ITR- Assignment 1

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Task 2-

1. Robotic Manipulators: https://youtu.be/IHS58MptlFQ

   The Terabot-S is a platform-agnostic robot manipulator designed by Oceaneering Space Systems in Clear Lake, Texas USA for mobile robotics applications such as first response, military EOD, surveillance, mining, research.

2. Mobile Robots: https://youtu.be/YZQDPML2W5Y

   A mobile robot is an automatic machine that is capable of locomotion.[1] Mobile robotics is usually considered to be a subfield of robotics and information engineering. Mobile robots like the one above are used in supply chain management and inventories widely to automate the system.

3. Aerial Robots: DJI – Introducing Phantom 4 Pro

   Best example of aerial robots are Drones. Drones are used everywhere nowadays from aerial video shooting to defence.

4. Underwater robots: https://youtu.be/_nn1_AyyrfE

   The RoboTuna is a robotic fish project involving a series of robotic fish designed and built by a team of scientists at the MIT in the US.Their aim was to investigate the possibility of constructing a robotic submarine that could reproduce the way tunas swim and see if they could find a superior system of propulsion for the Autonomous Underwater Vehicles (AUVs).

5. Soft robots: https://youtu.be/qoeMaFlB5xs

   Soft robotics is a subfield of robotics that concerns the design, control, and fabrication of robots composed of compliantmaterials, instead of rigid links.In contrast to rigid-bodied robots built from metals, ceramics and hard plastics, the compliance of soft robots can improve their safety when working in close contact with humans.

6. Micro robots: Magnetic Micro-Robots
   Microbotics (or microrobotics) is the field of miniature robotics, in particular mobile robots with characteristic dimensions less than 1 mm. The term can also be used for robots capable of handling micrometer size components.Tiny robots activated by magnetic fields may be used in future biomedical procedures.

7. Hybrid Robots: https://youtu.be/DhpMlI8jb5o

Hybrid robotis are categories that involve amalgamation of two types of robots. One of the recent example is of the shown Leonardo by catlech team. Its is hybrid of drone and mobile legged robot. The propellers give it extra stability and more function than traditional legged robot.

Task 3-

DC Motors:

1. Brushed DC motor : This uses brush to change the polarity of the magnetic field
2. Brushless DC motor(BLDC) : This works similar to the Brushed DC motors. In brushed DC motors, the polarity was changed using the brushes but here, the polarity is being changed eloctonically.
3. Stepper Motor : This works similar to the BLDC motor but in BLDC, the polarity is changed according to the peak in the back emf, in strpper motor the polarity is changed according to the number of steps required. Each change in polarity coresponds to a step in the rotor.
4. Servo motor(Brushed DC) : This is a general DC motor with a feedback loop which uses potentiometer(or encoder) to get to the correct angle.
5. DC Shunt Motor: DC shunt motor works on DC and the windings of this electric motor like the armature windings and field windings are linked in parallel which is known as a shunt.
6. DC Series Motor : In DC series motors, rotor windings are connected in series. The operation principle of this electric motor mainly depends on a simple electromagnetic law.

7. PMDC Motor : The term PMDC stands for “Permanent Magnet DC motor”. It is one kind of DC motor which can be inbuilt with a permanent magnet to make the magnetic field necessary for the electric motor operation.

AC Motors:

1. Asynchronous AC motors : It’s an AC motor that works using the induction, so there is no contact between the magnetic field and the rotor. The rotor speed and the speed of stator’s magnatic field is not same that’s why it’s called Asynchronous.
2. Synchronous Motor: This is similar to the Asynchronous AC motor but the only difference is that the rotor speed and the speed of stator’s magnatic field is same because the rotor follows the stator’s magnatic field.

Cite : https://www.elprocus.com/different-types-of-electric-motors/

Assign-1

Wednesday, 24 August 2022 10:42 PM

Task - 6)

We know rotation matrix R is orthogonal

so $R^T R = I$

$$R_0^1 = \begin{bmatrix} a & b & c \end{bmatrix}$$

$$a = \begin{pmatrix} \hat{i}_1 \cdot \hat{i}_0 \\ \hat{j}_1 \cdot \hat{j}_0 \\ \hat{i}_1 \cdot \hat{k}_0 \end{pmatrix} \qquad b = \begin{pmatrix} \hat{j}_1 \cdot \hat{i}_0 \\ \hat{j}_1 \cdot \hat{j}_0 \\ \hat{j}_1 \cdot \hat{k}_0 \end{pmatrix} \qquad c = \begin{pmatrix} \hat{k}_1 \cdot \hat{i}_0 \\ \hat{k}_1 \cdot \hat{j}_0 \\ \hat{k}_1 \cdot \hat{k}_0 \end{pmatrix}$$

$$R^T R = I$$

$$\begin{bmatrix} a^T a & a^T b & a^T c \\ b^T a & b^T b & b^T c \\ c^T a & c^T b & c^T c \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

so comparing element

$$a^T a = 1 \ (I) \qquad b^T b = 1 \ (I) \qquad c^T c = 1 \ (I)$$

so **colums** of R_0^1 are **orthogonal with unit length.**

Task - 7

We know $R^T R = I$

& $\det(AB) = \det(A)\det(B)$

$\det(A^T) = \det(A)$ & $\det(I) = 1$

so $\det(R^T R) = \det(I)$

$\det(R^T)\ \det(R) = 1$

$\det(R)^2 = 1$

$\det(R) = \pm 1$

For right handed coordinate axis

$\hat{i} \times \hat{j} = \hat{k}$

it becomes $\det(R) = +1$