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Assignment – 1

Q.2

Seven categories of robots are as follows:

1) **Manipulators**
   Object Classification and Sorting with 5 DOF Robotic Manipulator | RME | University Of Dhaka - YouTube
   It is a 5 DOF robotic manipulator. The base has 2 axes of rotation. The elbow and shoulder have one axis of rotation each. The manipulator can perform twist motion which counts for one more DOF.

2) **Mobile Robots**
   Mobile Robot project in Philadelphia university - YouTube
   The robotic workspace of mobile robots is a flat ground. They are usually used to industrial plants to carry payloads from one manufacturing station to another. They are attached with sensors to detect obstacles and adjust their path of motion

3) **Aerial Robots (UAV)**
   Aerial Robotics Course Project : Automatic Trajectory Following - YouTube
   The most common aerial robots are quadcopters. They can be used for surveying, delivery, videography and countless applications.

4) **Underwater Robots (AUV)**
   Kawasaki: Autonomous Underwater Vehicle "SPICE" - YouTube
   The AUVs have several underwater applications. The AUV in the video is developed by Kawasaki to detect any damages caused to the underwater pipeline. The AUVs are also used for surveying in the depth of the ocean, detect wrecks, etc.

5) **Soft Robots**
   This Unstoppable Robot Could Save Your Life - YouTube
   The arms of this type of robot are flexible and not rigid. For some robots the arms can be inflated and deflated using compressed air. They can adjust and tackle even if there are obstacles in their way.

6) **Micro Robots**
   Top 5 UNREAL Micro Robots - YouTube
   Micro robots can have several applications. Use of microrobots in the field of medicine is currently under testing phase.

7) **Hybrid Robots**
[The Flying STAR robot, a hybrid flying crawling quadcopter robot - YouTube]
Hybrid robots are built using combination of two or more robots. They are defined for carrying out multiple functions. They are based on a very specific requirement.

Q.3

The most common type of motors are as follows:

1) **Brushed DC motor**
Has a stator and a rotor. Stator has copper brushes attached to it, thus the name. The stator also has magnets on the other its side. We can switch the direction of spin of the rotor by reversing the polarity of the magnets.

2) **AC induction motors (Asynchronous)**
Magnetic field is created by a winding. AC voltage used in this device polarity of magnetic field keeps oscillating. The AC current flows magnetic flux is created in the metal core. The rotor rod rotated due to EMF produced. Higher the frequency of the current higher the speed of rotation.

3) **AC synchronous motors**
The rotor speed and the stator magnetic field is equal. It is not made out of closed loop of coils but permanent magnets or electromagnets. When we supply AC current alternating magnetic field will be created and rotor will rotate.

4) **DC brushless motors**
It has a triple phase input. It has a stator and a rotor as well. There are two types of rotors naming outrunner and inrunner. The ratio of poles and number of magnets is predefined. An ESC (electronic speed controller) is attached to control the speed of the motor.

5) **Stepper motors**
It is also a brushless DC motor with stator on outside and rotor in the middle. Here, triple input is not provided. There are two different coils having a particular number of windings each which decides the angle of the step. Each time when polarity is changed it creates a step. To control these motors a stepper driver is used.

6) **Servos**
It is a brushed DC with some extra components. The most important component of a servo motor is the feedback. It could be an encoder or a potentiometer. To generate greater torque gears are used. Usually, a PWM signal is used to control servo motors.