Computer Science

COMPSCI 372 S2 C – Exercise Sheet 5

12th August 2008

Q1: Let $\mathbf{u} = \begin{pmatrix} 1 \\ 3 \\ -2 \end{pmatrix}, \mathbf{v} = \begin{pmatrix} 2 \\ 0 \\ 1 \end{pmatrix}, \mathbf{w} = \begin{pmatrix} -2 \\ 0 \\ 0 \end{pmatrix}$

Compute

1. **u·v**
2. **u×v**
   Test whether your result is correct by checking whether the resulting vector **u×v** is perpendicular to both **u** and **v**.
3. the angle between **u** and **v**

Q2: Compute the area of the triangle defined by the vertices $P_1 = \begin{pmatrix} 2 \\ 0 \\ 0 \end{pmatrix}, P_2 = \begin{pmatrix} 0 \\ -1 \\ 0 \end{pmatrix}, P_3 = \begin{pmatrix} 2 \\ -1 \\ 3 \end{pmatrix}$

Q3: Find all vectors which are orthogonal to the vector $\mathbf{u} = \begin{pmatrix} 2 \\ 0 \\ 1 \end{pmatrix}$

Q4: Let $\mathbf{M} = \begin{pmatrix} 3 & -1 & 0 \\ 2 & 4 & 1 \end{pmatrix}, \mathbf{N} = \begin{pmatrix} 1 & 0 \\ 0 & 4 \\ -2 & -3 \end{pmatrix}$

Compute

1. $\mathbf{M}^T + \mathbf{N}$
2. **M·N**
3. **N·M**

Q5: Determine whether the four points $P_1 = \begin{pmatrix} 2 \\ 1 \\ 0 \end{pmatrix}, P_2 = \begin{pmatrix} 2 \\ -1 \\ 0 \end{pmatrix}, P_3 = \begin{pmatrix} 1 \\ 1 \\ 3 \end{pmatrix}, P_4 = \begin{pmatrix} 0 \\ 0 \\ 6 \end{pmatrix}$ lie on the same plane.

Q6: Compute the distance of the point $Q=\begin{pmatrix}1\\1\\0\end{pmatrix}$ to the plane $\begin{pmatrix}3\\1\\1\end{pmatrix}\bullet \mathbf{p} = 2$

Q7: Let $\mathbf{M} = \begin{pmatrix}0 & 2 & 0\\3 & 0 & 1\\5 & 0 & 2\end{pmatrix}$

a) Compute the inverse of **M**.
b) Test whether your result is correct by computing $\mathbf{M}\,\mathbf{M}^{-1}$.

Q8: Compute the intersection point (if any)

a) of the line $\begin{pmatrix}0\\2\\1\end{pmatrix}+\lambda\begin{pmatrix}1\\0\\0\end{pmatrix}$ with the plane $\begin{pmatrix}0\\-1\\3\end{pmatrix}\bullet \mathbf{p} = 4$

b) of the line $\begin{pmatrix}0\\2\\1\end{pmatrix}+\lambda\begin{pmatrix}0\\-1\\0\end{pmatrix}$ with the plane $\begin{pmatrix}0\\-1\\3\end{pmatrix}\bullet \mathbf{p} = 4$