

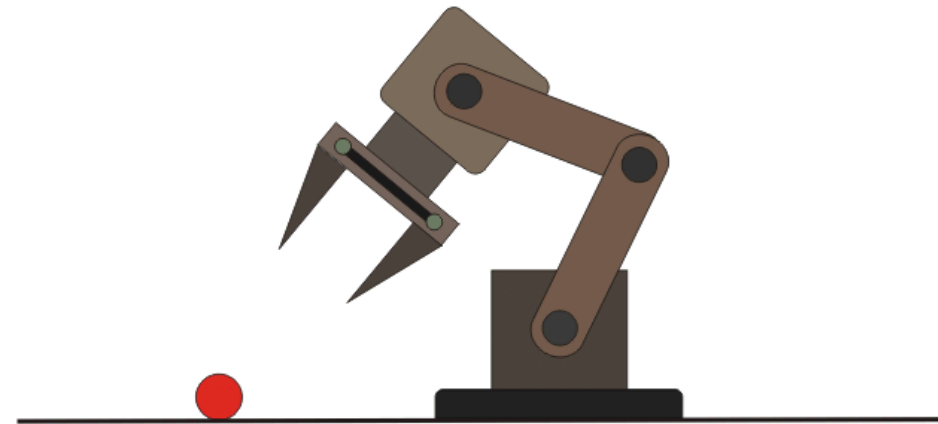
Servo Motors

Controlling servo motor using PWM

A servo motor is a rotary actuator or motor that allows for a precise control in terms of **angular position, acceleration and velocity**, capabilities that a regular motor does not have. It makes use of a regular motor and pairs it with a sensor for position feedback. The controller is the most sophisticated part of the servo motor, as it is specifically designed for the purpose.

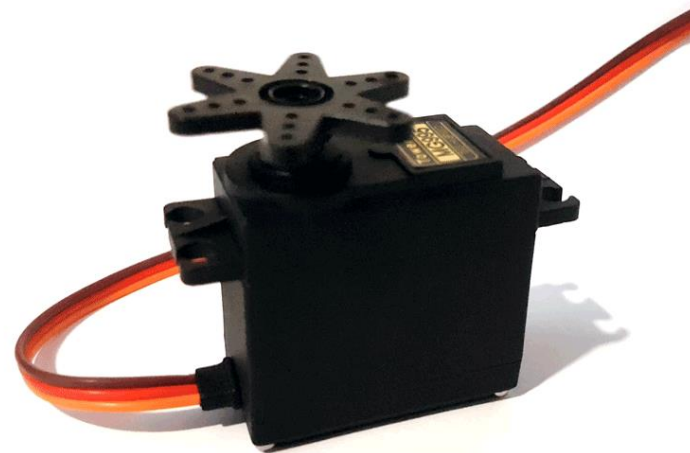
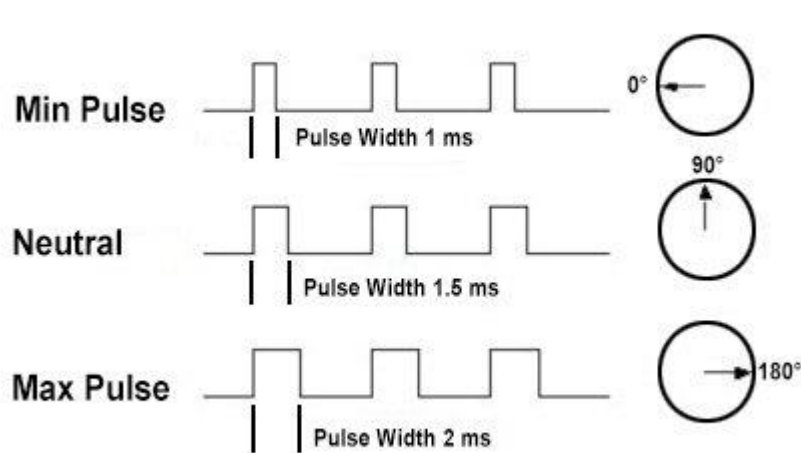


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Servo Motors : continued ..

Servos are controlled by sending an electrical pulse of variable width, PWM, through the control wire. There is a **minimum pulse**, a **maximum pulse**, and a **repetition rate**. A servo motor can usually only turn 90° in either direction for a total of 180° movement. The motor's neutral position is defined as the position where the servo has the same amount of potential rotation in the both the clockwise or counter-clockwise direction. The PWM sent to the motor determines position of the shaft, and based on the duration of the pulse sent via the control wire; the rotor will turn to the desired position. The servo motor expects to see a pulse every **20 milliseconds (ms)** and the length of the pulse will determine how far the motor turns. For example, a **1.5ms** pulse will make the motor turn to the 90° position. Shorter than **1.5ms** moves it in the counter clockwise direction toward the 0° position, and any longer than **1.5ms** will turn the servo in a clockwise direction toward the 180° position.



Variable Pulse width control servo position

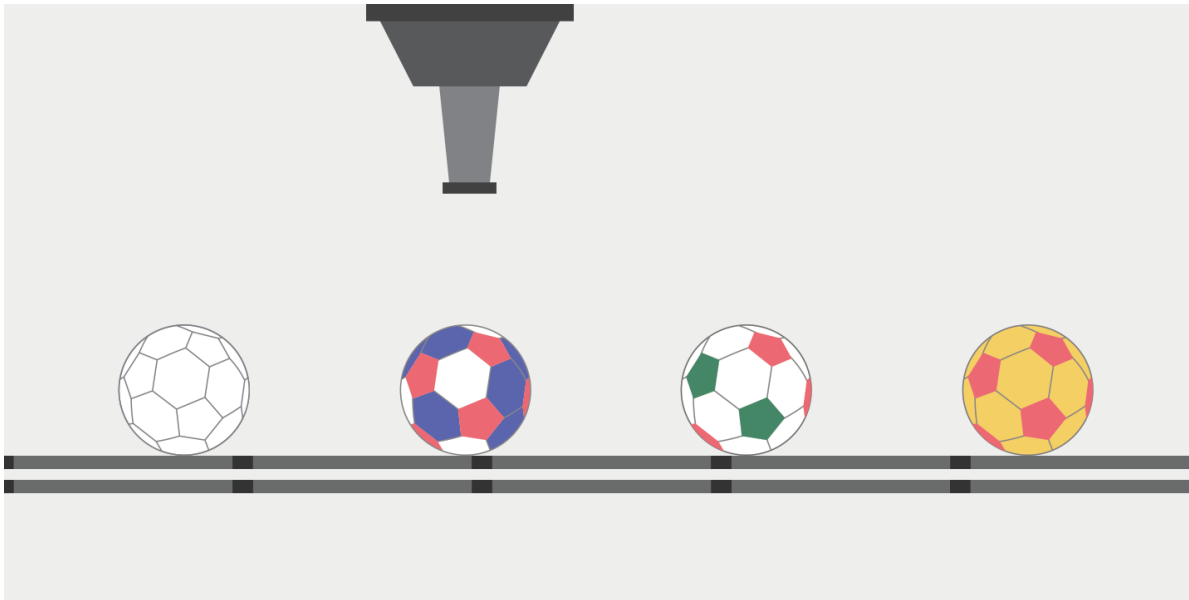
Industrial Application of Servo Motors

Robotics: A servo motor at every "joint" of a robot is used to actuate movements, giving the robot arm its precise angle.

Camera Auto Focus: A highly precise servo motor built into the camera corrects a camera's lens to sharpen out-of-focus images.

Solar Tracking System: Servo motors adjust the angle of solar panels throughout the day so that each panel continues to face the sun.

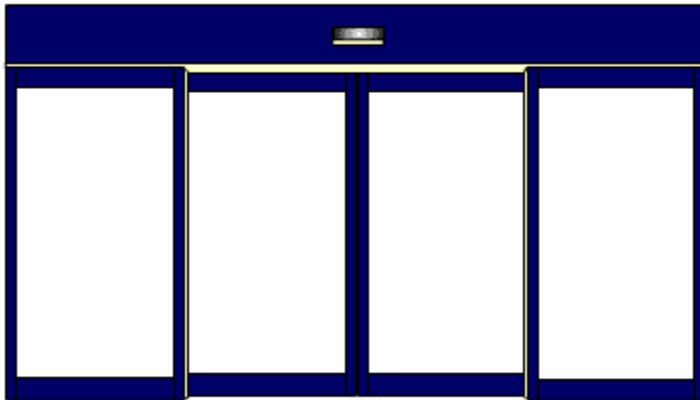
Automatic Door Openers: Supermarkets and hospital entrances are prime examples of automated door openers controlled by servo motors, whether the signal to open is via push plate beside the door for handicapped access or by radio transmitter positioned overhead.



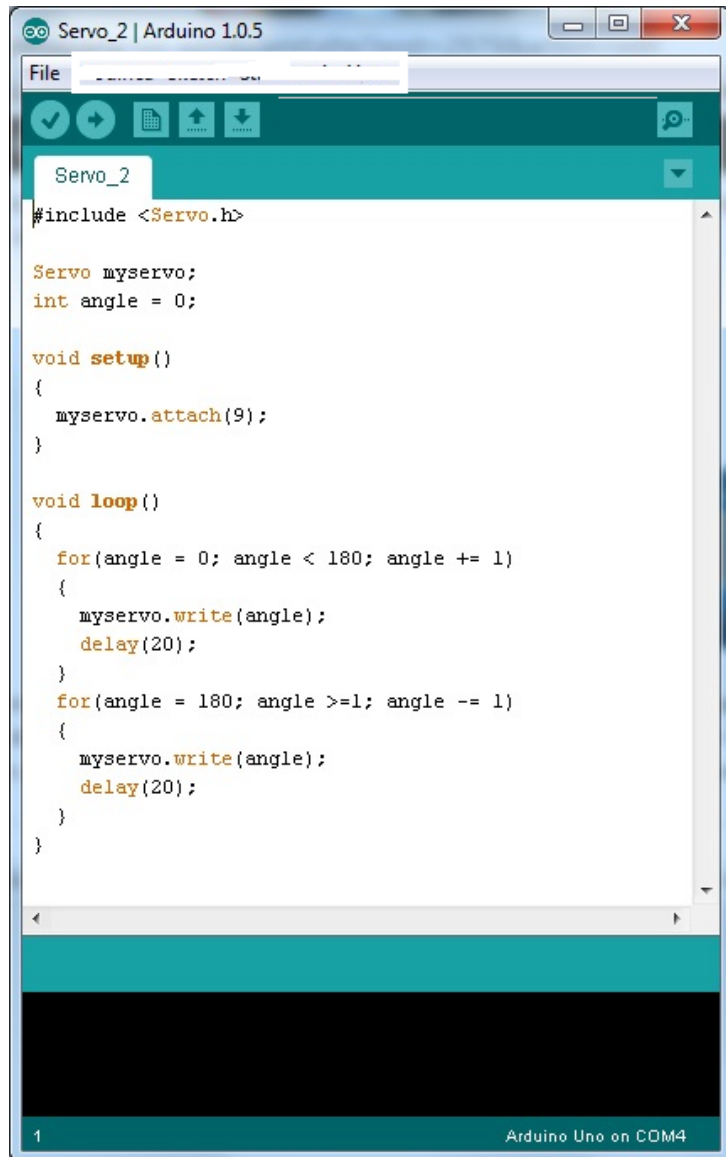
Industrial Application of Servo Motors

Conveyor Belts: Servo motors move, stop, and start conveyor belts carrying product along to various stages, for example, in product packaging/bottling, and labeling.

Metal Cutting & Metal Forming Machines: Servo motors provide precise motion control for milling machines, lathes, grinding, centering, punching, pressing, and bending in metal fabrication for such items as jar lids to automotive wheels.



Controlling a Servo Motor using Arduino Uno : continued ..



```
File Servo_2 | Arduino 1.0.5
Servo_2
#include <Servo.h>

Servo myservo;
int angle = 0;

void setup()
{
  myservo.attach(9);
}

void loop()
{
  for(angle = 0; angle < 180; angle += 1)
  {
    myservo.write(angle);
    delay(20);
  }
  for(angle = 180; angle >= 1; angle -= 1)
  {
    myservo.write(angle);
    delay(20);
  }
}
```

```
#include <Servo.h>
```

```
Servo myServo;
int angle = 0;
void setup(){
  myServo.attach(9);
}
```

/* attach(9) -> you are assigning the Servo2 pin out on the board to the motor; */

```
void loop(){
  for(angle=0; angle < 180; angle += 1) {
    myServo.write(angle);
    delay(20);
  }
  for(angle=180; angle >= 1; angle -= 1){
    myServo.write(angle);
    delay(20);
  }
}
```