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INTRODUCTION TO AI ROBOTICS

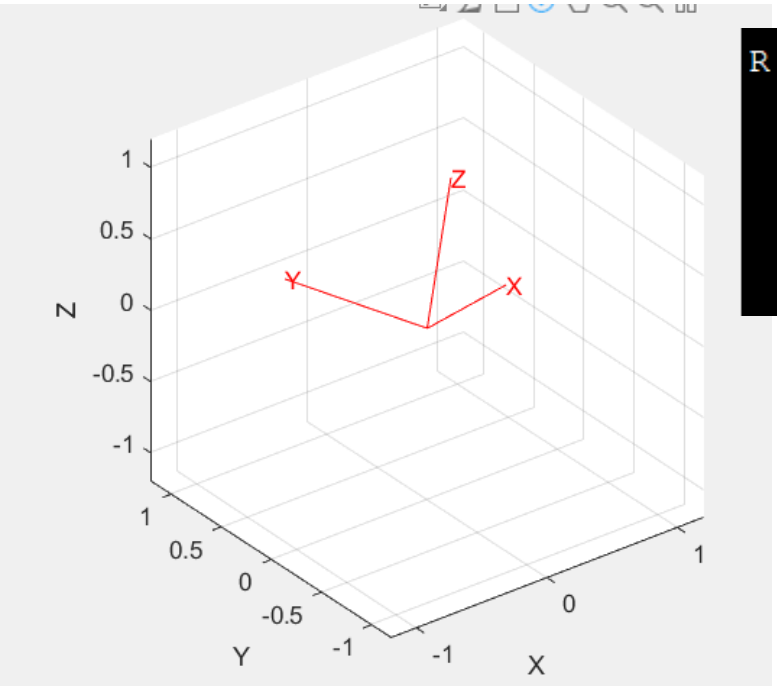
Labsheet – 5

1)Explore the function in Matlab eul2r

R= eul2r(0.1,0.2,0.3)

```
% Q1
R = eul2r(0.1,0.2,0.3)

trplot(R, 'color', 'r');
view(3);
```




```
R =

    0.9021   -0.3836    0.1977
    0.3875    0.9216    0.0198
   -0.1898    0.0587    0.9801
```

2)Explore the function in Matlab tr2eul

tr2eul(R)

```
% Q2
EulAngles = tr2eul(R)
```

```
EulAngles =

    0.1000    0.2000    0.3000
```

3) Check the orthogonality of R

```
% Q3
inverse = inv(R)
transpose = R'
```

For Orthogonal Matrices, it follows the property

$$A^{-1} = A^{T}$$

```
inverse =

    0.9021    0.3875   -0.1898
   -0.3836    0.9216    0.0587
    0.1977    0.0198    0.9801


transpose =

    0.9021    0.3875   -0.1898
   -0.3836    0.9216    0.0587
    0.1977    0.0198    0.9801
```

$R^{-1} = R^{T}$

Thus R is Orthogonal

4)Find R = eul2r(0.1,-0.2,0.3)

Find tr2eul(R)

Write your observation.

```
% Q4
R = eul2r(0.1,-0.2,0.3)
EulAngles = tr2eul(R)
```

```
R =

    0.9021   -0.3836   -0.1977
    0.3875    0.9216   -0.0198
    0.1898   -0.0587    0.9801


EulAngles =

   -3.0416    0.2000   -2.8416
```

Euler Angles is a conversion of Quaternions. Transforms use Quaternions under the functions eul2r(phi, theta, psi) and tr2eul(R).

Quaternions are functions of sines and cosines, which are periodical.
Thus the Quaternion conversion results in the range of [0, 2π]
if an input other than in the range of [0, 2π] is given the conversion back to Eulerian Angles will result in the domain of Quaternion, Thus Quaternion conversion will not result in the same Eulerian Angle