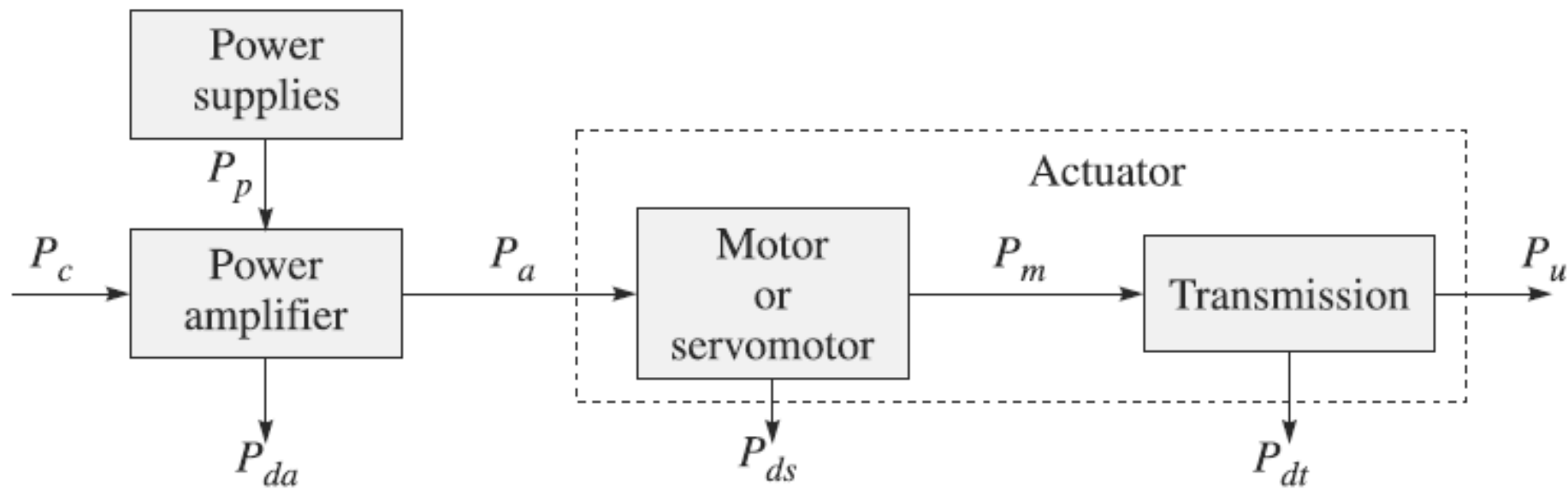


Actuators and Grippers

Dr. M. Shiple

Definitions

Actuators : A motor together with transmissions and other accessories



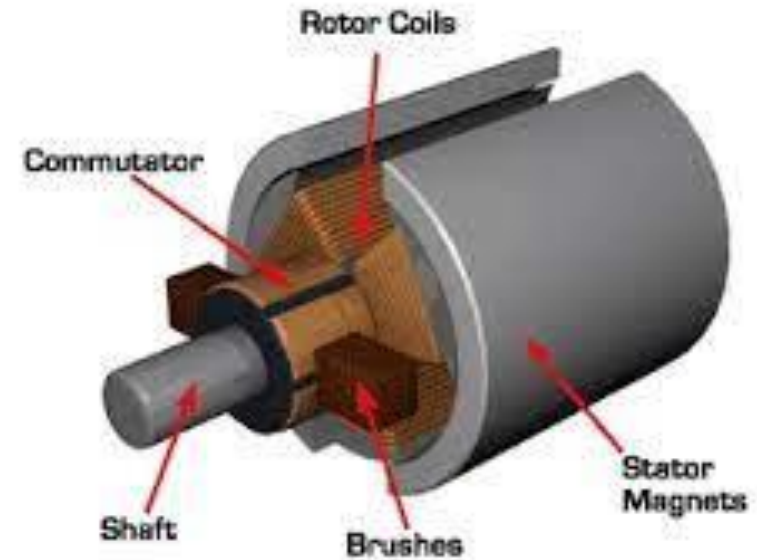
Types of Actuators

- 1. Electric Actuators** The primary input power supply is the electric energy from the electric distribution system.
- 2. Hydraulic Actuators** They transform hydraulic energy stored in a reservoir into mechanical energy by means of suitable pumps.
- 3. Pneumatic Actuators** They utilize pneumatic energy, i.e., compressed air, provided by a compressor and transform it into mechanical energy by means of pistons or turbines.

DC Motors

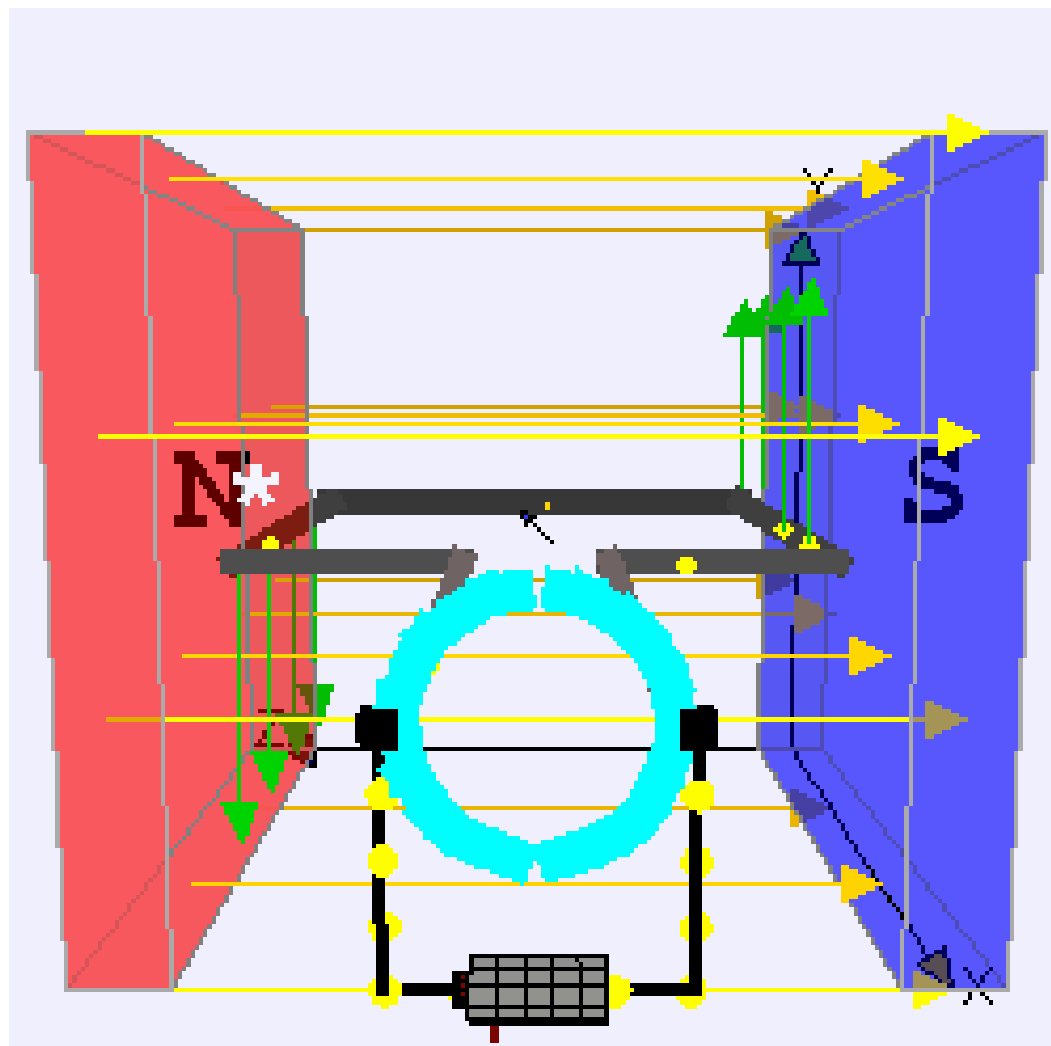
A DC motor or direct current motor is an electrical machine that transforms electrical energy into mechanical energy by creating a magnetic field that is powered by direct current

Brushed DC Motor



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DC motor

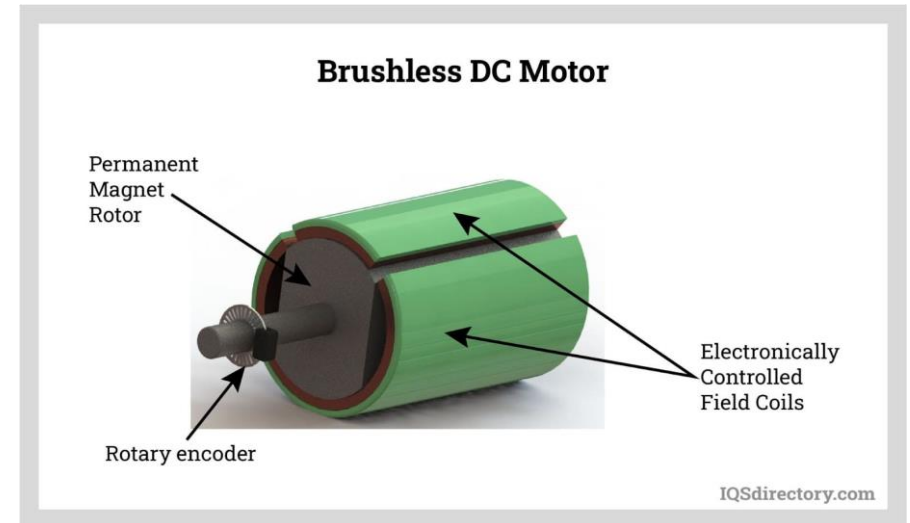


Brushless DC motor

are a permanent magnet synchronous electric motor driven by direct current and an electronically controlled commutation system

Benefits of BLDC Motor

- Absence of mechanical commutator to avoid wear
- High efficiency
- High speed of operation in loaded and unloaded conditions
- Smaller motor geometry and lighter weight
- Long life
- Higher dynamic response because of low inertia and carrying windings in the stator
- Less electromagnetic interference
- Low noise and quiet operation



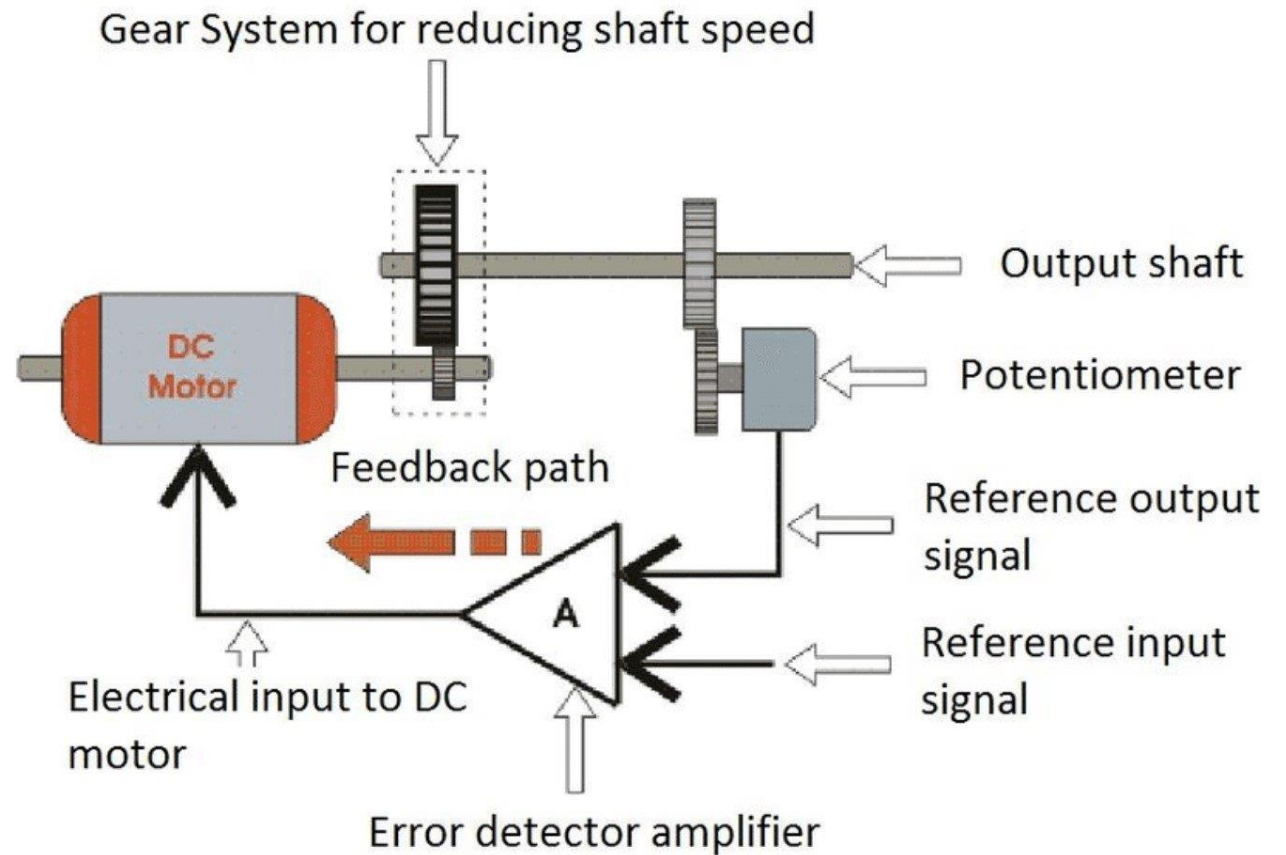
Servo Motors

CONSTRUCTION DIAGRAM

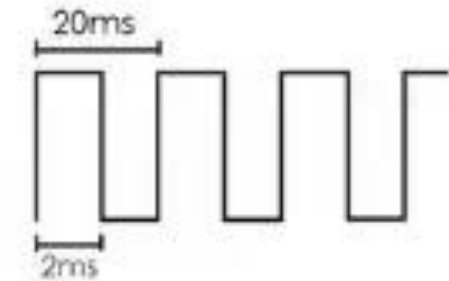
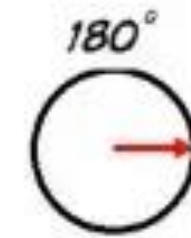
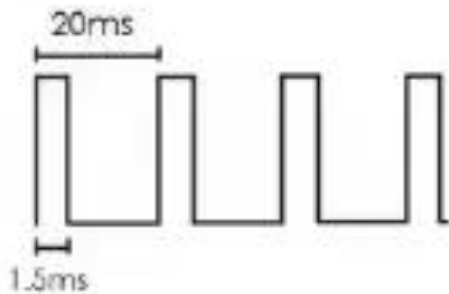
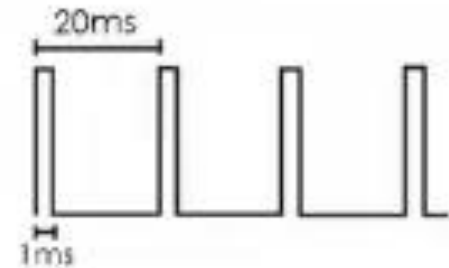
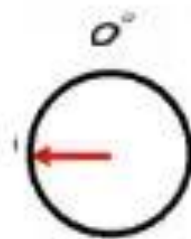
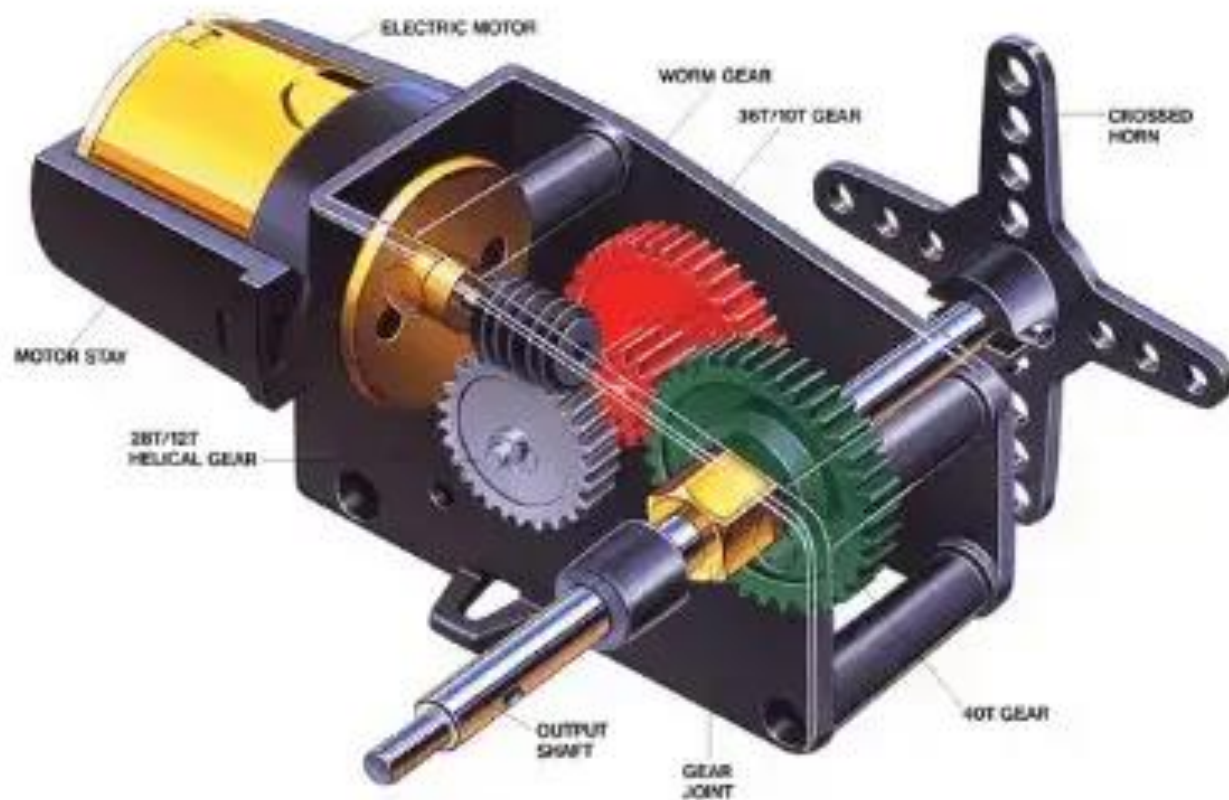
A servo motor is defined as:

1- an electric motor that allows for precise control of angular or linear position, speed, and torque.

2- It consists of a suitable motor coupled to a sensor for position feedback and a controller that regulates the motor's movement according to a desired setpoint.



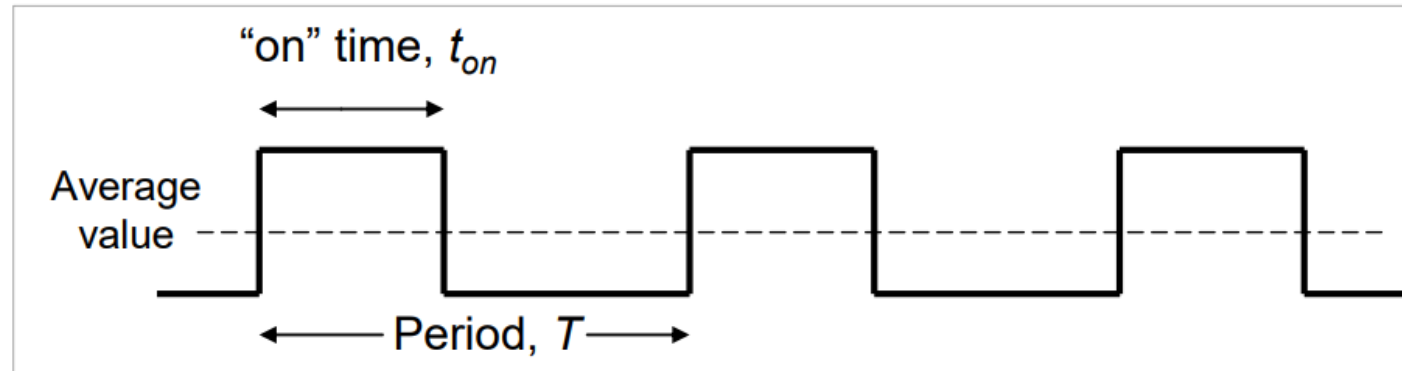
What is a Servomotor?



Electrical 4 U

Introducing pulse width modulation (PWM)

- › Pulse width modulation (PWM) is a simple method of using a rectangular digital waveform to control an analog variable



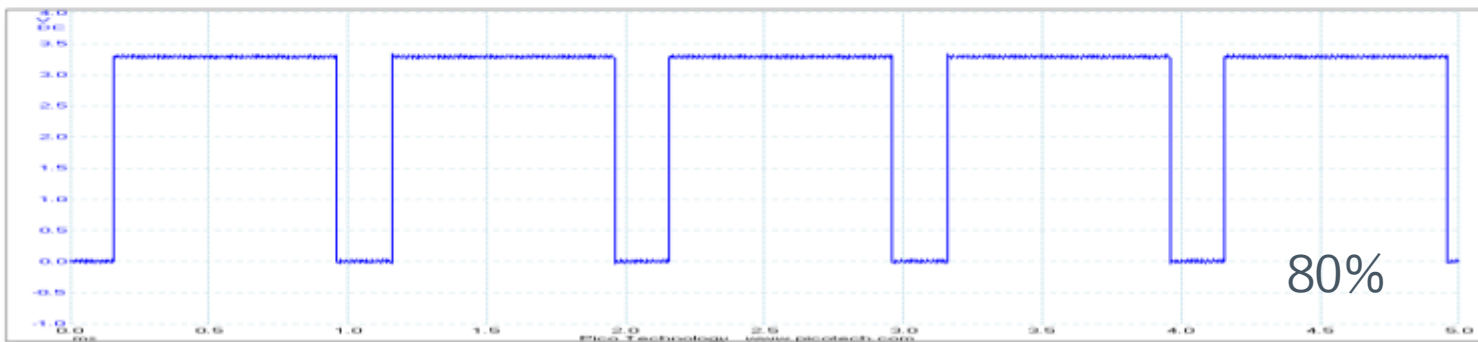
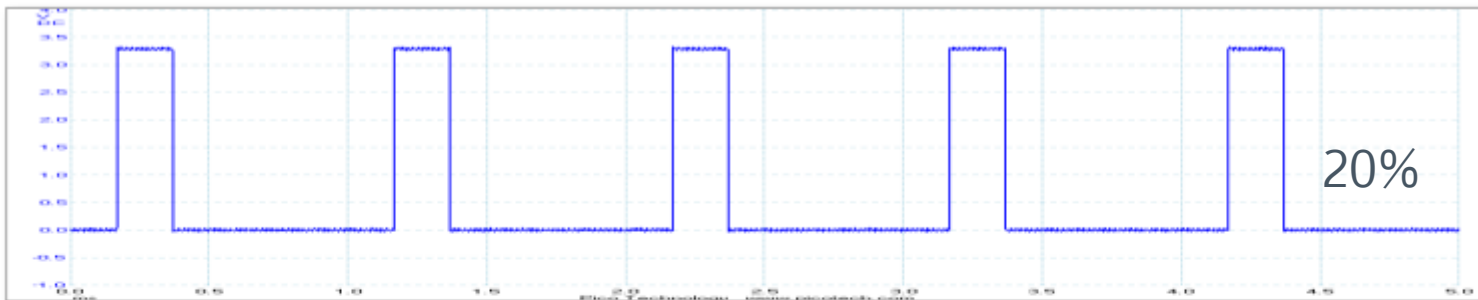
*The duty cycle is the proportion of time that the pulse is 'on' or 'high', and is expressed as a percentage:

$$\text{duty cycle} = \frac{(\text{pulse on time})}{(\text{pulse period})}$$

Examples

Devices used in robotics

- DC motors
- Servos
- Solenoids



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Controlling servo position with PWM

