DH2320   COMPUTER GRAPHICS AND VISUALIZATION   C. PETERS

Mon 10th March 2014 14:00-19:00   Written Exam

Aids: None

Instructions
The exam consists of 10 questions. The number of points awarded for each correct answer is stated next to the corresponding question. The maximum score is 22. To pass the exam, you need at least 13 points.

Read the questions carefully before answering and remain calm. Please write legibly in English – answers that I cannot understand will receive 0 points! Feel free to use figures/sketches to complement your written explanations.

Good luck!

Question 1 (3p): This piece of WebGL code will produce an animation by continually adjusting the *transformation* of an object. Only the most important part of the code is included. Describe, with the aid of a diagram, how the object (a square) will move.

```
var mvMatrix = mat4.create();
var anim = 0;


function animateWebGL()
{
     anim -= 1.0;
}


function drawSceneWebGL()
{
     ...
     mat4.identity[mvMatrix];
     mat4.translate(mvMatrix, [0.0, anim, 0.0]);
     mat4.rotate(mvMatrix, anim, [0.0, 0.0, 1.0]);
     drawSquare(); //draws a square of width 1.0 on the screen with
                   //a local origin located at the square center
     ...
}
```

Question 2 (4p): Polygonal meshes are often used in 3D computer graphics to represent solid virtual objects. Describe four elements of polygonal meshes.

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Question 3 (2p): What is *normal mapping*? Explain how it works.

Question 4 (2p): Why are approximations necessary for creating interactive computer graphics applications?

Question 5 (3p): The *Phong* reflection model is a sum of three terms, each modeling a specific type of light reflection. Name and describe the three terms.

Question 6 (2p): In hidden surface removal in computer graphics, what is *z-fighting*? Explain why it arises.

Question 7 (2p): Describe the principles underlying *key-frame animation* in computer graphics, making brief reference to traditional hand-drawn animation practices.

Question 8 (1p): Describe what is meant by *ordinal data*.

Question 9 (1p): What is a *diverging color map*?

Question 10 (2p): What is *regression analysis* and how is it useful in data mining?

END