Royal Melbourne Institute of Technology
School of Computer Science and Information Technology
INTE1113/2033 (IT543) 3D Web Technologies

PRACTICE EXAM Semester 2 2001

Date: Thursday 4th July
Duration: 2 hours

Time: 1:45 pm to 4:00 pm
Number of Pages: 4

Instructions to Candidates:

The exam accounts for 50% of the total marks for the subject.

Candidates should attempt all questions 1 to 9.

Marks for each question are shown. Total marks for the exam is 120.

Question 1

A VRML file is a textual description of a 3D world or object. Valid VRML files begin with a header. Comments are used in VRML to document the structure and logic.

(a) Write an example of a VRML header.
(b) Write an example of a VRML comment.

\[(2+2 = 4 \text{ marks})\]

Question 2

VRML scenes are composed of nodes, fields and field values.

Shape

\{
\text{appearance Appearance}
\{
\text{material Material}
\{
\text{diffuseColor 1.0 0.0 0.0}
\}
\}
\text{geometry Cylinder}
\{
\text{height 10.0}
\text{radius 1.0}
\}
\}
\)

(a) Describe the appearance of this VRML in 3D.
(b) Describe the purpose of each node.
(c) Re-write this code fragment to draw a green sphere with a diameter of 6 units.

\[(2+4+6 = 12 \text{ marks})\]
Question 3

VRML is designed for web-based real-time, interactive three dimensional content.
(a) Describe three features of VRML for conserving bandwidth minimising download time.
(b) Describe three features of VRML for maximising graphics performance and real-time interactivity.

(6+6 = 12 marks)

Question 4

The VRML Transform node allows translation, scaling and rotation of shapes in three dimensions. Write the VRML Transform for the following illustrations. (You need not include the children of the Transform node)

(a)

(b)

(c)

(d)

(2+2+2+4 = 10 marks)
Question 5

VRML transformations may be nested, forming a heirarchy of shapes and relative transformations. In the following example, a simple model of the solar system is formed by nested transformations. The earth rotates around the sun and the moon rotates around the earth, and so on.

DEF SUN Transform
{
  children
  [
    Shape { ... sun shape ... }
    DEF EARTH Transform
    {
      children
      [
        Shape { ... earth shape ... }
        DEF MOON Transform
        {
          children
          [
            Shape { ... moon shape ... }
          ]
        ]
      ]
    ]
  ]
}

(a) How would a translation applied to the SUN node affect the position of the sun, earth and moon?
(b) What would happen when a rotation is applied to the earth node?
(c) Write a VRML PROTO called Planet that includes fields for the radius and colour of the planet. Include both the interface and body of the PROTO.
(d) Using your planet PROTO, write the VRML code for a solar system including the sun, earth and mars. The sun should be yellow, the earth should be blue, and mars should be grey.
(e) Write a VRML OrientationInterpolator node for rotating the earth around the sun.

(2+2+6+6+6 = 22 marks)

Question 6

Material and Lighting

(a) What are the three kinds of VRML light source?
(b) Describe the fields of the VRML Material node.

(3+6 = 9 marks)
Question 7

VRML includes shapes such as spheres, cones, cylinders and boxes. Other shapes must be constructed from lines and faces using co-ordinate based geometry.

(a) Write a VRML IndexedLineSet node for the arrow.
(b) Write a VRML IndexedFaceSet node for the arrow.
(c) Are the face(s) in your IndexedFaceSet convex? Explain why.
(d) Should the solid field of your IndexedFace be TRUE or FALSE? Why?

(8+8+4+4 = 24 marks)

Question 8

VRML Texturing
(a) List at least three image file formats that can be used for textures in VRML.
(b) What are the advantages of these image file formats?
(c) What is the purpose of texture coordinates in IndexedFaceSets and ElevationGrids?

(3+6+6 = 15 marks)

Question 9

VRML Audio
(a) List at least two sound file formats that can be used for audio in VRML.
(b) What are the advantages of these audio file formats?
(c) What are the purposes of the VRML AudioClip and Sound nodes?

(2+4+6 = 12 marks)

THE END