



KTH Engineering Sciences

GPU Simulation of Rigid Fibers

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Master's Thesis at School of Engineering Sciences

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Abstract

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Referat

GPU simulering av stela fibrer

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Contents

1	Introduction	1
2	Theoretical Foundation	9
3	CPU Implementation	11
3.1	Discretization	11
3.2	Timestepping	11
4	GPU Implementation	13
4.1	CUDA	13
4.2	Kernels	13
4.3	Optimizations	13
4.3.1	Numerically vs. Analytically	13
4.3.2	Grid Dimension	13
4.3.3	Shared Memory	13
5	Results	15
5.1	Fair comparison	15
5.2	Fortran vs. CUDA	15
5.3	Grid Dimension	15
5.4	Scaling	15
6	Conclusion	17
	Appendices	17

Chapter 1

Introduction

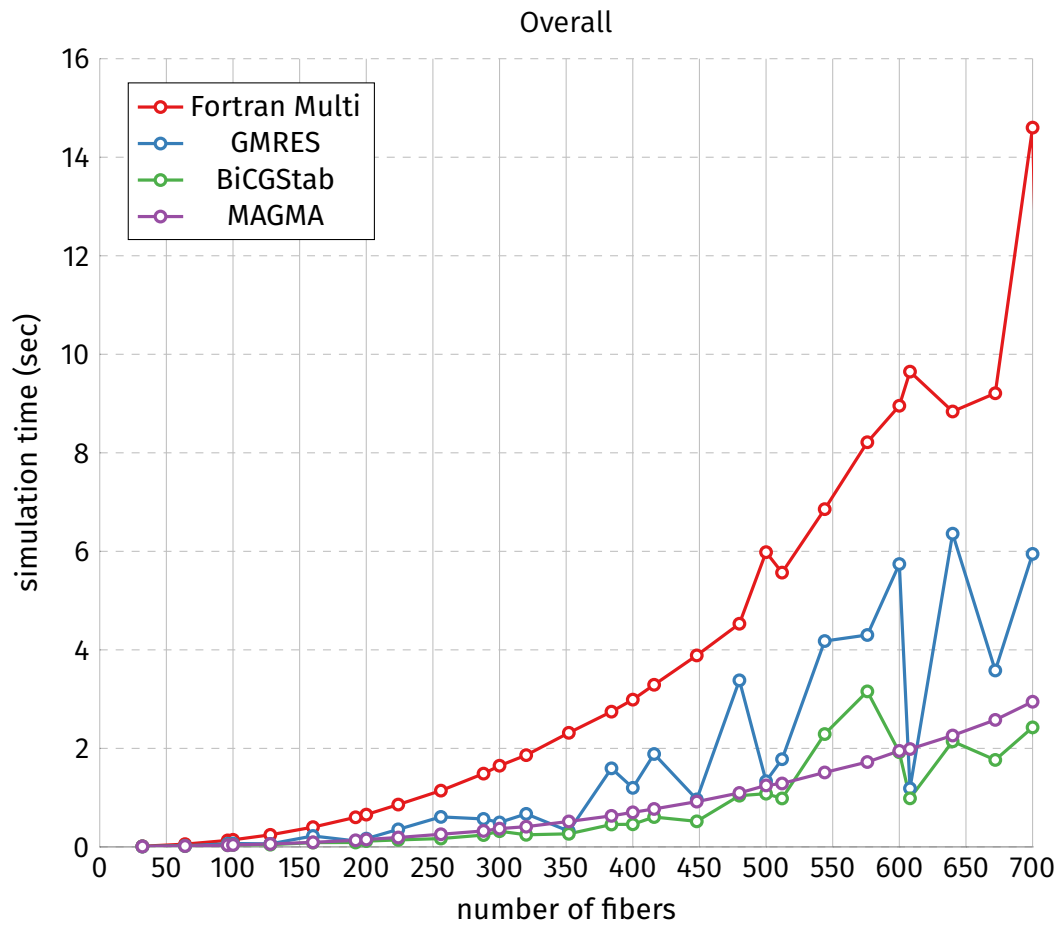


Figure 1.1: Total time per timestep using the average over 10 timesteps. First timestep is excluded as warmup. Assuming linear scaling for Fortran.

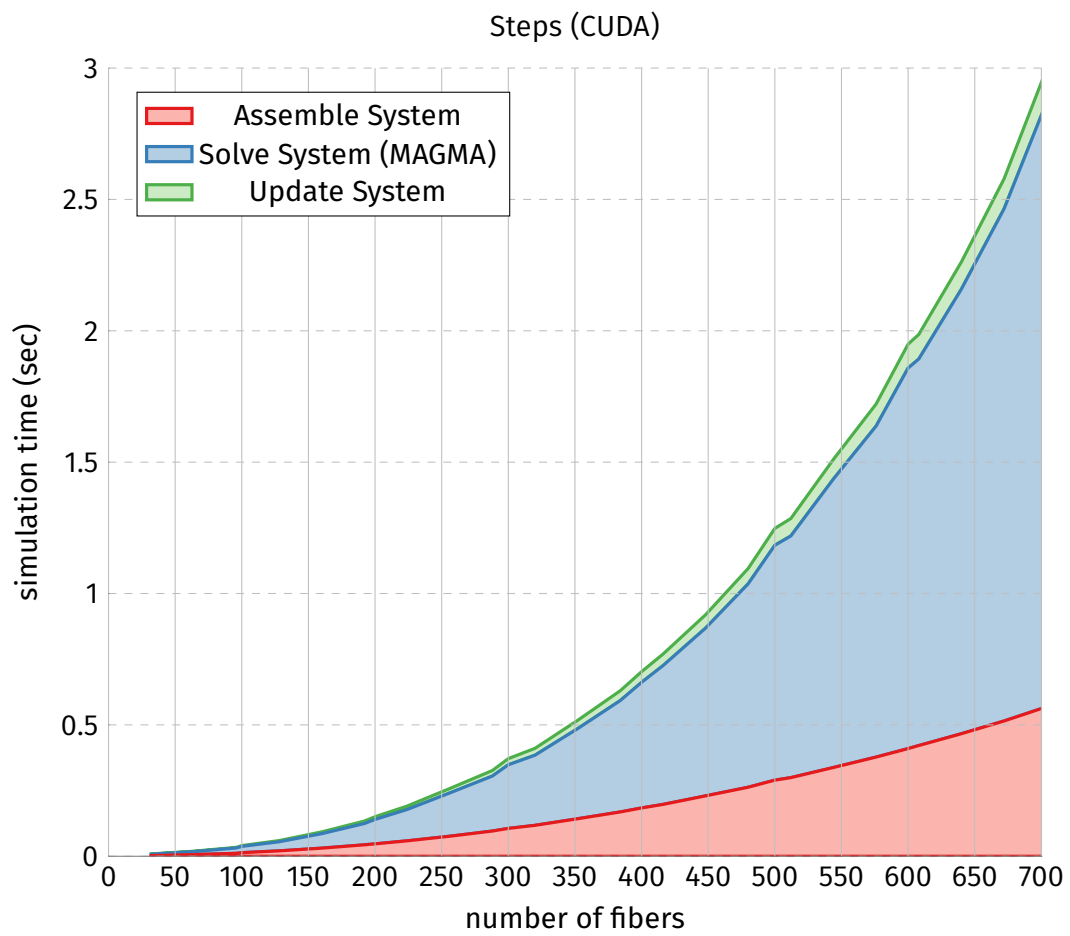


Figure 1.2: Average time for each simulation step over 10 timesteps. First timestep is excluded as warmup.

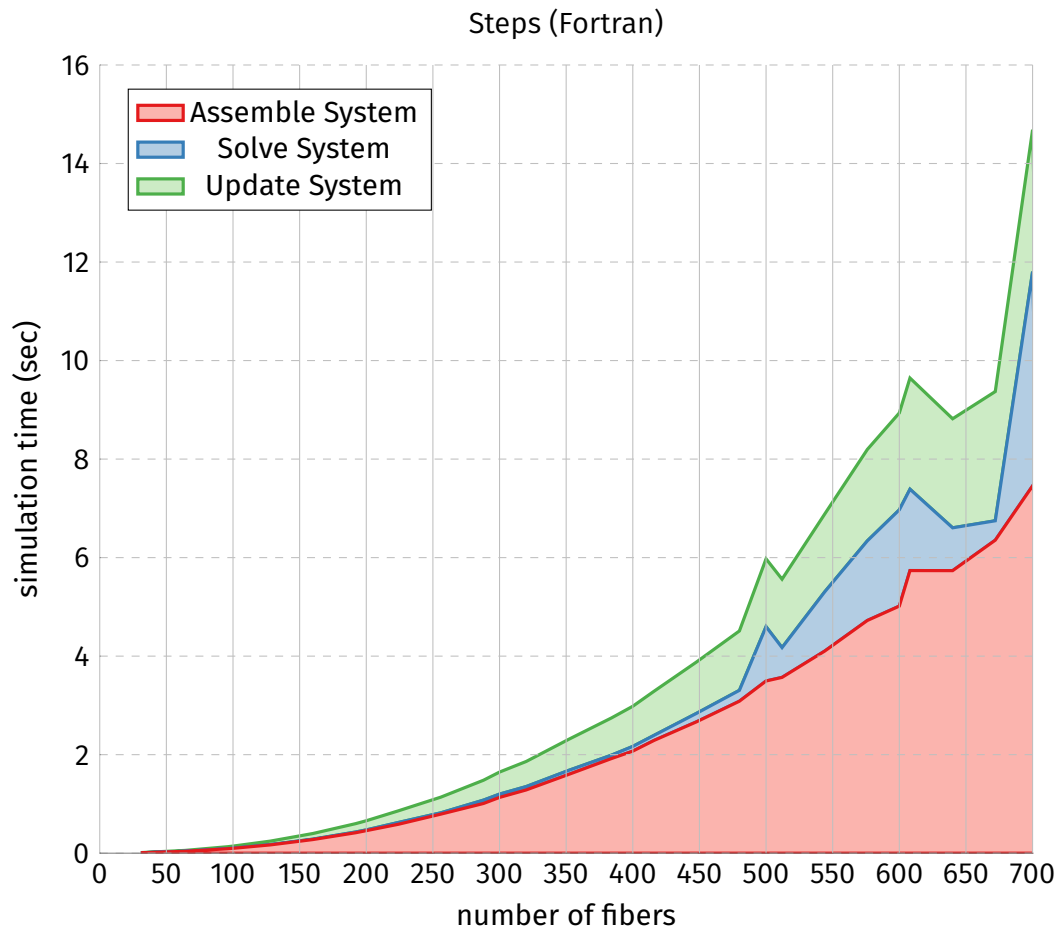


Figure 1.3: Average time for each simulation step over 10 timesteps. First timestep is excluded as warmup. Assuming linear scaling for Fortran.

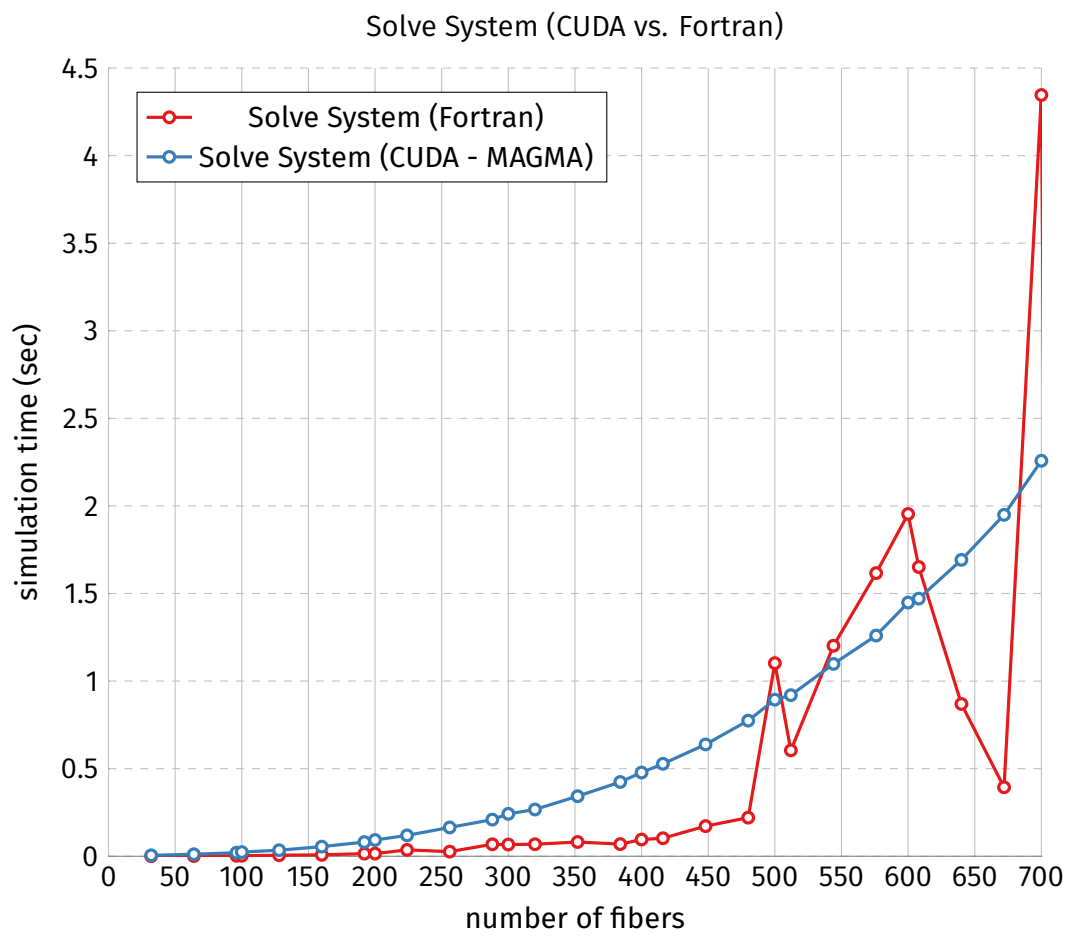


Figure 1.4: Average time for solve system step. Averaged over 10 timesteps (1st excluded). Assuming linear scaling for Fortran.

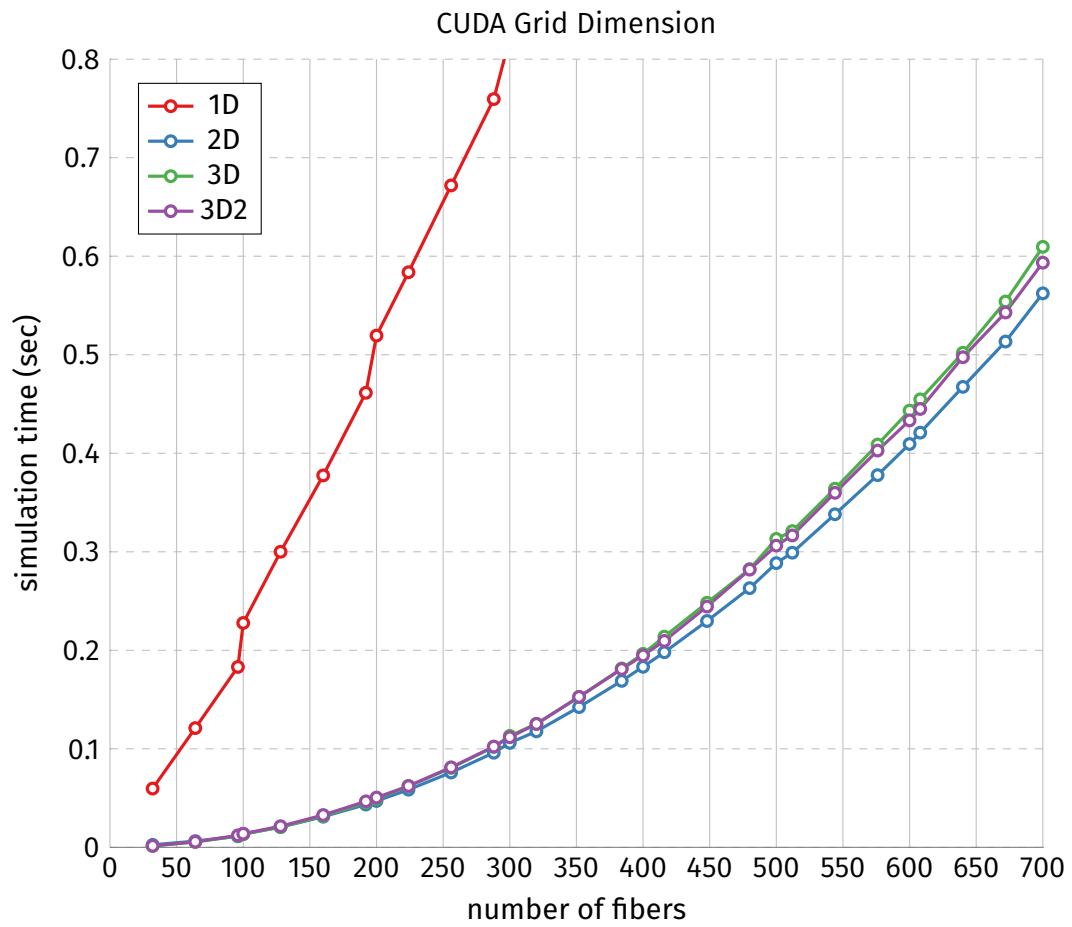


Figure 1.5: Total time per timestep using the average over 10 timesteps. First timestep is excluded as warmup.

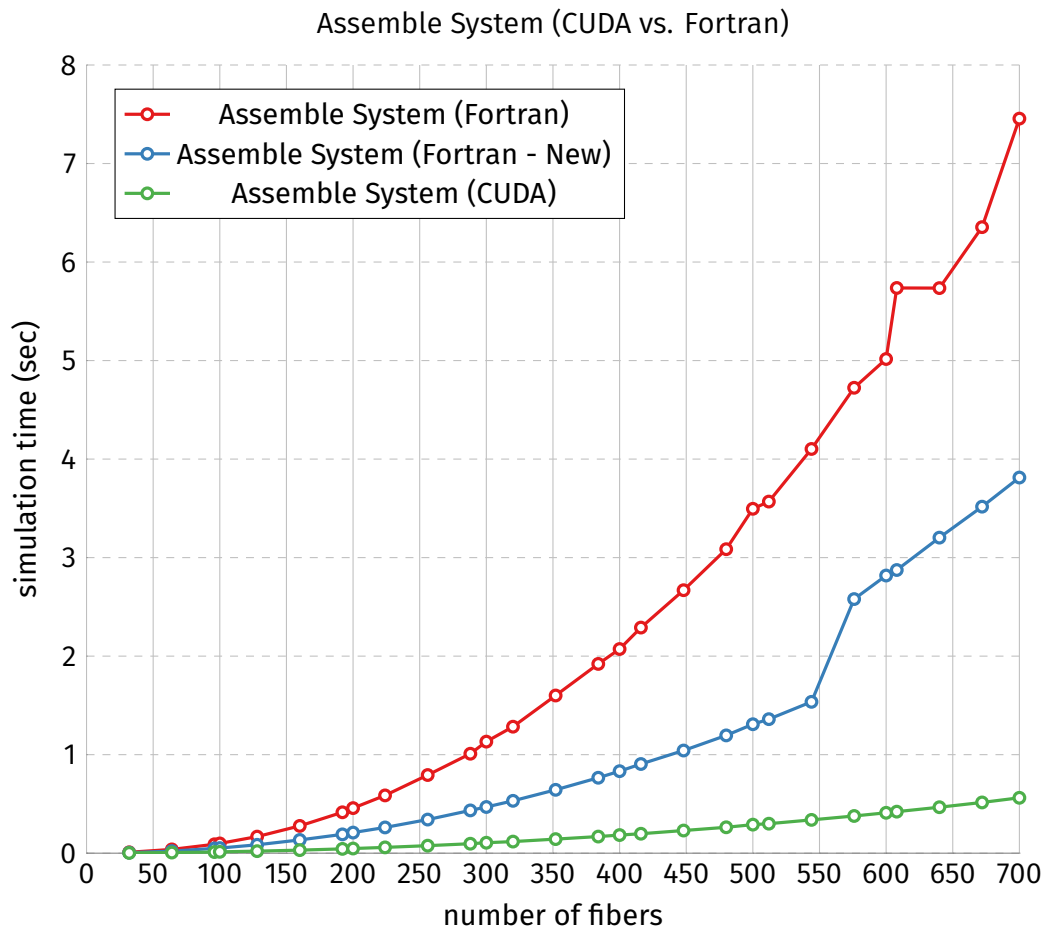


Figure 1.6: Average time for assemble system step. Fortran and CUDA are averaged over 10 timesteps (1st excluded). Fortran New is only 1st timestep. Assuming linear scaling for Fortran.

Chapter 2

Theoretical Foundation

Chapter 3

CPU Implementation

3.1 Discretization

3.2 Timestepping

Chapter 4

GPU Implementation

4.1 CUDA

4.2 Kernels

4.3 Optimizations

4.3.1 Numerically vs. Analytically

4.3.2 Grid Dimension

4.3.3 Shared Memory

Chapter 5

Results

5.1 Fair comparison

5.2 Fortran vs. CUDA

5.3 Grid Dimension

5.4 Scaling

Chapter 6

Conclusion