

Assignment P4 - Tanks

Formal assignment description for P4 – INFOMOV2018

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Introduction

This document describes the requirements for the fourth assignment for the INFOMOV course. This is the final assignment, and requires all your skills to pass successfully. All means are allowed: low-level optimization, SIMD, multithreading, GPGPU, and anything I didn't think of.

Tanks

Your task is to optimize a small game. The game has been implemented in C++, and features two armies battling for survival. One army is controlled by the computer, the other army is yours. You may give orders to your army by clicking the battlefield to set a destination, and by dragging a line for finer control. Tanks will fire automatically when an enemy is within sight.

Application Overview

Internally, the game operates on a 2048x1536 pixel bitmap, which is scaled down to 1024x768 pixels just before the window contents are updated. Functionality can be broken down in five main blocks:

1. updating the dust particles;
2. updating tank positions;
3. updating bullet positions;
4. handling player input;
5. drawing a magnifying glass at the mouse position.

The game can be run in two modes. In the default mode, both armies are small and the game runs smoothly on any reasonably recent system.

The second mode is 'measurement mode', which is enabled by uncommenting the MEASURE define in `game.h`. In this mode, the game runs at its intended complexity, but without user input, and for a fixed number of frames (4000). The time it takes to complete one full run indicates how well the application is optimized. You are encouraged to run the original code on the hardware that you will use for this assignment. This yields a running time, which you can convert to milliseconds and record in `game.h` as *reference performance* (REFPERF). Subsequent runs will compare performance against the reference performance to give you an indication of the achieved speedup.

Note that your optimized code should produce the same (or at least very similar) output. Especially tank and dust particle behaviour should be indistinguishable from the original code. If you have doubts about this, please ask.

Optimization

To obtain better run times, every possible optimization is allowed, including:

- vectorization
- data-centric and cache-related optimizations
- low level optimizations
- assembler
- compiler choice and settings
- multi-threading
- GPGPU
- high level optimizations

You are encouraged to research and try additional optimizations. Shortcuts, approximations and so on are allowed, but do keep in mind the strict requirement that your optimized code *must* produce the same output as the original code (just faster).

One optimization is *not* allowed: you cannot simply play back a movie.

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, concepts and taunts.

Grading

Your final grade will be determined by final performance. A table will be published which will allow you to directly compute your grade from application performance.

Deliverables

Your submission will consist of the optimized code plus project files. Make sure the code compiles out-of-the-box in VS2017. If any other tools are required to produce the intended executable, please add a `readme.txt` that contains build instructions. There is no need to deliver a report.

Deadline

The deadline for this assignment is **Thursday November 1st, 23:59**. You may submit your work up to 24 hours later; the penalty for this is 1 point. Please submit your work using the SUBMIT system.

Academic Conduct

The work you hand in must be your own original work, or properly referenced. If you used materials from other sources, please specify this clearly in the `readme.txt`.

Alternative P4 Assignment

Be aware that an alternative P4 assignment is available; check the website for details.

The End

Questions and comments:

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