

# CISC 330-Assignment 1

## ORTHONORMAL Coordinate System - Ground Truths

### Test 1

$$a = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \quad b = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} \quad c = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$$

$$\text{center} = \left( \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} + \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix} \right) / 3 = \begin{bmatrix} 1/3 \\ 1/3 \\ 0 \end{bmatrix}$$

$$x = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} - \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$$

$$c - a = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix} - \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$$

$$z = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} \times \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix} = \begin{bmatrix} 0 \times 0 - 0 \times 0 \\ 0 \times 0 - 0 \times 0 \\ 1 \times 1 - 0 \times 0 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$$

$$y = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} \times \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} = \begin{bmatrix} 0 \times 0 - 0 \times 1 \\ 1 \times 1 - 0 \times 0 \\ 0 \times 0 - 1 \times 0 \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$$

\*x, y & z are all normalized\*