Homework 2

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CE 661

1. Question 1

    a. NWU is a right handed system

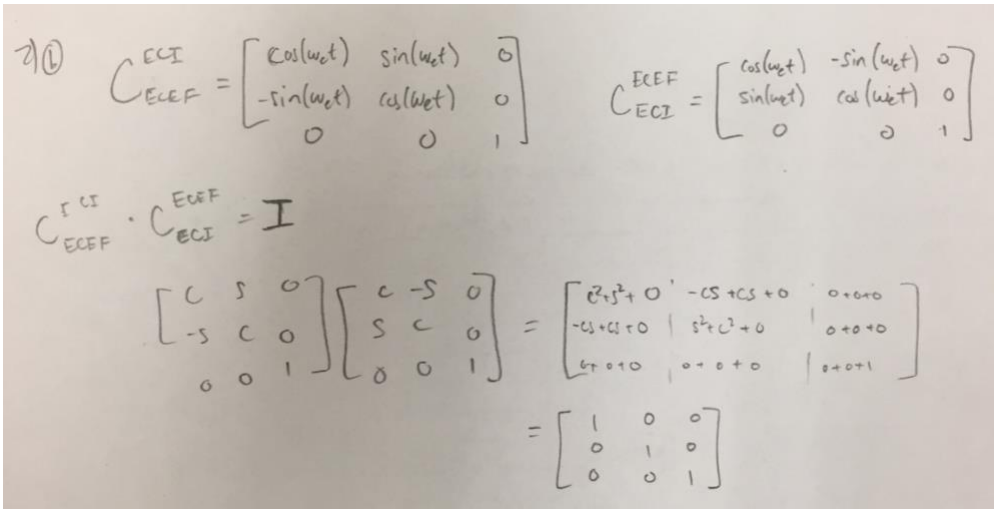
    b. $C = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos(\theta) & -\sin(\theta) \\ 0 & \sin(\theta) & \cos(\theta) \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & -1 \end{bmatrix}$

    c. The determinant of C is 1. This is expected since this matrix is a rotation about x.

    d. The point will be reflected in y and z but not change in x. The point in the NWU frame is (11.521, 215.633, -108.617).

2. Question 2

    a. $C_{ECI}^{ECER} = (C_{ECEF}^{ECI})^T = \begin{matrix} \cos(\omega_e t) & -\sin(\omega_e t) & 0 \\ \sin(\omega_e t) & \cos(\omega_e t) & 0 \\ 0 & 0 & 1 \end{matrix}$

    b. 

3. Question 3

    a. Quaternion = [0.0427 0.0303 0.7070 0.7053]

b. $C_{IMU}^{NED} = \begin{bmatrix} -0.0015 & 0.9998 & 0.0177 \\ -0.9947 & -0.0033 & 0.1030 \\ 0.1030 & -0.0174 & 0.9945 \end{bmatrix}$

4. Question 4

$$C_{NED}^{IMU} = \begin{bmatrix} -0.1042 & 0.9813 & 0.1619 \\ -0.9938 & -0.0964 & -0.0555 \\ -0.0388 & -0.1667 & 0.9853 \end{bmatrix}$$

5. Point in frame 2 = [3.6863, 5.0151]. Multiple by a rotation matrix that has theta = 30.