Introduction to Flight Simulation (List 6)

Due: 23 november 2010

1. Let

$$\overline{v}_1 = \begin{pmatrix} 10 \\ 1 \\ -3 \end{pmatrix}, \quad \overline{v}_2 = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}, \quad \overline{v}_3 = \begin{pmatrix} -4 \\ 5 \\ -7 \end{pmatrix}, \quad \overline{v}_4 = \begin{pmatrix} -1 \\ 3 \\ 8 \end{pmatrix}.$$

   Compute (by hand), $\overline{v}_1 \times \overline{v}_2$, $\overline{v}_2 \times \overline{v}_3$, $\overline{v}_3 \times \overline{v}_4$. Compute $\overline{v}_1 \times (\overline{v}_2 + \overline{v}_3)$ and $\overline{v}_1 \times \overline{v}_2 + \overline{v}_1 \times \overline{v}_3$.

2. Also compute $\overline{v}_1.\overline{v}_2$, $\overline{v}_2.\overline{v}_3$, $\overline{v}_3.\overline{v}_4$.

3. Assume that force $F = (4, 5, 6)$ works at position $\overline{r} = (-1, 4, -3)$. Compute the resulting torque.

   Same for force $(-4, 5, 7)$ at position $\overline{r} = (-1, 3, 8)$.

4. Suppose that a plane (its center of gravity) is flying at speed $(70, 3, 5)$ aligned exactly along the X-axis. Note the plane is slight sideslipping, and that it will not stay aligned. Assume that the plane has angular velocity $(0.1; 0.3; -0.5)$. Compute the speed of the right wing tip on position $(-5, 20, -1)$, and the speed of the rudder, on position $(-20, 0, -5)$.