Assignment P1 – Low Level Optimization

Formal assignment description for P1 – INFOMOV – J. Bikker, D. Alexandridis 2023

Introduction

This document describes the requirements for the first assignment for the INFOMOV2023 course. For this assignment, you will apply low level optimizations to a small application that uses a genetic algorithm to approximate a greyscale image with a set of lines. Profiling indicates that the (anti-aliased) line drawing code is the bottleneck.

Wu Antialised Lines

The application uses Xiaolin Wu's line algorithm to produce antialiased lines (see Wikipedia: https://en.wikipedia.org/wiki/Xiaolin_Wu%27s_line_algorithm). The original implementation is from Codeproject member '.Suchit' and can be found on https://www.codeproject.com.

Low Level Optimization

Your task is to make the line rendering faster. Overall application speed is measured as 'ips' (*iterations per second*). The application caches part of the drawing, to save on the number of lines. As a result, the 'lps' (*lines per second*) figure fluctuates, but a 'peak' lines per second is also reported.

For the purpose of this assignment, you are asked to optimize line rendering alone; you can thus leave all other code unmodified. Please do not use the GPU to speed up line rendering, and do not use multi-threading. Just low level optimization in other words, as discussed in lecture 2. You may want to apply the 'rules of engagement':

1. Avoid costly operations
2. Precalculate
3. Pick the right data type
4. Avoid conditional branches
5. Early out
6. Use the power of two
7. Do things simultaneously (limited; no GPU, no multithreading!)

All, some, or most of these may apply; this is up to you.

Team

You may work on this assignment alone, or with one partner. You may team with one partner for all assignments, but it is also allowed to change teams per assignment. You cannot change your team halfway an assignment; if for whatever reason you don't want to finish the project with your partner, both of you will work alone. Both team members may continue working with the code that was produced up till the split.

You may exchange information about the project with other students, online or in real life. Do not share code snippets: limit the exchange to ideas, hints, and concepts.

Deliverables

For this assignment, you only have to hand in the optimized project, in source form, via the SUBMIT system. Make sure the code compiles out-of-the-box in Visual Studio. If any other tools are required to produce the intended executable, please add a `readme.txt` that contains build instructions.

Grading

Your final product will be graded on absolute performance alone. For this, I will compare against my (Jacco's) 'best effort'. Handing in the original code yields a 1, meeting or surpassing my result yields a 10 (and treats for the whole class), all other numbers are linearly interpolated.

Deadline

The deadline for this assignment is **Friday May 12, 17:00**. Please submit your work through Teams. If you fail to meet this deadline, you may submit one day later. One point will be subtracted from your grade in this case.

The End

May the Light be with you!

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