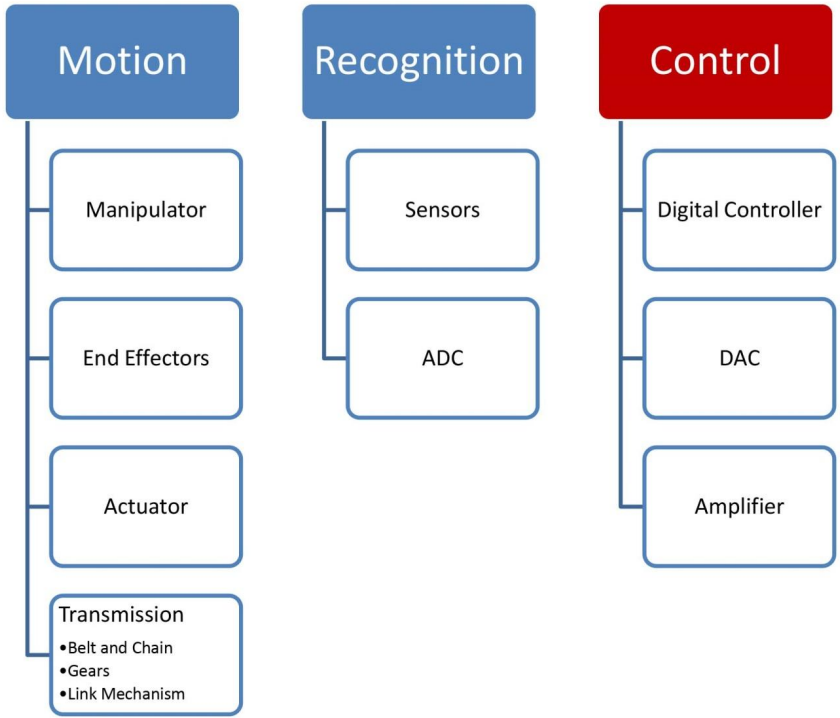
Introduction to Robotics
CSE 461

Riad Ahmed
Lecturer, Dept. of Computer Science and Engineering
Brac University
Lecture 4: Chapter 1(Introduction to robotics: basics)

Previous Class

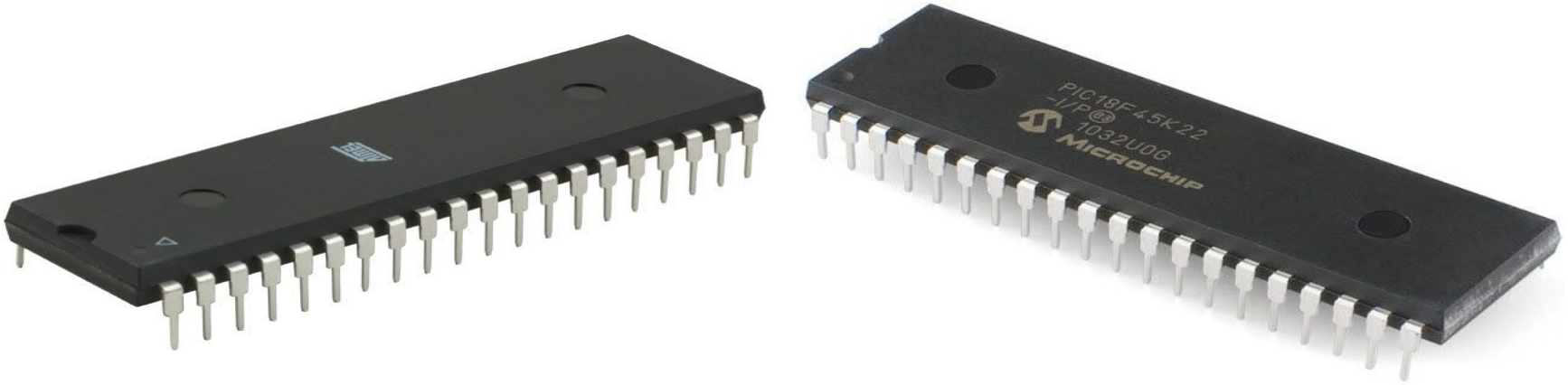
1. Subsystem

Subsystems


Motion
Manipulator
End Effectors
Actuator
Transmission
•Belt and Chain
•Gears
•Link Mechanism
Recognition
Sensors
ADC
Control
Digital Controller
DAC
Amplifier

Microcontrollers

A microcontroller is a small, integrated circuit that contains a processor, memory, and input/output peripherals.



Arduino


ARDUINO


ARDUINO
MEGA
2560
ARDUINO.CC
COMMUNICATION
POWER
ANALOG IN
DIGITAL

Arduino

Arduino Uno

Arduino Leonardo

Arduino Mega 2560

Arduino LilyPad

Arduino Mega ADK

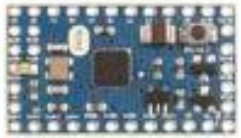
Arduino Fio

Arduino Ethernet

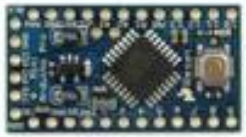
Arduino Pro

Arduino BT

Arduino Nano

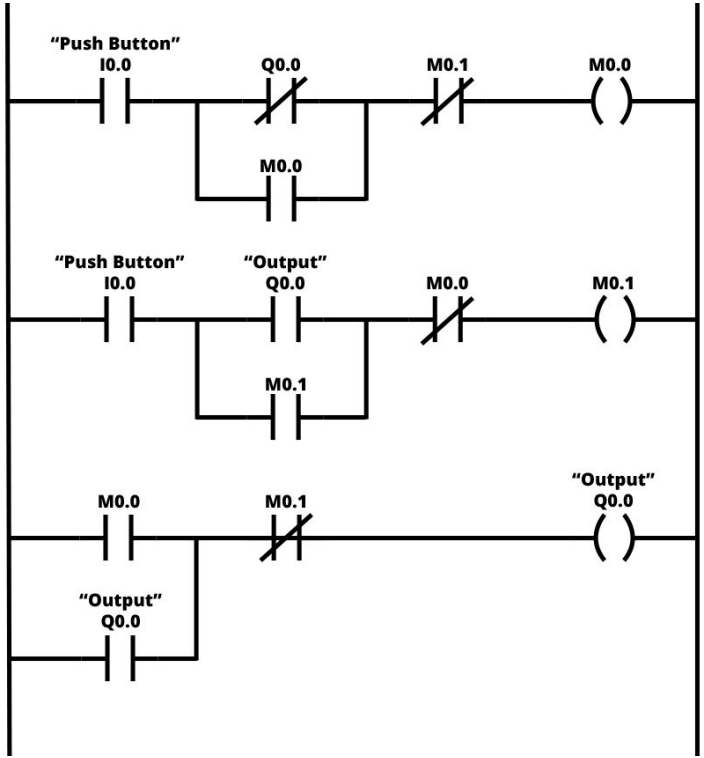


Arduino Mini

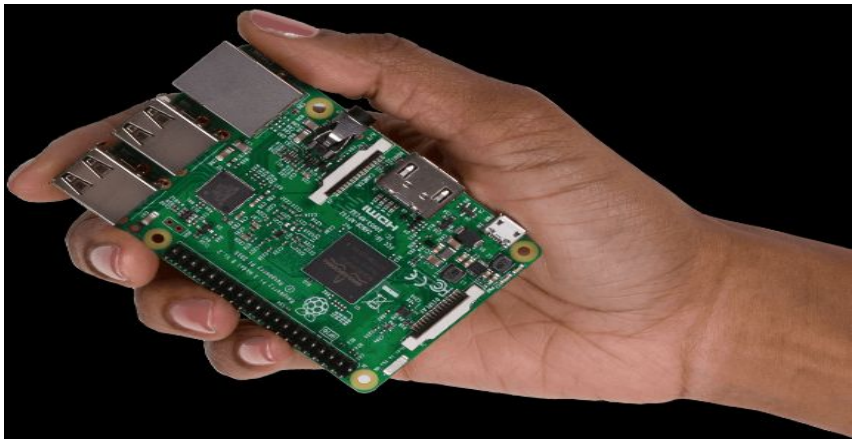


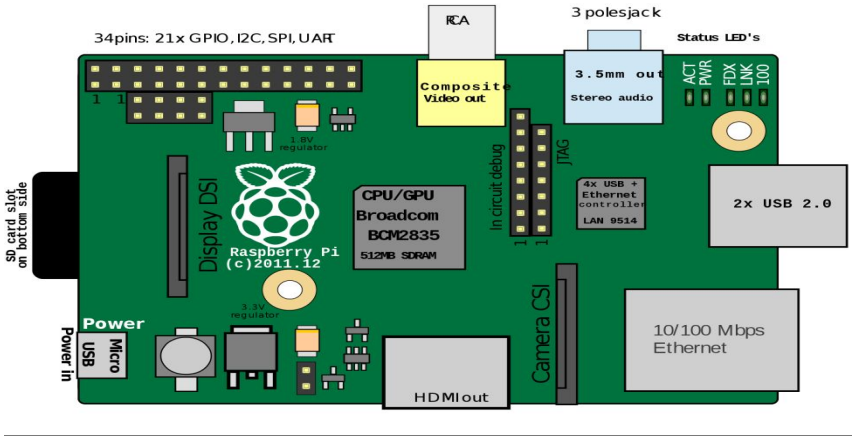
Arduino Pro Mini

Programmable Logic Controller (PLC)



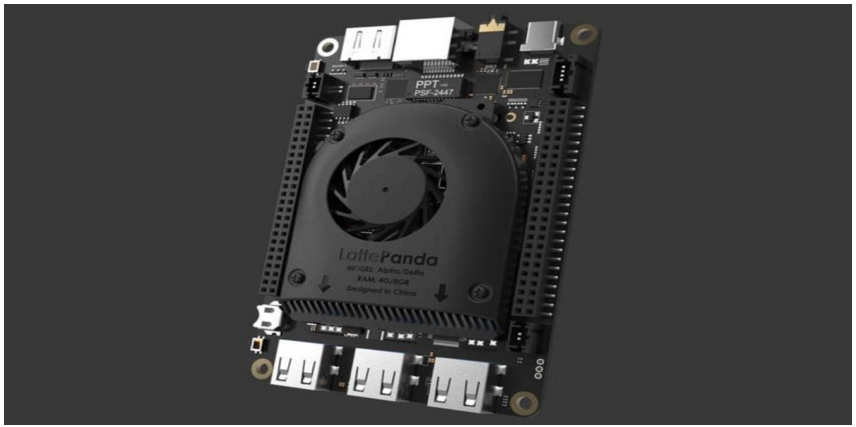
Single board Computer



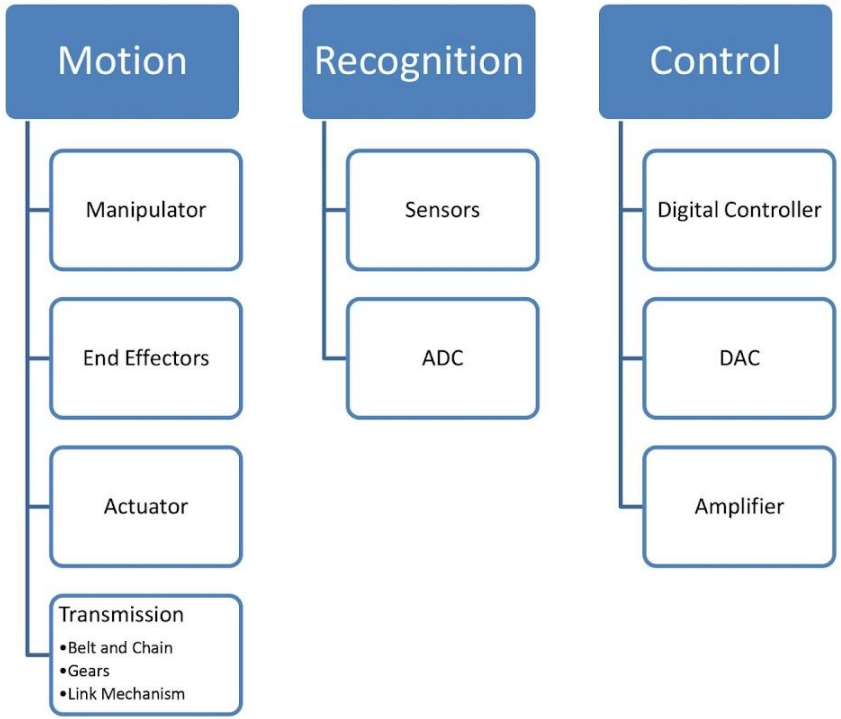


Raspberry PI 4, Tinkerboard

Little Panda and Jetson nano



Subsystems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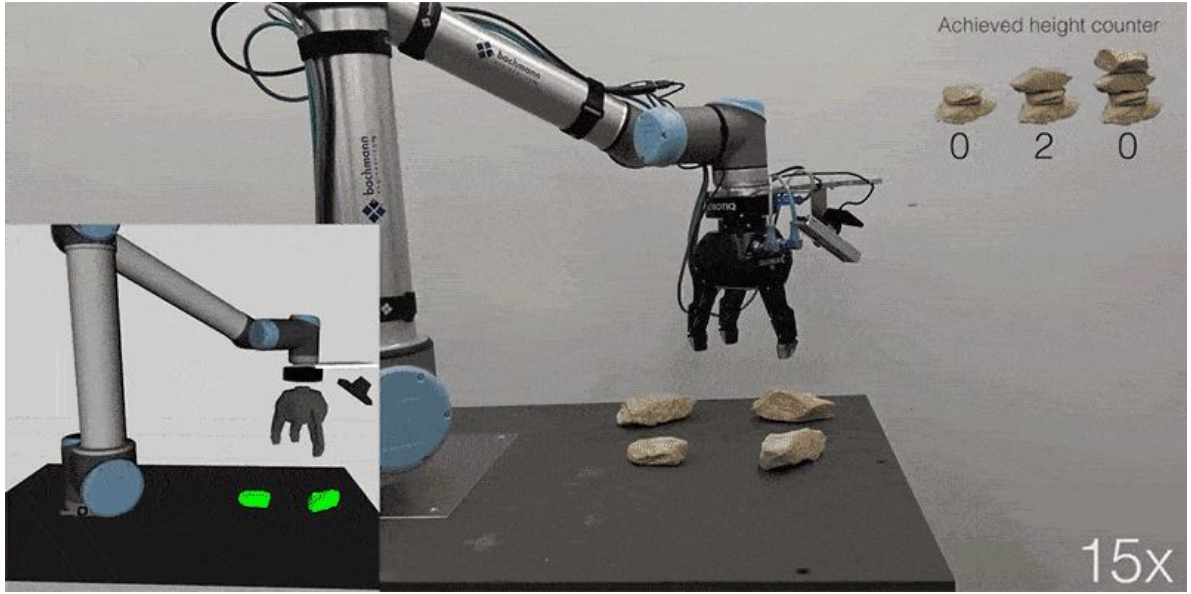
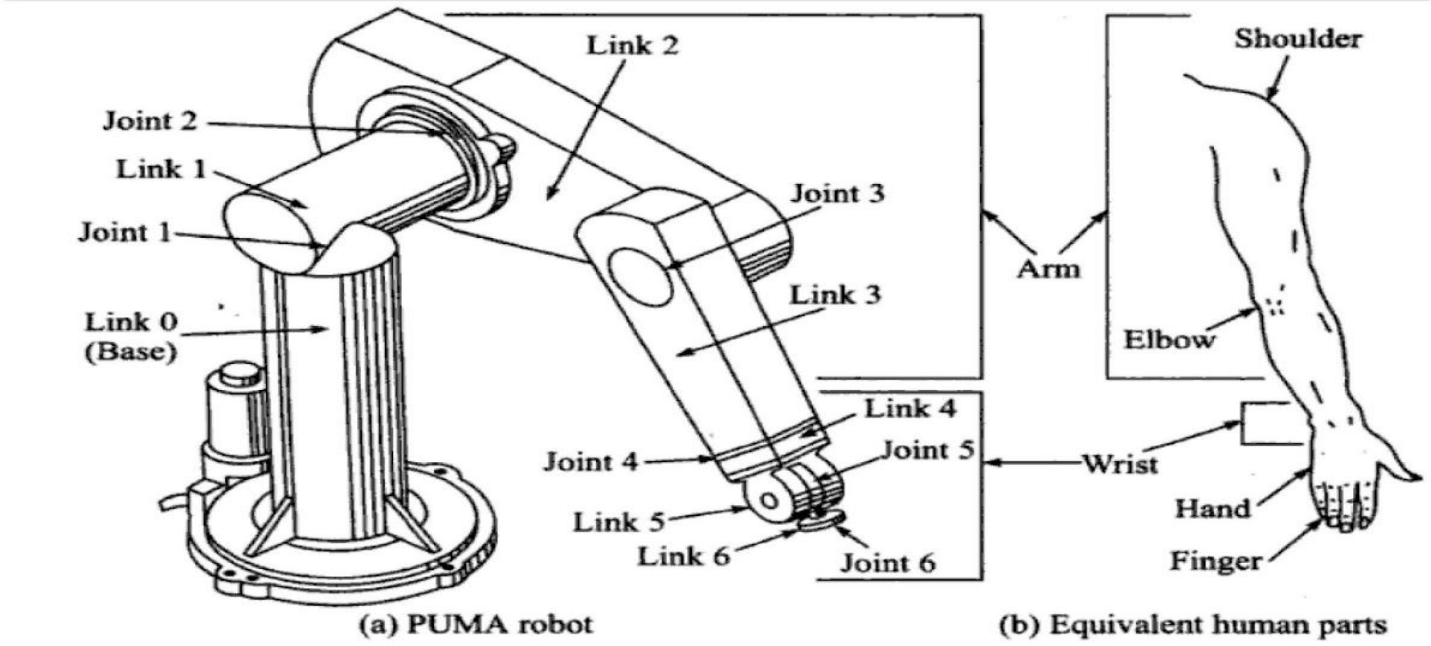

Achieved height counter
0 2 0
15x

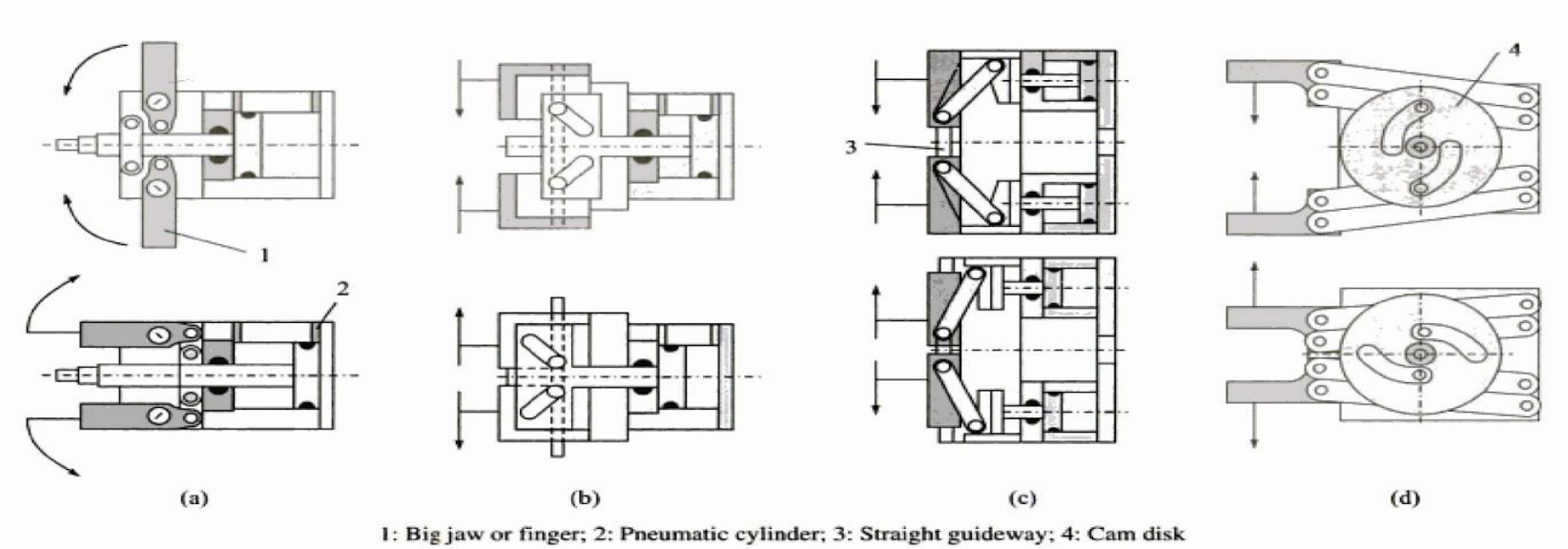
Motion

Manipulator



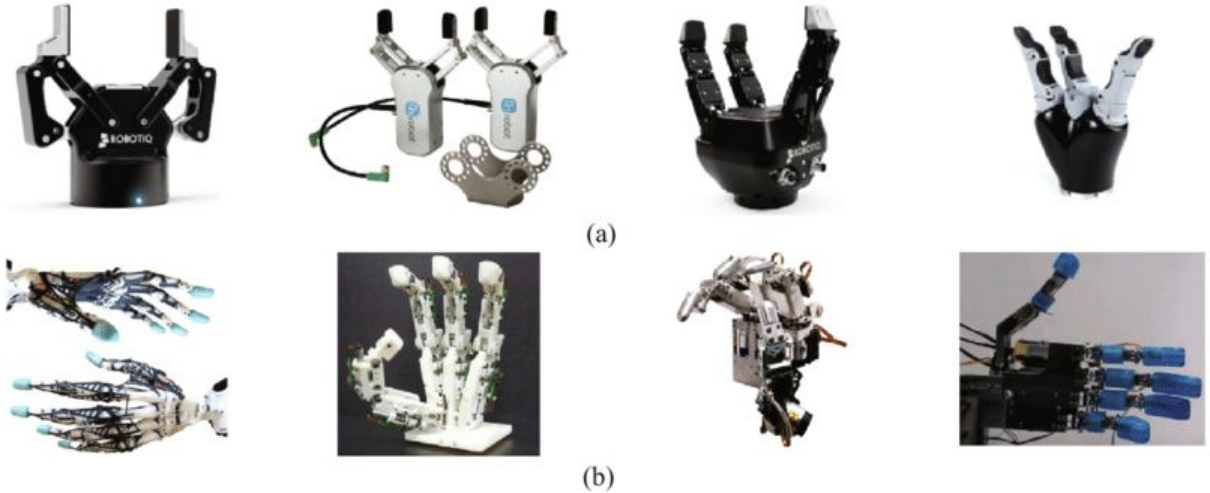
Motion

End-effector



1: Big jaw or finger; 2: Pneumatic cylinder; 3: Straight guideway; 4: Cam disk

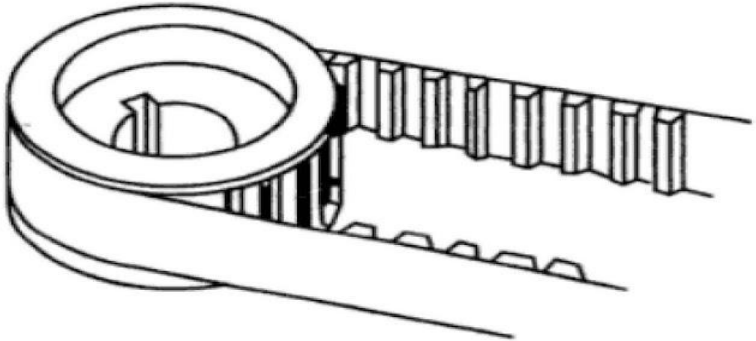
End Effector



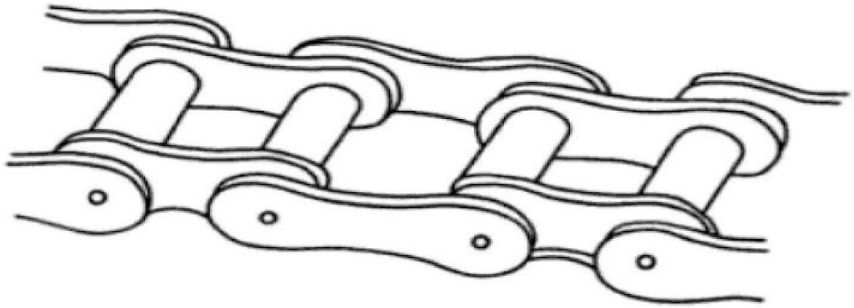
Two types of fingered end-effectors: (a) gripper type, (b) anthropomorphic type

Motion

Transmission (Belt and chain)



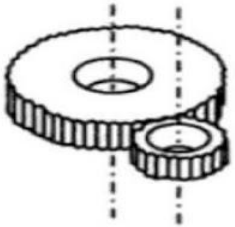
(a) Synchronous belt



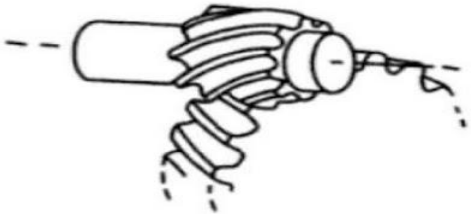
(b) Roller chain

Motion

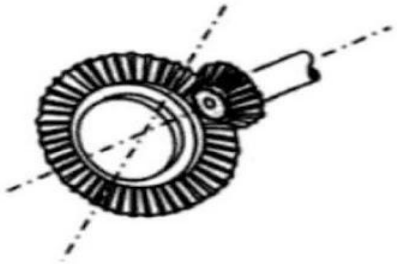
Transmission (Gears)



Spur gears



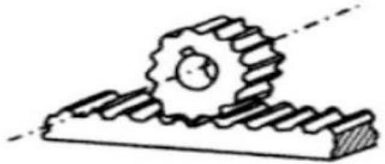
Helical gears



Straight bevel

Spiral bevel

Worm



Rack and pinion

Motion

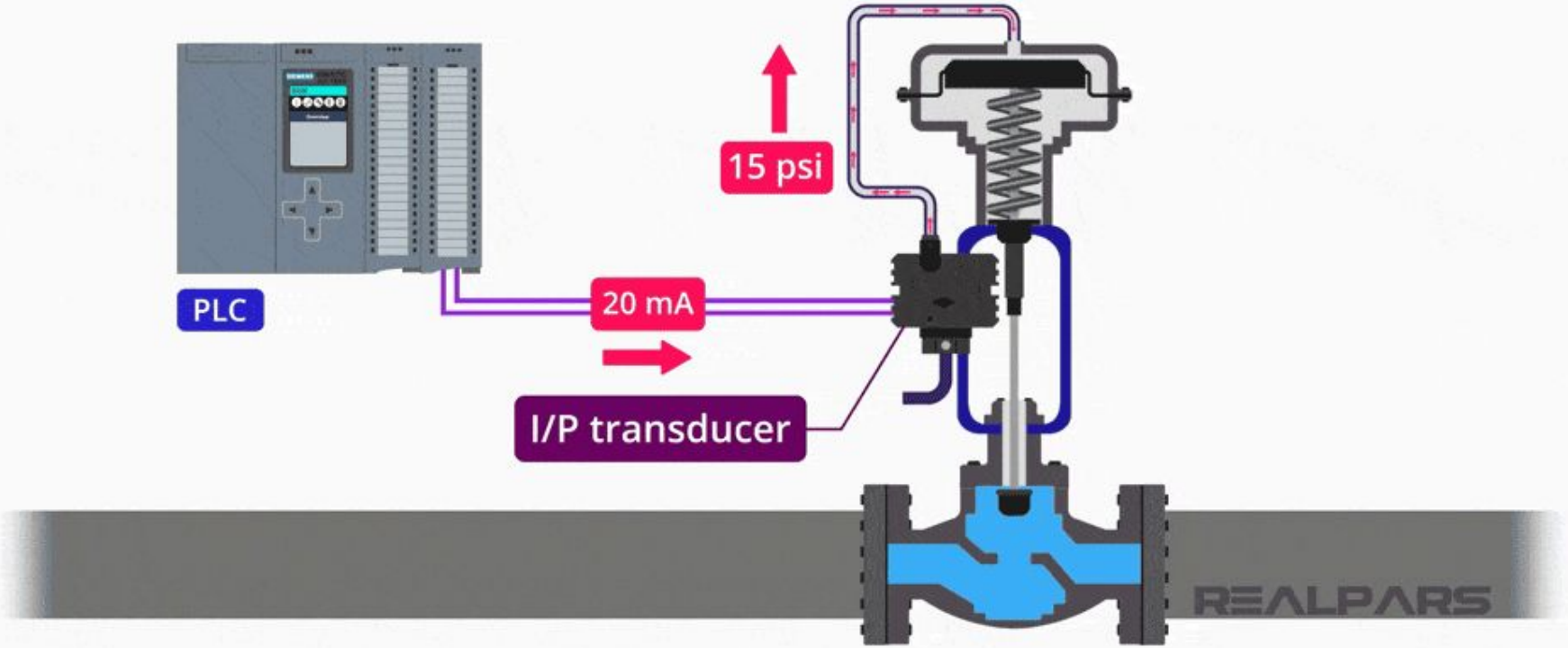
Actuators

Pneumatic Actuator

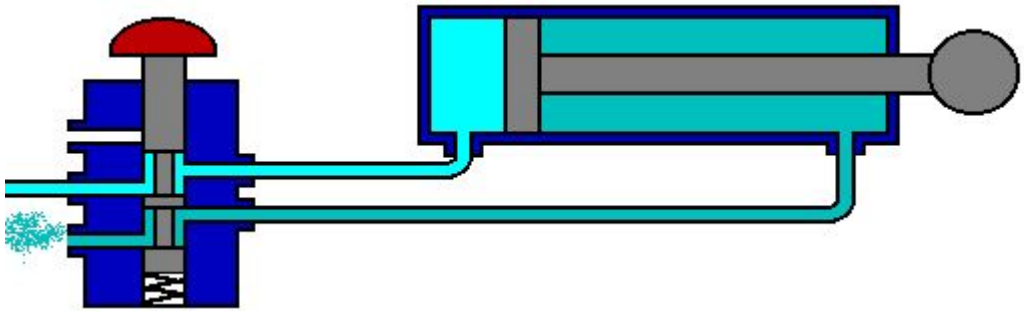
Hydraulic Actuator

Electric Actuator

Pneumatic



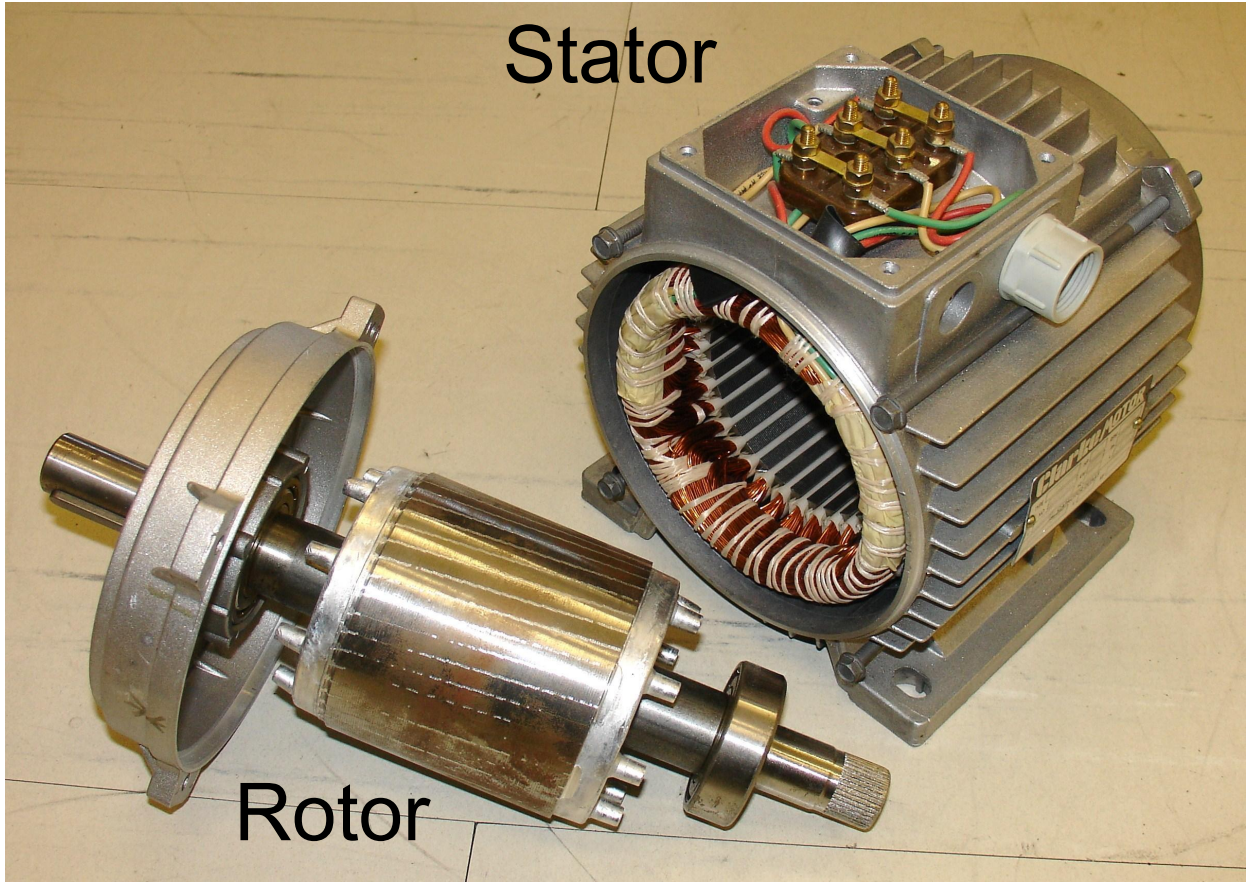
Hydraulic



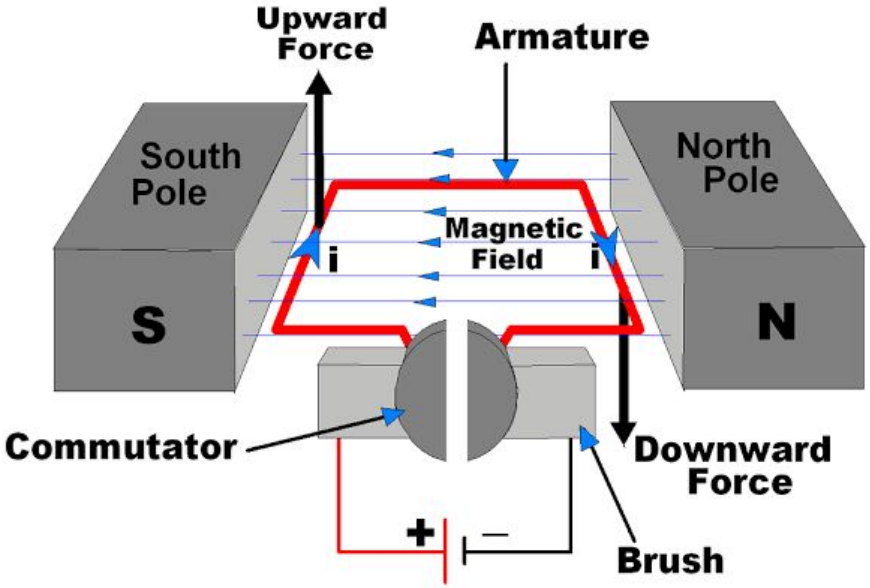
Electric

Characteristics	Pneumatic	Hydraulic	Electric
Efficiency	Low	Low	High
Reliability	Excellent	Good	Good
Maintenance	High user-maintenance	High user-maintenance	Little to no maintenance
Purchase Cost	Low	High	High
Operating Cost	Moderate	High	Low

Motor



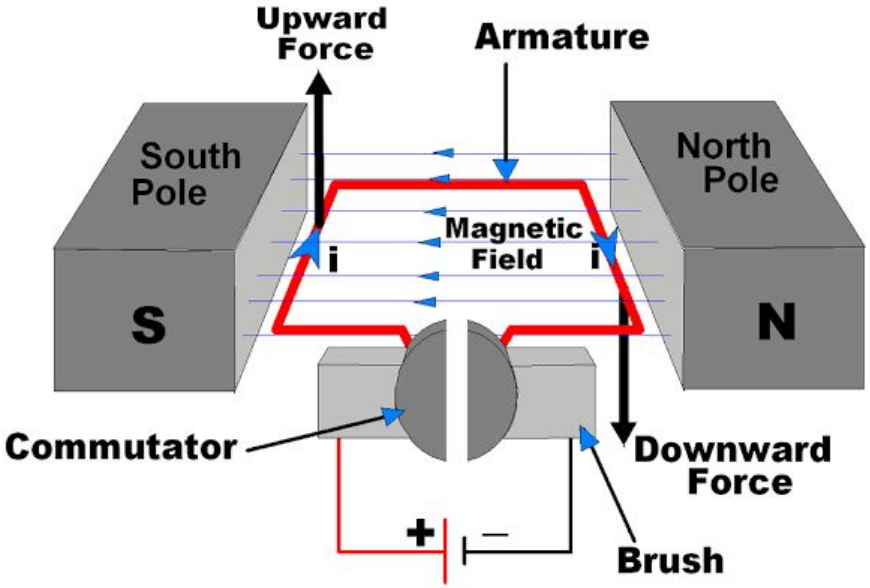
DC motor



DC Motor Conceptual Diagram

https://youtu.be/LAtPHANEfQo

DC motor



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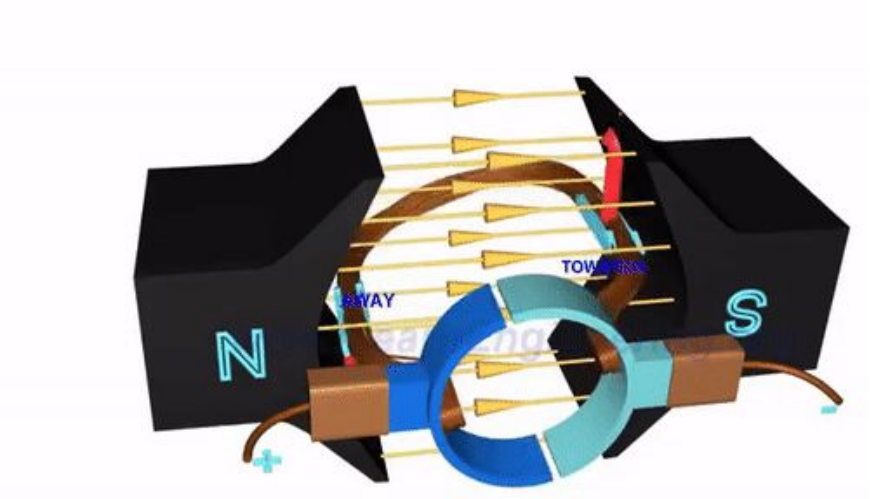

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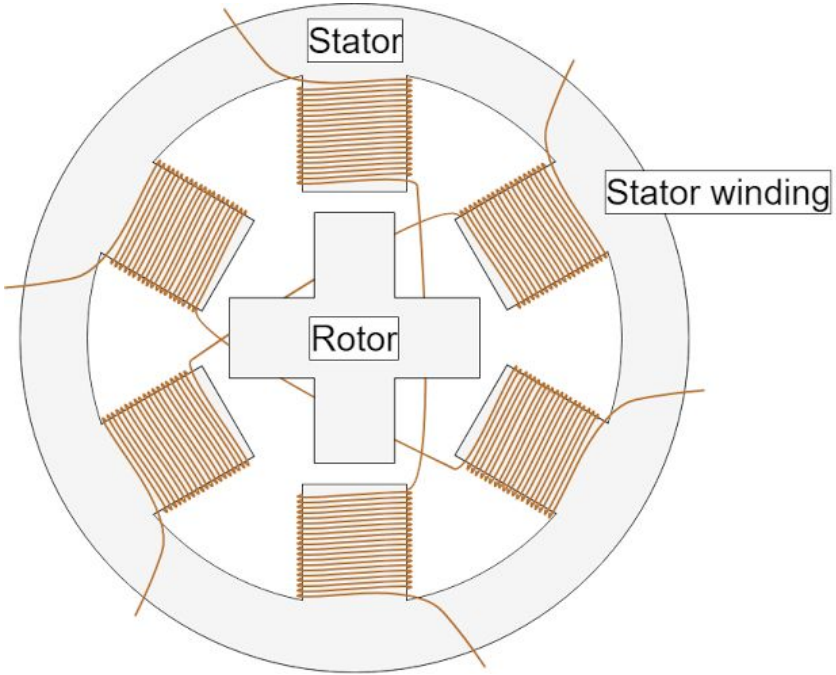
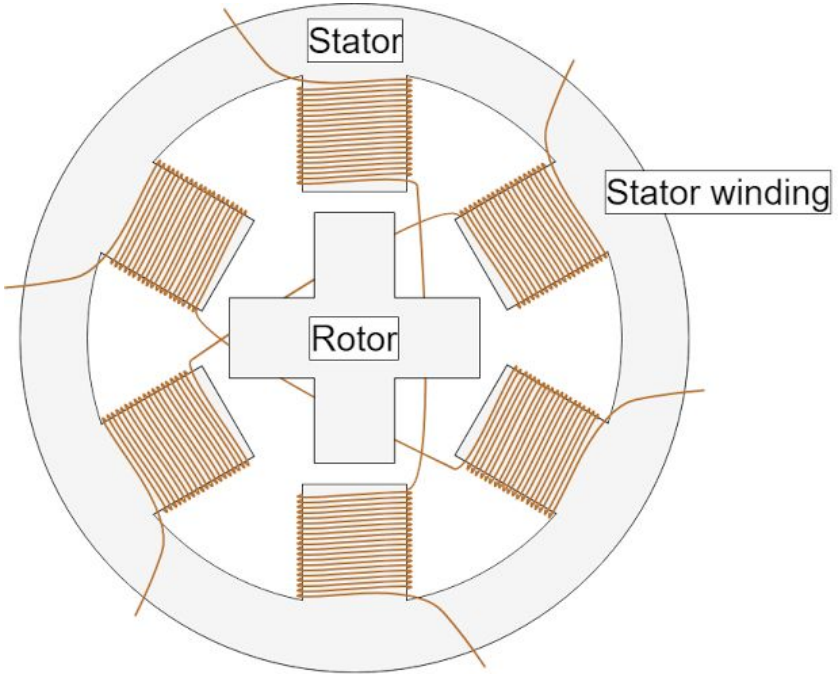
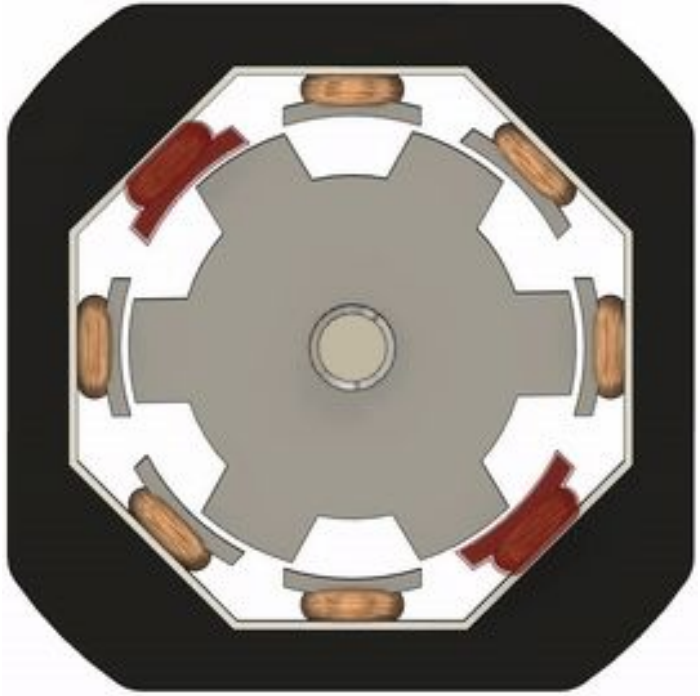
Stepper Motor



https://youtu.be/eyqwLiowZiU

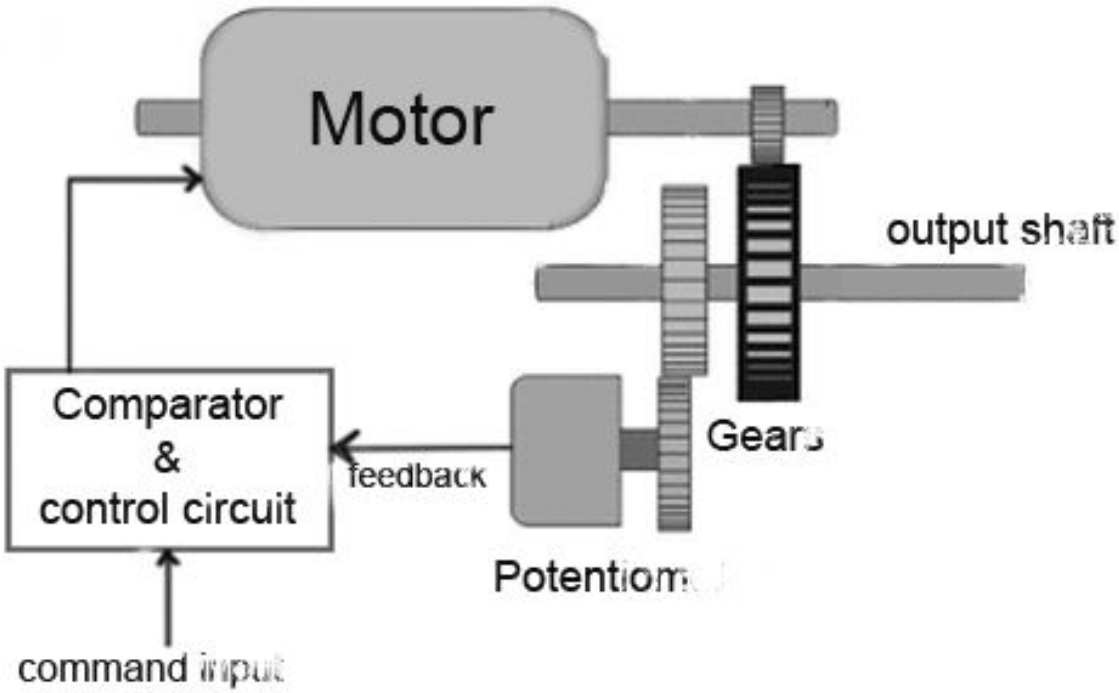
Stepper Motor





https://youtu.be/eyqwLiowZiU

Servo Motor


Motor
output shaft
Comparator
&
control circuit
feedback
command input

Next Class

- Quiz

Thank You