

# ME 639\_Assignment1

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2.

Manipulators:

1. <https://www.youtube.com/watch?v=QFbVjEZkBTk>
  - A cartesian type manipulator system that can be programmed to do customised tasks.
2. <https://www.youtube.com/watch?v=s-yne8xTNM0>
  - Starting scene shows a parallel type manipulator and an elbow manipulator. Both the manipulators are seen sorting an object.

Mobile Robots

1. <https://www.youtube.com/watch?v=M0fL5Q6rGws>
  - Load carrying mobile robots to move stuff in a storage house. The robots are enabled with dynamic path planning to move autonomously.

Aerial Robots

1. <https://youtu.be/AOYxlj5iuvo>
  - Review of an autonomous aerial drone. The drone has omnidirectional sensing which it uses to avoid obstacles from any direction.

Underwater robots

1. <https://youtu.be/4aaPZ80Yo4s>
  - An AUV to perform complex underwater tasks. They can also work together in a swarm to perform highly complex tasks. They use SONAR to communicate.

Soft Robots

1. <https://youtu.be/A7AFsk40NGE>
  - Explains the basics of soft robotics and mechanisms used. Shows a tentacle robot and a soft manipulator robot.

Micro Robots

1. <https://youtu.be/FLFse2RcuRU>
  - Shows a micro robot that is able to carry huge loads. It can carry upto 3000 times its own weight.

Hybrid Robots

1. <https://youtu.be/shimvNXyVtw>
  - An underwater robot with a pair of manipulators attached. It can assume AUV(Autonomous Underwater Vehicle) form as well as ROV (Remotely Operated Underwater Vehicle) form and function as either.

3.

A. AC Motors

a. Synchronous

- i. Rotor speed = AC frequency
- ii. Coil is a permanent magnet rather than a coil.

- b. Asynchronous
  - i. Magnetic field created by winding
  - ii. Field oscillates due to AC current
  - iii. The oscillating magnetic field induces current in the rotor coil and makes it rotate under the field force.
  - iv. Rotor is not touched through any brush/contacts; thus, will last longer than others
  - v. Need to change the AC frequency to change speed  $\Rightarrow$  can be done using Variable Frequency Driver(VFD)

## B. DC Motors

- a. Brushed DC Motors
  - i. For small RC Motors, used in CD players
  - ii. Can come with inbuilt fan/double shaft
  - iii. Stator Body(with Magnets); Rotor coil
  - iv. Brush change contacts with spinning rotor, changing the polarization of coils; which are pushed in the magnetic field]
  - v. Speed can be changed by changing the applied DC value  $\Rightarrow$  can be done using PWM power controller
- b. Brushless DC Motors
  - i. Normal BLDC
    - 1. 3 phase input
    - 2. Stator coil; Rotor magnet
    - 3. Inrunner: Rotor inside stator
    - 4. Outrunner: Rotor outside stator
    - 5. Controlled using ESCs(Electronic Speed Controller)
    - 6. Stator coils (using specific number of phases(3))
    - 7. Rotor has magnets
  - ii. Stepper
    - 1. Same as Normal BLDC
    - 2. Has 2 phase inputs, each connected to alternate stator windings
    - 3. But the number of coils and magnets are increased to get position precision
    - 4. Need a stepper driver

## C. Servo Motors

- a. Has feedback(either encoder or potentiometer): For position precision
- b. Gear boxes used to have high torques
- c. Controlled using PWM signals