UNIVERSITY COLLEGE LONDON

University of London

EXAMINATION FOR INTERNAL STUDENTS

For the following qualifications:-

M.Sc.

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ESGV1: Principles of Virtual Environments

COURSE CODE   :   **ENVSGV01**

DATE   :   **29-Aug-03**

TIME   :   **10.00**

TIME ALLOWED   :   **3 hours 0 minutes**

TURN OVER

PART A

Answer ALL FOUR questions from Part A

1. (a)   Nawal is attempting to make a space ship follow an asteroid. The asteroid is at coordinate {3,3,3} and the space ship is at {2,5,2}. What is the vector between them?

[2 marks]

(b)   Currently the space ship is pointing in the direction (1 0 0). What angle would it have to turn through to point at the asteroid?

[4 marks]

(c)   Nawal is using the function "makeRotation()" to transform her space ship to point towards the asteroid. The function takes the axis of rotation and the angle to rotate about as parameters. Calculate the axis of rotation about which Nawal should rotate the space ship.

[6 marks]

2. (a)   Describe how a 4 x 4 matrix can be used to perform the functions translation, scaling and rotation separately. Give an example of such a transformation 4 x 4 matrix in your answer.

[6 marks]

(b)   Why is it important to separate the functions like this?

[2 marks]

(c)   Why is a reflection matrix not generally used in 3D graphics?

[2 marks]

3. (a)   Describe the steps required to construct a perspective viewer matrix.

[4 marks]

(b)   Demonstrate the construction of a perspective viewer matrix by preparing a matrix that looks along the *x*-axis towards positive *x*. Be careful to select a sensible value for your perspective distortion, and to ensure it distorts along the correct axis.

[6 marks]

(c)   Transform the triangle formed by the coordinates {1,1,1}, {2,-1,-1}, {1,2,2} using your viewer matrix.

[6 marks]

(d)   Sketch the triangle and the transformed triangle in order to demonstrate the perspective distortion.

[4 marks]

2. Describe the process of *z*-buffering. In your answer explain at what stage in the rendering process *z*-buffering is used, and why it is important to 3D graphics.

[8 marks]

TOTAL 50 MARKS for Part A

PART B

Candidates should refer to the work of authors they have studied wherever relevant and illustrate their answers with examples wherever possible. Candidates should feel free to use diagrams in their answers wherever they feel it is appropriate to do so.

·Candidates must answer TWO questions from Part B

1. What is a Distributed Virtual Environment? As designers, how is the design of a distributed office environment related to that of a real building?

(25 marks)

2. How can avatars be used for communication in a virtual community? Drawing from your own experience, describe the role of avatars within virtual communities. How did their actions help or hinder communication?

(25 marks)

3. The CAVE system can be viewed as both a collaborative and augmented reality system. Discuss the meaning of these terms.

(25 marks)

4. Discuss the relevance of Navigation in virtual environments. What are the pros and cons of existing navigational methods and how can these be exploited by virtual environment designers?

(25 marks)

5. "Linear narrative is a wholly inappropriate model for interactive virtual environments."
Discuss.

(25 marks)

TOTAL 50 Marks

END OF PAPER