

DV2520 — ASSIGNMENT 2 — PARTICLES

Deadline 2011-10-10 09:00
Submission tarball including source, Makefile and report (in pdf)
uploaded to It's Learning

1 Description

In this assignment you will look at optimising a dense numeric $O(n^2)$ workload. The problem is simulating perfectly elastic collisions between particles in either 2D or 3D space.

2 Grading

The grade that you receive is dependent on you demonstrating the following:

Grade 3 • Pick a physically realistic method of simulating collisions between point masses.

- Implement a brute-force approach to checking for collisions (i.e consider all n^2 interactions between n particles).

- Write a report (in grammatically correct English) that describes:

The approach that you implemented (in enough detail to allow another engineer to implement an equivalent approach).

How you validated your simulation; what tests you applied and why you are confident they are sufficient for testing.

How the number of threads scales with the number of particles.

How does the performance of your approach scale with the number of particles.

Grade 4 As with grade 3 plus:

- Use shared memory to accelerate your simulation.

- In your report describe:

What you store in shared memory

Which transfers from global memory this eliminates

How does the performance of your optimised approach scale with the number of particles.

How does this compare to the original.

Grade 5 As with 3 plus:

- Use shared memory and align your transfers for coalescing to accelerate your simulation.

- In your report describe:
 - What you store in shared memory
 - Which transfers from global memory this eliminates
 - How you altered your data-storage to allow for coalescing
 - How does the performance of your optimised approach scale with the number of particles.
 - How does this compare to the original.

For measuring performance use timings for $2^4, 2^5, \dots 2^{16}$ particles.

3 Submission

You must submit your source-code in a tarball, and report as a `.pdf`, through It's Learning.