EXAM
DH2320 Computer Graphics and Visualization
2012-06-07

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Aids: None

The exam consists of 10 questions. The number of points awarded for a correct answer is stated next to each question. The maximum score is 22. To pass the exam, you need at least 12 points.

Write legibly! Answers that I cannot read will receive 0 points! When explaining, try to be as concise and clear as possible! Answers that I cannot understand will receive 0 points! Feel free to use figures/sketches to complement your written explanations.

Good luck! /Marcus

Question 1 (2p): With pseudo Open GL code draw two lines that looks like below. One should be red and the other one green!
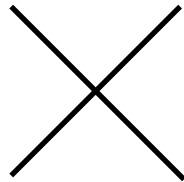
Answer:

begin(line)
glcolor(255,0,0)
glvertex(-1,1,0)
glvertex(1.-1,0)
end(line)

begin(line)
glcolor(0,255,0)
glvertex(-1,-1,0)
glvertex(1.1.0)
end(line)

Question 2 (2p): This excerpt from an OpenGL program transforms an object. Explain (preferably with a sketch) how it will move!

```
float anim = 0.0f;
void idle()
{
  anim += 1.0f;
  glutPostRedisplay();
}
void draw()
{
  ...
```

```
        glMatrixMode(GL_MODELVIEW);
        glLoadIdentity();
        glRotatef(anim, 0.0f, 1.0f, 0.0f);
        glTranslate(0.0f, 0.0f, -5.0f);
        glRotatef(2.0f * anim, 1.0f, 0.0f, 0.0f);
        glutSolidCube(1.0f);
        ...
    }
```

Answer: A cube that rotates around its own y-axes and also travels a circle around the x-axes of origo. The rotation around the origo is twice that of the cubes rotation around its own axes

Question 3 (2p): Describe the difference between a local illumination algorithm and a global illumination algorithm!

Answer: A local illumination algorithm only affects the object itself while a global illumination algorithm will affect other objects and the whole scene

Question 4 (2p): In hidden surface removal in computer graphics, what is z-fighting? Explain why it arises!

Answer: When using z-buffering the limitation of the size for the z-buffer can result in two close objects ending up with the same distance in the z-buffer. This will make it impossible for the algorithm to decide the order of these objects. Z-fighting is the artifacts that is result of this ambiguity. It shows itself as a "fight" between these surfaces where they change who is printed to screen randomly.

Question 5 (2p): Describe the difference between an interpolating spline and a Bezier spline!

Answer: An interpolating curve runs through all four control points used while a Beizer spline uses the point 2 and 3 as direction vectors for the tangents at the end points of the spline.
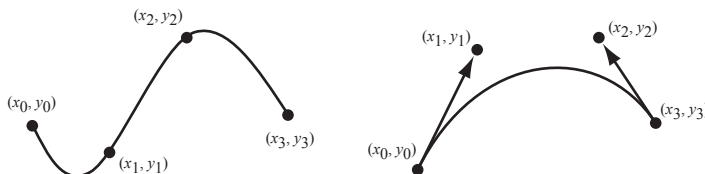

Question 6 (2p): In animation, what is a key frame? Describe how they are used!

Answer: A keyframe in animation describes the specific location of all objects of the scene. Movement between keyframes are then calculated according to specific rules when creating the animation so that the objects starts in the location of the first keyframe and end in the location from the next keyframe.

Question 7 (2p): What geometrical shape is important for natural looking movement in animation and why is it important?

Answer: Many natural movement paths have the shape of arcs for example the movement of an arm when walking.

Question 8 (2p): Explain why is this graph an example of poor information design? Describe how it could be improved!
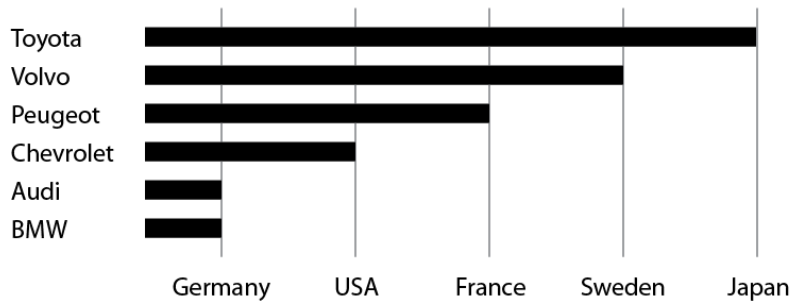
Answer: Using a bar for non-numeric values gives a false picture of order between the countries. That Germany is less then Japan. Using a point to show that for example Toyota comes from Japan makes more sense. Even better would be to place the car brands on the countries on a map.

Question 9 (2p): Why is the rainbow color map often a poor choice for encoding data in visualization?

Answer: Using a rainbow color map were one side represent a number and the other side a bigger number makes it hard to distinguish were on the scale the data is as the relationship between colors in the map is hard to communicate.

Question 10 (4p): Explain the difference between nominal, ratio, interval, and ordinal data!

Answer:
- Nominal data is labeling, it allows us to specify whether an entity is equal or not equal to another entity (in terms of the category).
- Ordinal data is ranking, it can be sorted and arranged in order but the size or the difference between data elements cannot be computed.
- Interval data is measured on a scale in which each position is equidistant, which allows for measuring distance. But since the scale has no zero-point, multiplication and division are not possible.
- Ratio data is measured on a scale with a defined zero-point, which allows numbers to be compared as multiples or ratios of one another.