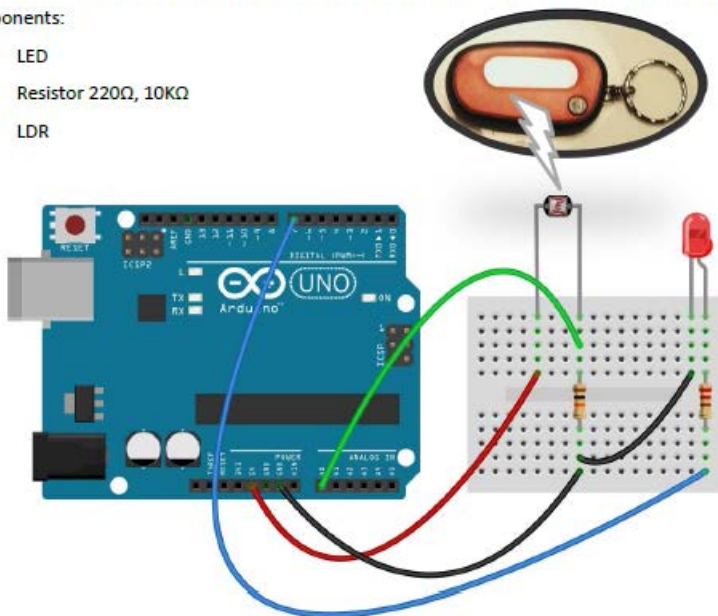
An LDR is a type of variable resistor which changes its resistance according to the intensity of the light falling on its surface. Hence it can be considered a sensor or light sensor.



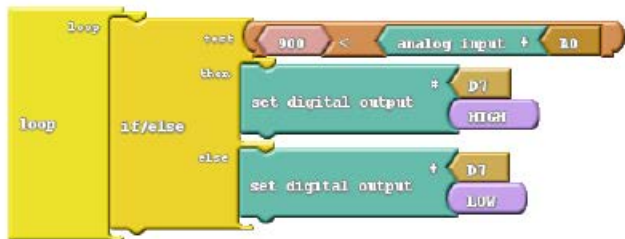
Activity 4.1: Turn On and Off LED by LDR

In this activity we will study the operation of the LDR sensor. We will use the following components:

- LED
- Resistor 220 Ω , 10K Ω
- LDR

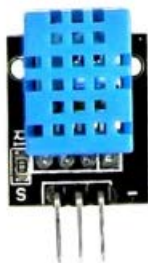


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P4-1.2 Temp and Humidity

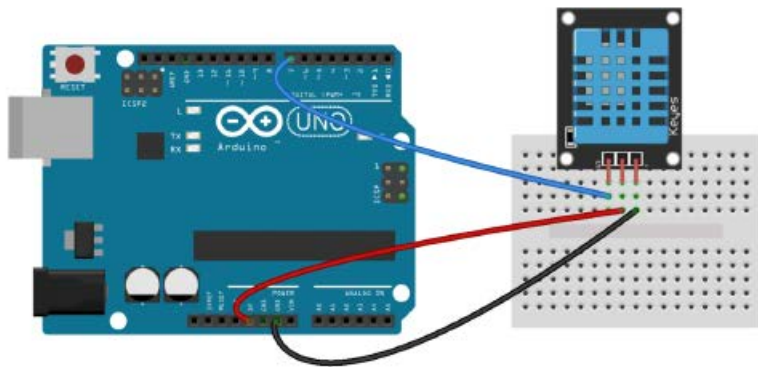
DHT11 digital temperature and humidity sensor is a composite Sensor contains a calibrated digital signal output of the temperature and humidity. Only three pins are available for use, that is, VCC, GND, and DATA. Temperature range : 0 - 50°C (+/-2°C), Rel. humidity: 20-95% (+/-5%), Supply voltage: 3 to 5.5V.



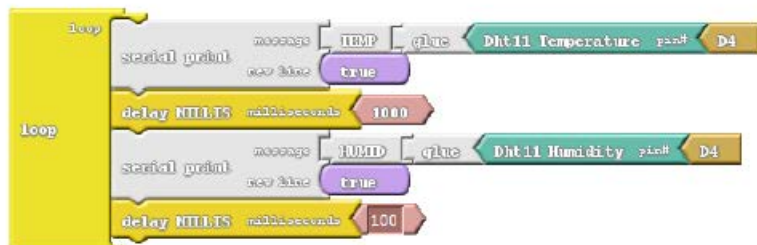
Activity P4.2: Measure temperature and humidity

In this program we will study the operation of the dht11 sensor. We programming to read the values of temperature and humidity send in the ArduBlock serial screen. In this example we will use the following components:

- DHT11



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P4-1.3 Ultrasonic Sensor HC-SR04

The HC-SR04 ultrasonic sensor uses sonar to determine distance to an object like bats do. The ultrasonic sensor uses sonar to determine the distance to an object.

1. The transmitter (trig pin) sends a signal: a high-frequency sound
2. When the signal finds an object, it is reflected
3. The transmitter (echo pin) receives it.

Transmitter

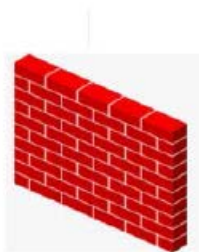


Receiver

Original wave

Reflected wave

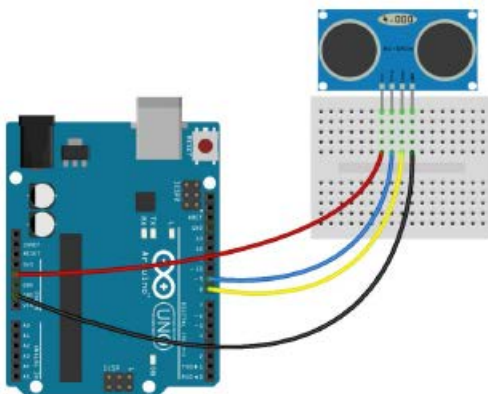
Distance



Activity P4.3: Measure distance

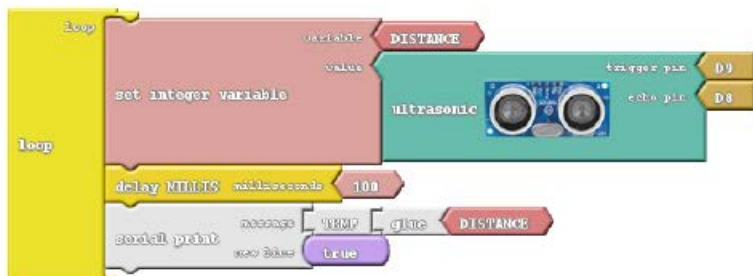
With ultrasonic sensors, we can locate objects in and measure distance from them in applications such as locating an obstacle from a robotic vehicle. In this example we will use the following components:

- HC-SR 04 Sensor (Ultrasonic Sensor)



Once you've upload to Arduino, click the Serial Screen button to see your measurements by placing a barrier opposite your sensor!

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P4-1.4 LCD Screen

The LCD Screen used for display message to users.



P4-2 Actuators for STEAM

An actuator is a component of a machine that is responsible for moving and controlling a mechanism or system. An actuator requires a control signal and a source of energy.

P4-2.1 Servo motor

Servo motors are great devices that can turn to a specified position. Servos have integrated gears and a shaft that can be precisely controlled. Standard servos allow the shaft to be positioned at various angles, usually between 0 and 180 degrees.



A servomotor system includes the following parts:

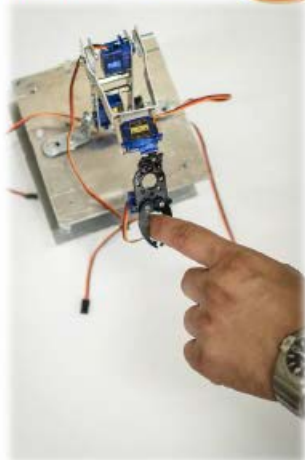
- DC motor,
- Mechanical speed system (gearbox),
- control unit,
- linear resistance sensor (potentiometer).

A servomotor carries the following cables:

Black: Ground.

Red: Power supply Vcc.

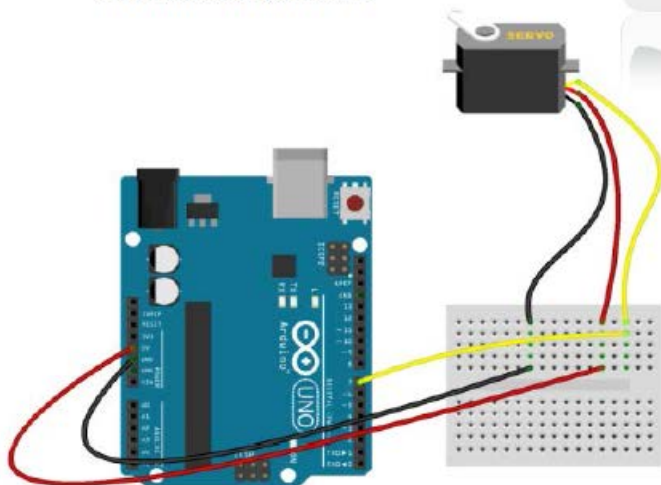
Orange or Yellow: Control signal PWM.



Activity P4.6: Hi!

In this example we will operate a servomotor. In the program the servomotor will move from 45° to 135° . Among his movements he will wait for 0.5 sec. In this example we will use the following components:

- Servomotor SG90 9g Micro Servo



fritzing



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