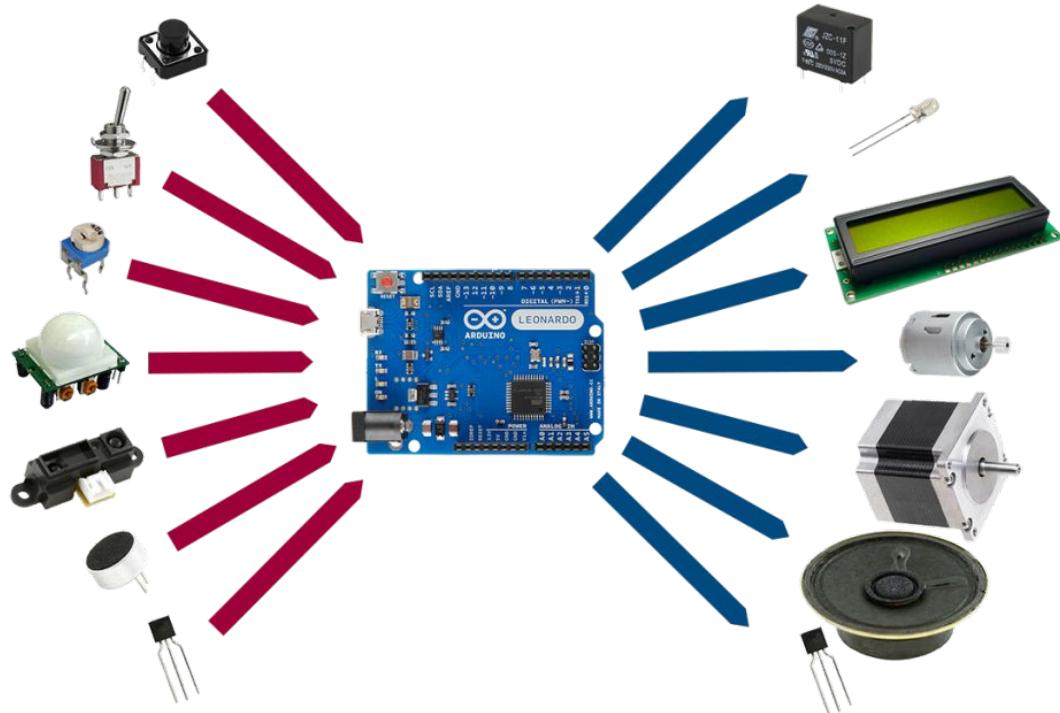


# Electronics **Outputs**

# Outputs

Outputs is a broad term for any load that we connect and control using the code.

This can create sound, motion, light, colour, display information etc.

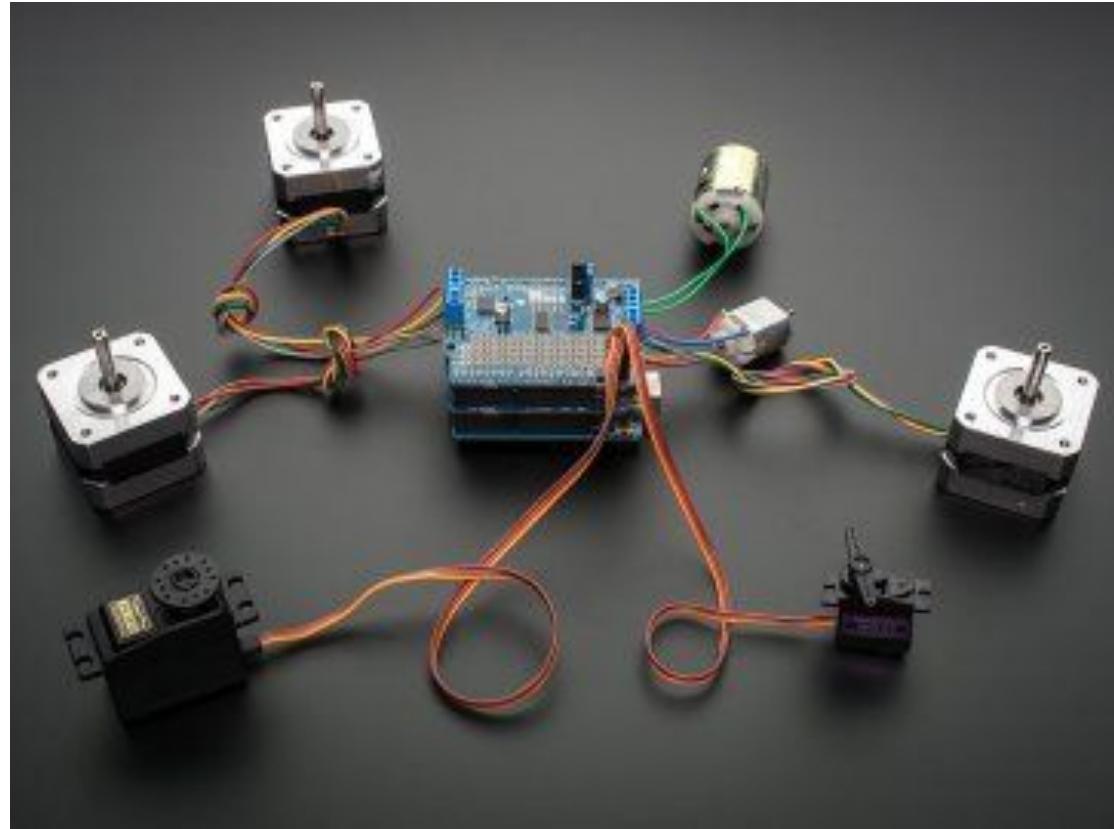


## Outputs >> Motors

Motors are one of the most common outputs used in Arduino projects.

We can use motors to create a range of different movements.

At times we'll want to dictate the speed of the motor, or its specific position.



## Outputs >> Motors >> Servo

Servo motors are light and simple motors that can be powered directly through the arduino.

They can be used to set to a specific angle or to a specific speed.

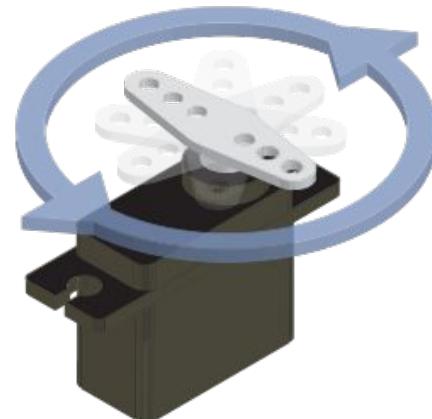
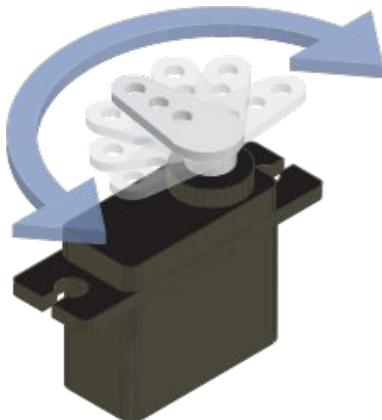


## Outputs >> Motors >> Servo >> Continuous vs regular

Servo motors can be split into two groups:  
Regular and continuous

Regular servo motors have a 180 angle, and we can set the motor to a specific angle within the range (somewhere between 0 and 180).

Continuous servos have full rotation capabilities, and we can set their speed and direction of rotation using the same range of values (90 being still, 0 full speed rotation to one direction and 180 full speed rotation to the next).

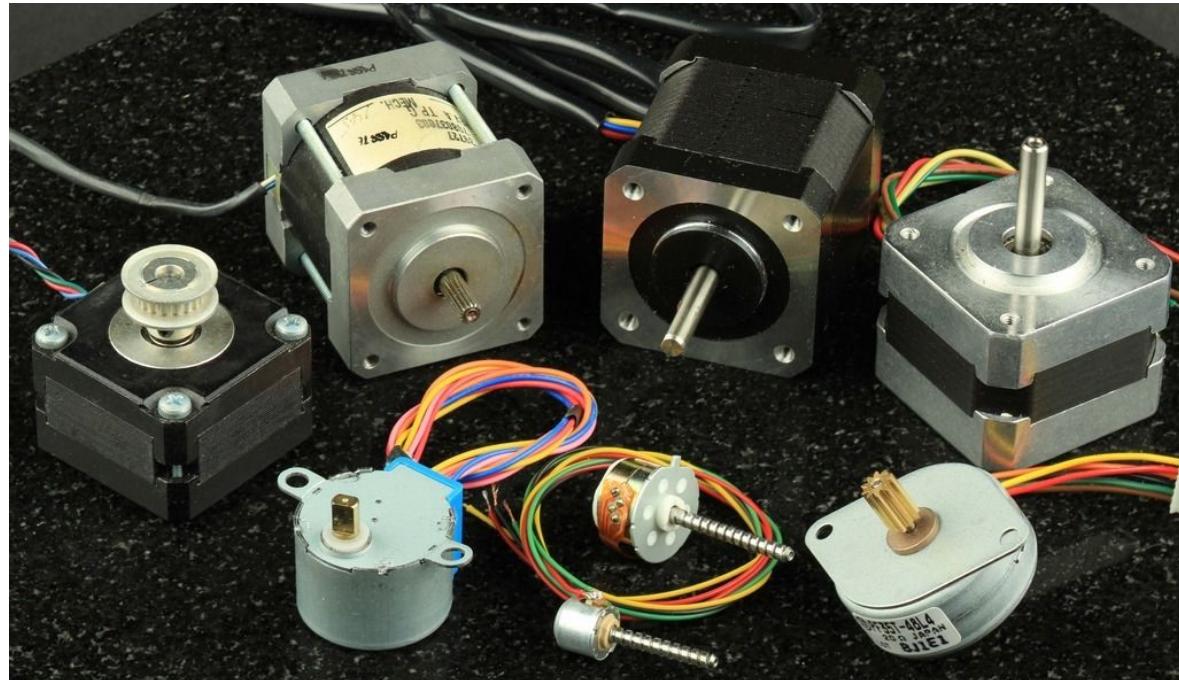


## Outputs >> Motors >> Stepper

Stepper motors are controlled using the motor's steps. Which is a predetermined angle within the circle= step.

Because of their precise positioning, they are often used for CNC and 3D printers.

Stepper motors require drivers, which are used to supply the motor with the correct electricity. For stronger motors this will be above the 5V that the arduino can supply.



## Outputs >> Motors >> Movement

Rotary to linear:

<https://www.youtube.com/watch?v=ve9M8d6KfdI>

[https://www.youtube.com/playlist?list=PL\\_6VEfozyAFFN1L6HgAeYErpjqd4n8VXr](https://www.youtube.com/playlist?list=PL_6VEfozyAFFN1L6HgAeYErpjqd4n8VXr)

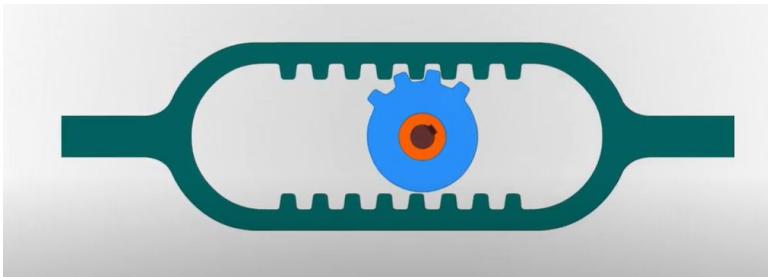
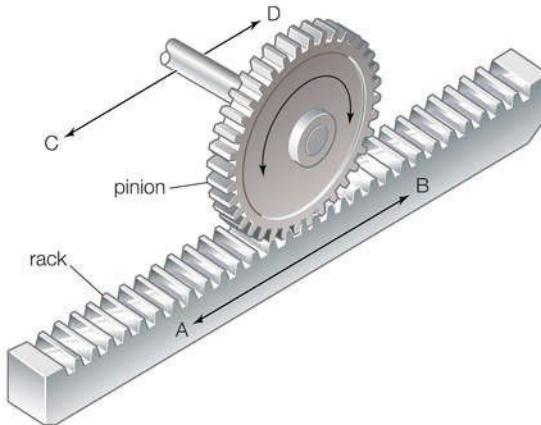
Rotary to reciprocating:

<https://www.youtube.com/watch?v=0c0yB5zF7sg>

Thingiverse ideas:

<https://www.thingiverse.com/thing:3170748>

<https://www.thingiverse.com/thing:715525>



## Outputs >> Buzzer

A piezo buzzer has a ceramic disk that can create different tones depending on the electrical current output to it. It is connected using a digital pin, and it doesn't need an PWM pin.

In order to use it, we use the function:

**tone**(pin, frequency, duration)

It can typically generate a tone between 2 to 6 kHz.



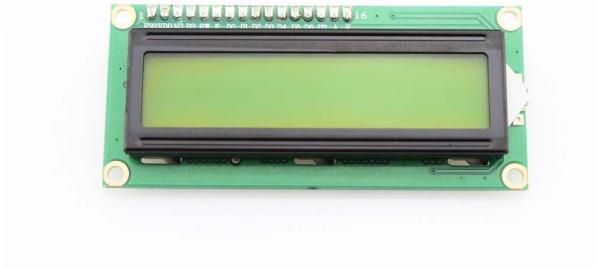
## Outputs >> Buzzer

The frequency in Hz can be used inside the note() function to play specific notes.

1st Octave	2nd Octave	3rd Octave	4th Octave
C1 32.703 Hz	C1# 34.648 Hz		
D1 36.708 Hz	D1# 38.391 Hz		
E1 41.203 Hz			
F1 43.654 Hz	F1# 46.249 Hz		
G1 48.99 Hz	G1# 51.913 Hz		
A1 55 Hz	A1# 58.27 Hz		
B1 61.735 Hz			
C2 65.406 Hz	C2# 69.296 Hz		
D2 73.416 Hz	D2# 77.782 Hz		
E2 82.407 Hz			
F2 87.307 Hz	F2# 92.499 Hz		
G2 97.999 Hz	G2# 103.83 Hz		
A2 110 Hz	A2# 116.54 Hz		
B2 123.47 Hz			
C3 130.81 Hz	C3# 138.59 Hz		
D3 146.83 Hz	D3# 155.56 Hz		
E3 164.81 Hz			
F3 174.61 Hz	F3# 185 Hz		
G3 196 Hz	G3# 207.65 Hz		
A3 220 Hz	A3# 233.08 Hz		
B3 246.94 Hz			
C7 2093 Hz	C7# 2217.5 Hz		
D7 2349.3 Hz	D7# 2489 Hz		
E7 2637 Hz			
F7 2793.8 Hz	F7# 2960 Hz		
G7 3136 Hz	G7# 3322.4 Hz		
A7 3520 Hz	A7# 3729.3 Hz		
B7 3951.1 Hz			
		F4 349.23 Hz	F4# 369.99 Hz
		G4 392 Hz	G4# 415.3 Hz
		A4 440 Hz	A4# 466.16 Hz
		B4 493.88 Hz	

## Sensors >> Display

Different modules can be used to display information or even graphics to a user.

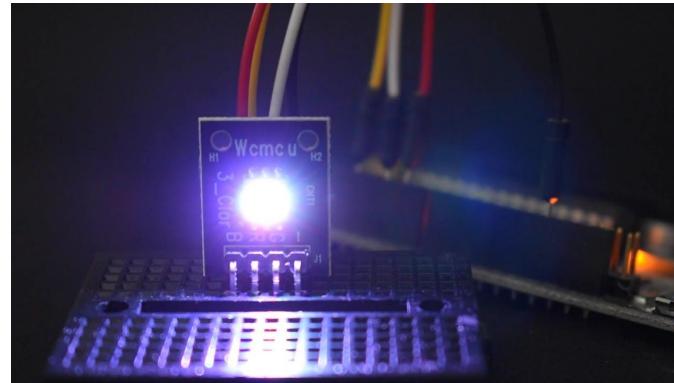


## Sensors >> RGB

An RGB LED light can be used to produce a colour from the RGB scale.

This allows greater flexibility and control of the design.

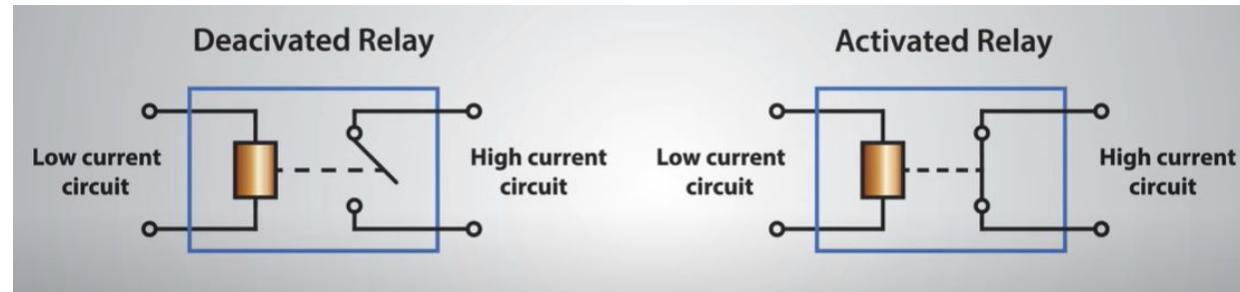
The shade is controlled by outputting a value to three different pins, each attached to one of the Red Green and Blue pins.



## Sensors >> Relay

Relays are used to control higher voltage loads using a lower voltage. The higher voltage is activated and deactivated using a switch controlled by the lower voltage.

NO and NC on the relay signify if the circuit should be normally open or normally closed. We'll choose how through which to connect depending on the use.



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