

# **Introduction to Robotics**

## **[ME\_639]**

### **Assignment-1**

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## ➤ Task-1:

I have read the Chapter-1 of the Textbook by Spong & Vidyasagar.

## ➤ Task-2:

Categories of robots with Examples:

### 1. Category-1: Manipulators (Robotic Arm)

- A. KUKA ROBOT (<https://www.youtube.com/watch?v=QCKl9RMd5-s>)
- B. FANUC ROBOT (<https://www.youtube.com/watch?v=rbki4HR41-4>)

These are mainly used in industrial environment for tasks involving lifting of heavy components, moving parts from one place to another. They are also used to perform some repetitive tasks like fitting nuts/screws and sometimes used to assemble components in assembly line. They are generally stationary.

### 2. Category-2: Mobile Robots (Ground)

- A. Logistic Mobile Robots (<https://www.youtube.com/watch?v=Jkv9qeYFtPs>)
- B. ASRS robot ([https://www.youtube.com/watch?v=r\\_yMB66FCNA](https://www.youtube.com/watch?v=r_yMB66FCNA))

These are the robots having wheel or the robots which are not stationary. They find their application in multiple domains. They are also used for logistics management in the warehouse/factories. Mobile robots such as Automated Storage retrieval system are being used in warehouses by companies like Amazon & Flipkart.

### 3. Category-3: Aerial Robots (UAV)

- A. Amazon drone Delivery ([https://www.youtube.com/watch?v=mzhvR4wm\\_M](https://www.youtube.com/watch?v=mzhvR4wm_M))
- B. DJI-Agras T20 (<https://www.youtube.com/watch?v=hGyLjO7KWeU>)

Aerial Robots also known as Unmanned Aerial Vehicles. Drones comes under this category. These are being used in Commercial, Agricultural as well as Defence applications. Work is being done on Autonomous drones for applications in delivery of goods and monitoring crops.

### 4. Category-4: Underwater Robots (AUV & ROV)

- A. Kawasaki: Autonomous Underwater Vehicle “SPICE”  
(<https://www.youtube.com/watch?v=rril44oN63s>)
- B. ECA Group’s H300V Remotely Operated Underwater Vehicle  
(<https://www.youtube.com/watch?v=ya6R9HKQd4Y>)

Underwater robots are the robots which performs tasks while remaining underwater. In the last decade they have found huge application in underwater pipeline inspection, internet cable inspection and sea bed exploration. These days they are being employed for defence applications too. In India L&T is developing an AUV for defence application.

### 5. Category-5: Soft Robots

- A. UCSB Soft Robot (<https://www.youtube.com/watch?v=qevIIQHrJZg>)
- B. MIT robotic fish ([https://www.youtube.com/watch?v=BSA\\_zb1ajes](https://www.youtube.com/watch?v=BSA_zb1ajes))

Soft robots are those which are not composed of rigid links as body parts. They are also known as biomimetic robots. Researchers are focussing more on developing materials more suitable to mimic the body of the animals/mammals for improving the efficiency of existing products.

#### 6. Category-6: Micro-robots

- A. Cancer Killing Nanobots (<https://www.youtube.com/watch?v=Cg--UVL9xCc>)
- B. MIT Insect like robots ([https://www.youtube.com/watch?v=50\\_kK9phHy8](https://www.youtube.com/watch?v=50_kK9phHy8))

Micro-robots are robots which are generally with characteristic dimensions less than 1mm. They are finding use in Biomedical applications such as removing clots from the brain of humans, and surgery assisting micro robots.

#### 7. Category-7: Hybrid robots

- A. Cyborg Beetles (<https://www.youtube.com/watch?v=tgLjhT7S15U>)
- B. Wheeled Legged Robots (<https://www.youtube.com/watch?v=ukY0vyM-yfY>)

It is known as Hybot. It is a form of robot which is controlled by a computer consisting of both electronic and biological elements. Work is being done to control the Gait of insects/animals to make them do sophisticated tasks which is difficult for a Human Being.

### ➤ Task-3:

Most common types of motors are:

1. **Brushed DC motor:** Brushed DC motors does not require a controller to switch current in the windings. Instead, communication of the windings is done mechanically. They have good low speed torque, lightweight and inexpensive.  
**Examples:** DVD writer, RC cars, Electric trimmers etc.
2. **Brushless DC motor:** It is a DC motor which is turned inside out. To control the speed of these an Electronic Speed Controller is required. They have higher efficiencies, high reliability and no brushes and commutator to wear out.  
**Examples:** Drones, RC Aircrafts, AUV/ROV Thrusters etc.
3. **Stepper Motor:** A stepper motor is a discrete positioning device that moves one step at a time for each pulse of command input. They are ideal for open loop positioning control and produces better torque than DC motors at lower speed. It is also Brushless.  
**Examples:** 3D printers, 2 axis plotters, CNC Machines etc.
4. **Servo Motors:** it can rotate an object with great precision at some specific angles or distance. It has an advantage of availability in a wide range of sizes and torque ratings. It is limited to 180 degrees and uses logic level pulses from a microcontroller/servo controller. It uses brushed DC motor.  
**Examples:** RC aircraft (wing control), Mobile robots, Actuators etc.

5. **AC Motors/Synchronous:** These are rarely used in robots because of most of the robots have DC power source. Its speed is independent of load and it is not self-starting. A prime mover is used for rotating the motor to its synchronous speed.

**Examples:** Machine tools used in Industries, Robot Actuators, Generators, Fans, Compressors etc.

6. **AC Induction/ Asynchronous:** They operate at a speed less than their synchronous speed. Same as Synchronous motors, they don't find much use in Robotics. They have high efficiency and their speed varies with the applied load.

**Examples:** Pumps, Vacuum cleaners, Drilling Machines etc.

➤ **Task-4:** Reviewed

➤ **Task-5:** Reviewed