Exam – Computer Graphics

21 august 2009, 8-13

1 (a) Write down the matrix which performs a rotation of π/4 around the positive x-axis. *(0.5)*
(b) Explain the vector operation *cross product* and give its formula? *(0.5*)

2 (a) What is *perspective correct interpolation*? *(0.6)*
(b) What is the relationship between the normal, the tangent and the binormal of a surface? *(0.4)*

3 (a) Explain the concept of *texture mapping*? *(0.3)*
(b) What is a *reflection map* (also known as an *environment map*), and what purposes can it be used for? *(0.7)*

4 (a) Explain how *rasterization* of a triangle is done. *(0.7)*
(b) What is *ray tracing* and how does it work. *(0.3)*

5. What is drawn on the screen after a call to the function draw() below? *(1.0)*

```
def draw():
   glColor(1, 0, 0)
   glScale(1, 2, 1)
   glPushMatrix()
   glRotate(90, 0,0,1)
   glTranslate(-1, 0, 0)
   drawSquare()

   glColor(0, 1, 0)
   glTranslate(2, 3, 0)
   glRotate(180, 0,0,-1)
   glPopMatrix()
   glRotate(180, 0,0,-1)
   glPushMatrix()
   glTranslate(-3, -1, 0)
   glScale(2, 2, 1)
   drawSquare()

   glColor(0, 0, 1)
   glPushMatrix()
   glRotate(180, 0,0,1)
   glPopMatrix()
   glTranslate(-1, 0, 0)
   drawSquare()

def drawSquare():
   glBegin(GL_QUADS)
   glVertex(0,0)
   glVertex(0,1)
   glVertex(1,1)
   glVertex(1,0)
   glEnd()
```

6 (a) Describe *Phong's reflection model*. *(0.6)*
(b) Which important simplifications of the exact equation for light transmission does this model exploit? *(0.4)*

THE END!