22AIE214 – INTRODUCTION TO ROBOTICS

LABSHEET 5

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1)Explore the function in Matlab eul2r

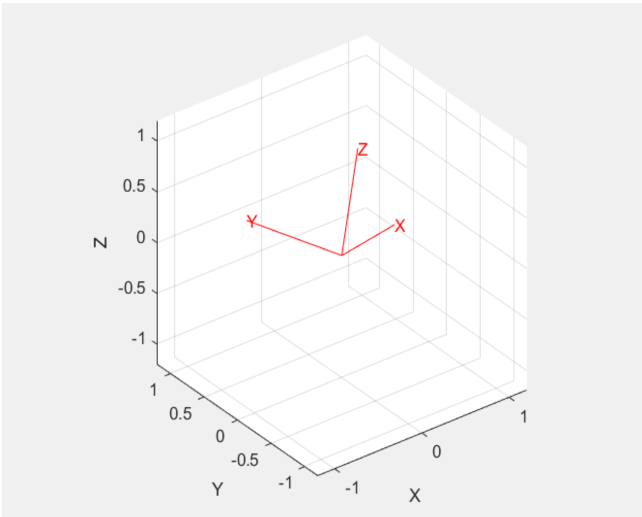
R= eul2r(0.1,0.2,0.3)

CODE :

```
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)

CODE :

```
R= eul2r(0.1,0.2,0.3)
tr2eul(R)
```

```
>> Lab5_Q2

R =

    0.9021   -0.3836    0.1977
    0.3875    0.9216    0.0198
   -0.1898    0.0587    0.9801


ans =

    0.1000    0.2000    0.3000
```

3) Check the orthogonality of R

CODE :

```
R = eul2r(0.1,0.2,0.3)
inverse = inv(R)
transpose = R'
```

```
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
```

Orthogonal matrices follow property : $A^{-1} = A^T$

Here $R^{-1} = R^T$, therefore matrix R is orthogonal

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

Find tr2eul(R)

Write your observation.

CODE :

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

```
>> Lab5_Q4

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
```

Observation :

Euler angles can be converted from quaternions using functions like `eul2r(phi, theta, psi)` and `tr2eul(R)`. Since quaternions are based on periodic functions such as sine and cosine, their values fall within the range [0, 2π]. If the input values exceed this range, converting to quaternions and then back to Euler angles might not give you the original angles, because quaternions will always convert to values within 0 to 2π.