EE2802: Assignment5

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1 Problem

For the vectors $\mathbf{a} = \begin{pmatrix} 2 \\ -1 \\ 2 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} -1 \\ 1 \\ -1 \end{pmatrix}$, find the unit vector along the direction of $\mathbf{a} + \mathbf{b}$.

2 Solution

$$\mathbf{a} = \begin{pmatrix} 2 \\ -1 \\ 2 \end{pmatrix} \tag{2.0.1}$$

$$\mathbf{b} = \begin{pmatrix} -1 \\ 1 \\ -1 \end{pmatrix} \tag{2.0.2}$$

$$\mathbf{a} + \mathbf{b} = \mathbf{u} = \begin{pmatrix} 2 \\ -1 \\ 2 \end{pmatrix} + \begin{pmatrix} -1 \\ 1 \\ -1 \end{pmatrix} \tag{2.0.3}$$

$$= \begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix} \tag{2.0.4}$$

Unit vector in direction of $\mathbf{u}$,

$$\hat{\mathbf{u}} = \frac{\mathbf{u}}{\|\mathbf{u}\|} \tag{2.0.5}$$

$$= \frac{1}{\sqrt{2}}\mathbf{u} \tag{2.0.6}$$

$$= \frac{1}{\sqrt{2}} \begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix} \tag{2.0.7}$$

$$\hat{u} = \begin{pmatrix} \frac{1}{\sqrt{2}} \\ 0 \\ \frac{1}{\sqrt{2}} \end{pmatrix} \tag{2.0.8}$$