

Question Set 3

CS 420

Chapter 3

1. What does \tilde{o} represent?
2. Practically speaking, what is the difference between a basis and a frame?
3. Given points \tilde{p} and \tilde{q} , how do we construct a vector from \tilde{p} to \tilde{q} ?
4. Is translation linear or affine?
5. Is rotation linear or affine?
6. Does $[3, 7, 8, 1]^t$ represent a point or a vector?
7. Express the affine matrix

$$\begin{bmatrix} a & b & c & d \\ e & f & g & h \\ i & j & k & l \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

as the product of its translational and linear factors.

8. Which of these transformations are RBTs: rotation, scale, translation?
9. These two operations make sense: $\tilde{p} - \tilde{q} = \vec{v}$ (point-point subtraction), and $\tilde{q} + \vec{v} = \tilde{p}$ (point-vector addition). On its face, this operation does not make sense (What is the product of a scalar and a point? What is the sum of two such objects?):

$$\alpha\tilde{p}_1 + (1 - \alpha)\tilde{p}_2,$$

in which α is on the interval $[0, 1]$. Algebraically manipulate this operation into a form that does make sense. What is the type (vector or point) of this operation? What is its geometric interpretation?