Project Specification

Title (Preliminary): GPU Simulation of Rigid Fibers

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Description:

The goal of this master's thesis is to speed up and adept the simulation method presented in "A Numerical Method for Simulations of Rigid Fiber Suspensions" by Anna-Karin Tornberg and Katarina Gustavsson to run on a Graphics processing unit (GPU). The implementation will be done using NVIDIA GPUs using the Compute Unified Device Architecture (CUDA).

After the initial porting of the simulation further work will be done to optimize and fine-tune the algorithm to take advantage of the highly parallel compute architecture and high bandwidth memory access provided by modern GPUs. The achieved performance improvements will be compared against the original serial CPU implementation using Fortran, especially with regards to the respective ability to scale with the number of simulated rigid fibers.

Towards the end, if time permits, one of a few possible extensions to the algorithm and/or implementation will be looked at. Potential candidates are (1) Visualization, (2) Brownian Motion or (3) Not storing matrix in memory.

Schedule:

Phase/Task	Sept	Sept	Sept	Sept	Sept/Oct	Oct	Oct	Oct	Oct/Nov	Nov	Nov
	Week 36	Week 37	Week 38	Week 39	Week 40	Week 41	Week 42	Week 43	Week 44	Week 45	Week 46
1. Planning											
2. Research											
3. Implementation											
4. Optimization											
5. Simulation + Tests											
6. Extensions											
7. Thesis Report											
8. Other											

Phase/Task	Nov	Nov	Dec	Dec	Dec	Dec	Dec/Jan	Jan	Jan	Jan	Jan/Feb
	Week 47	Week 48	Week 49	Week 50	Week 51	Week 52	Week 1	Week 2	Week 3	Week 4	Week 5
1. Planning					Christmas						
2. Research											
3. Implementation											
4. Optimization											
5. Simulation + Tests											
6. Extensions											
7. Thesis Report											
8. Other											