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Introduction to GPU Programming

Course Project Proposal

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1 Project Proposal

For the Course Project in Intro. to GPU Programming, I will develop software using OpenCL that will accomplish "dithering" of an input image. If time and efficiency permits, I will try to develop software that will accomplish "dithering" of multiple images in "real-time" by input from a webcam-feed (or perhaps a video file) at approximately 10 frames per second (more or less depending on how efficient the process is).

1.1 Explanation of "Dithering"

According to Wikipedia[1], the process of "dithering" is "an intentionally applied form of noise used to randomize quantization error."

A good article that describes dithering and the theory behind using it can be found here.[2]

1.2 TLDR Explanation of "Dithering"

Dithering reduces the color palette of an image to (usually) very few colors (it is usually described as a process of quantization). For example, a grayscale image can be reduced to an image containing only black or white pixels. However, dithering "arranges" the pixels in the resulting image such that the resulting image resembles the original image (with some lack of accuracy).

Figure 1: Original Compared with Bayer Dithering of "Michelangelo's David" (from Wikipedia)

[1] Wikipedia entry on Dithering
[2] An article on dithering written by "Surma" who works at Google (as far as I can tell)

1.3 Types of "Dithering"

There are several types/methods of Dithering that can be applied to an image, and I haven't yet decided which algorithm to use. Depending on the algorithm involved, I will probably decide on one that can be parallelized across the GPU cores instead of any other sort of algorithm (such as recursive ones). "Blue-Noise Dithering" is one such candidate, where "blue-noise" is applied to the source image before quantizing the image, which should be trivial to parallelize.

2 Further Notes

I plan on creating a private repository on GitHub that will host the course project.