

CS 230, Quiz 3

Solutions

You will have 10 minutes to complete this quiz. No books, notes, or other aids are permitted.

Problem 1 (2 points)

Write a routine that rasterizes a filled circle. That is, it draws pixels that lie on or inside the circle but not pixels that lie outside it. Your routine should be written in C++-like syntax and use the signature `void fill_circle(int x, int y, int r);`, where (x,y) and r are the circle's center and radius. You may call the routine `void draw(int x,int y);` to set the pixel (x,y) . You may assume that the circle lies entirely inside the image.

```
void fill_circle(int x, int y, int r)
{
    for(int i=-r;i<=r;i++)
        for(int j=-r;j<=r;j++)
            if(i*i+j*j<=r*r)
                draw(x+i,y+j);
}
```

Problem 2 (3 points)

What are the (a) vertex shader, (b) fragment shader, and (c) geometry shader used for? (Be specific. A good way to answer the questions is to give an example of a calculation that is typically performed at that stage.)

(a) The main use of the vertex shader is for vertex transformations. Per-vertex shading is occasionally performed in this stage. (b) The fragment shader is used for shading. The Phong shader would normally be placed here. Texture mapping and bump mapping are also done here. (c) The geometry shader is used for operations that must be performed per primitive (point, segment, triangle). It can be used to convert one type of primitive into another (such as replacing a set of points with plotting markers like diamonds or triangles). It can be used for instancing (rendering multiple copies of an object - render a whole classroom of desks by sending one desk to the GPU and duplicating it in the geometry shader).