Robotic Actuators

Mini-Enrichment Course

Robotics: Intelligent Connection of the Perception to Action

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Motors

- A robot is a system that can automate some tasks called *freedoms*
- An actuator is a device that makes the freedoms possible

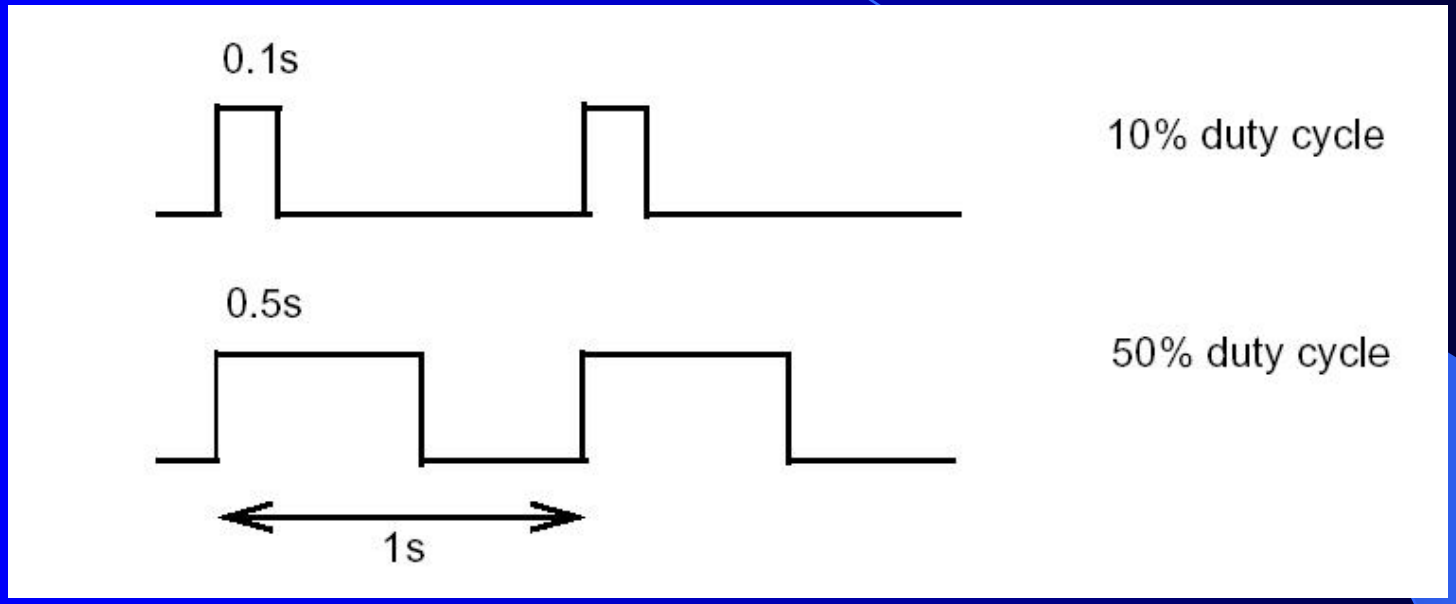
- The most important and popular actuator is a motor, which allows the robot to control a wheel, a switch or even an arm
- There are different types of motors
  - Direct Current (DC) motors
  - Alternating Current (AC) motors
  - Inductive motors
- Motors also have different ways to control them
  - Increasing or decreasing the voltage (stepper motors)
  - Slowing or speeding up the motor using a feedback loop (servo motors)

Servo Motors

- Used to control the wheels of a robot, or an arm

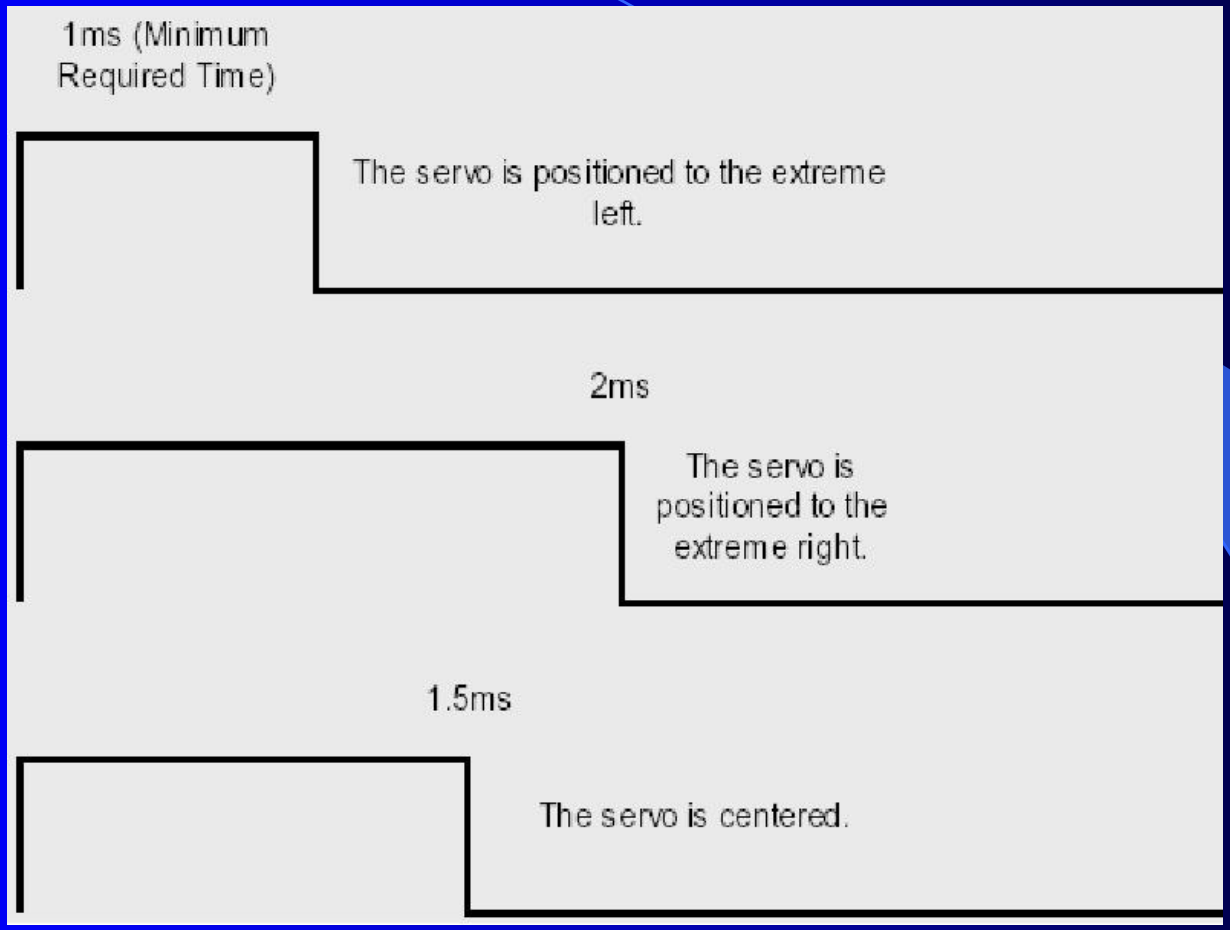
- A popular control method is the pulse width modulation (PWM) scheme
- By varying the pulse width we can
  - Increase/decrease the speed of the motor
  - Change the direction of the motor
  - Stop the motor

PWM Motors



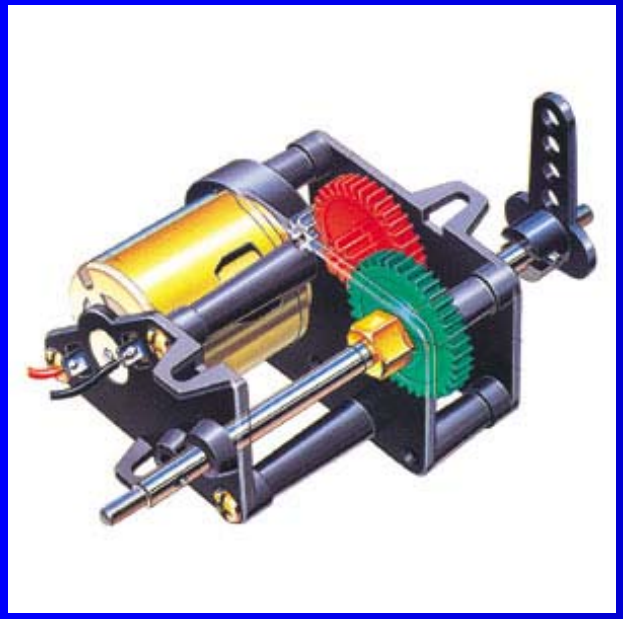
1. Signal repeats regularly (periodic)
2. Has a constant high-time (pulse width)
3. High-time determines rotation speed and direction

PWM Motors (2)

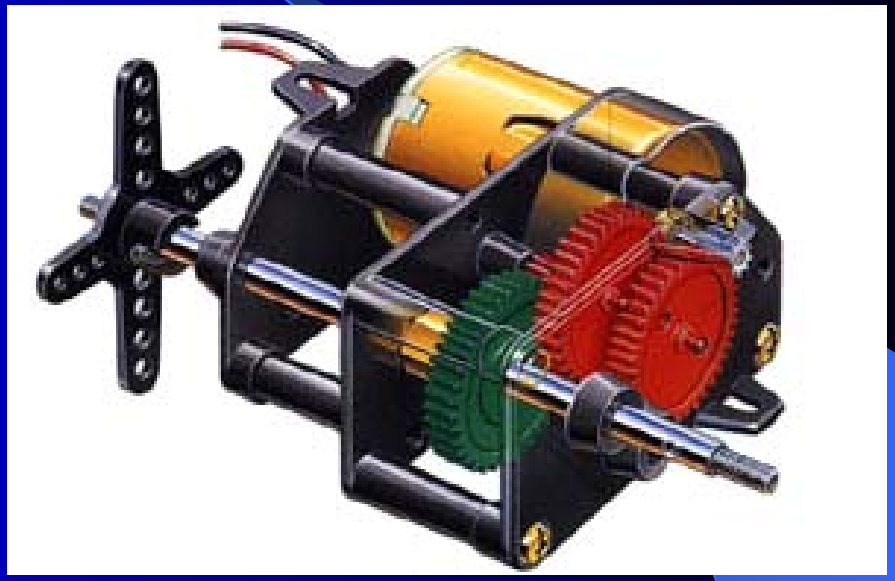


1. Normally only goes to 180°
2. We modify the motor to make it spin 360°

Gearboxes



High-Speed Gearbox



High-Power Gearbox

Robotic Arms

- Most prominent example is the CanadaArm

Robotic Arms (2)

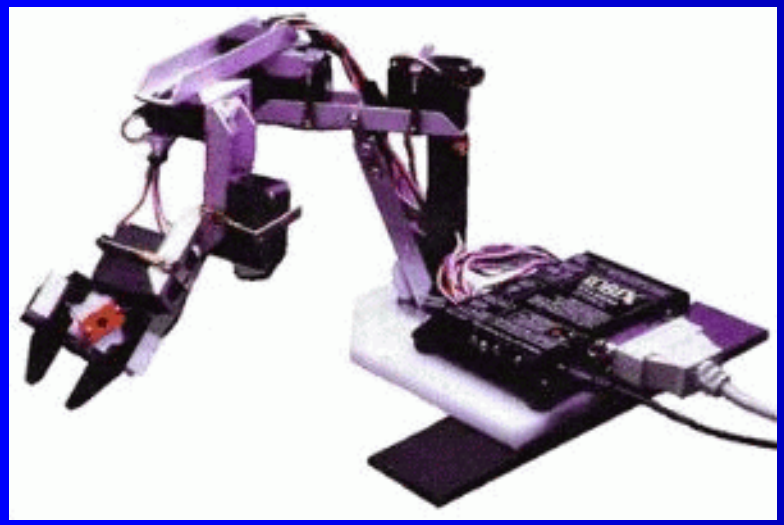
- Also called the Shuttle Remote Manipulator System (SRMS)

Robotic Arms (3)

- Other robotic arms are used in many applications (space, mining, automotive, medical and so on)

Robix Kit

- The Robix RCS-6 is made by Robix
- It is used in middle-school projects as well as senior-level university robotics courses
- Consists of six motors controlling different arms



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