EEC 277 – Computer Graphics Project Proposal

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Overview

For Prof. Owens' Computer Graphics class we are proposing the following project goals to gain a better understanding of the GPU and CPU relationship (specifically for my given Intel 5300 graphics card, and Cheryl's Intel 5500 card). We would like to write different vertex and fragment shaders with varying complexity and compare the results.

Performance metrics we would like to measure:

- Throughput. How many fragments/second does our program output with the varying parameters?
- FLOPS. How many floating point operations per second can our shader unit perform maximally? This can be done by multiplying the number of operations in each function by fragments.

Parameters we would like to vary:

- Function complexity. Vary the floating point operations in the function and graph the metrics.
- Vertex vs fragment shader. Holding floating point operations constant, does the GPU do vertex shading or fragment shading better?
- Branching. Keep each fragment taking branch A, then vary between branch A and B (where both branches are computationally equivalent). See how branching decision effects performance.
- As a bonus, look at the machine code of the shader. Does performance drop off after a certain register count?

Workloads we will be considering:

- Similar to wesbench, we would like to build a mesh of triangles with varying sizes. By varying the size of triangle we will be able to play with the number of vertices we are shading. This would give us the flexibility to increase vertex count to measure vertex shader throughput.
- We will try different branching strategies, from all fragments being one branch to alternating fragments branching. This will allow us to measure how branching affects throughput, and if there are mechanisms in place that accelerate branched paths.

Seeing as there is no concrete specification sheet for out graphics cards, it would be interesting to compare the performance between the two cards.

Milestones

Here are the general milestones that we hope to hit.

By Monday, 3/6: Have basic GLSL (the shader language) program compiling.

By Friday 3/10: Have various functions written for fragment/vertex shading.

By Monday 3/13: Have all performance graphs (mentioned above) done. Compare between the two graphics cards.

By Friday 3/17: Do machine code (register) analysis. At this point we may consider adding complexity to other stages of the pipeline, such as the texture part.

Ultimate Goal

The ultimate goal of this project is to be able to concretely provide evidence of the specifications of my GPU, using the programmable shader feature as a key component. If the evidence is conclusive and the data leads to a firm conclusion, I will view this project as a success.

Grading Goals

Were we able to produce all performance deliverables? Did we come to a reasonable conclusion based on the graphs? Were we able to create our own shaders of varying complexity?