CS 230, Quiz 4

Solutions

You will have 10 minutes to complete this quiz. No books, notes, or other aids are permitted. For the first three problems, be specific. Non-informative answers like "per-vertex calculations" or "per-fragment calculations" or "per-geometry calculations" will not be accepted. A good way to answer the questions is to give an example of a calculation that is typically performed at that stage.

Problem 1 (1 points)

What is the vertex shader used for?

The main use of the vertex shader is for vertex transformations. Per-vertex shading is occasionally performed in this stage.

Problem 2 (1 points)

What is the fragment shader used for?

The fragment shader is used for shading. The Phong shader would normally be placed here. Texture mapping and bump mapping are also done here.

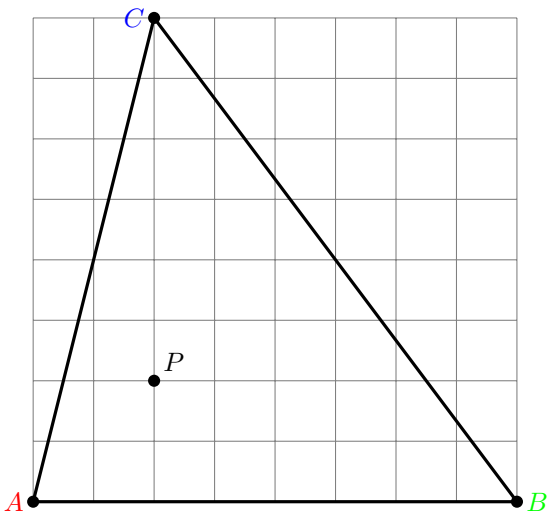
Problem 3 (1 points)

What is the geometry shader used for?

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).

Problem 4 (2 points)

The triangle below is to be rasterized. The colors of the vertices are $A = \text{yellow} = (1, 1, 0)$, $B = \text{cyan} = (0, 1, 1)$ and, $C = \text{violet} = (1, 0, 1)$. (1) Compute the barycentric weights of P, and (2) compute the color of the point P.



$$\text{area}(ABC) = 32 \qquad \text{area}(APC) = 6 \qquad \text{area}(ABP) = 8$$
$$\text{area}(PBC) = 18$$
$$\alpha = \frac{\text{area}(PBC)}{\text{area}(ABC)} = \frac{9}{16} \qquad \beta = \frac{\text{area}(APC)}{\text{area}(ABC)} = \frac{3}{16} \qquad \gamma = \frac{\text{area}(ABP)}{\text{area}(ABC)} = \frac{1}{4}$$
$$C_P = \alpha C_A + \beta C_B + \gamma C_C = \left(\frac{3}{4}, \frac{7}{16}, \frac{13}{16}\right)$$