KTH Engineering Sciences

GPU Simulation of Rigid Fibers

ERIC WOLTER

Master's Thesis at School of Engineering Sciences
Supervisor: Katarina Gustavsson
Examiner: Michael Hanke

TRITA xxx yyyy-nn

Abstract

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Mauris purus. Fusce tempor. Nulla facilisi. Sed at turpis. Phasellus eu ipsum. Nam porttitor laoreet nulla. Phasellus massa massa, auctor rutrum, vehicula ut, porttitor a, massa. Pellentesque fringilla. Duis nibh risus, venenatis ac, tempor sed, vestibulum at, tellus. Class aptent taciti sociosqu ad litora torquent per conubia nostra, per inceptos hymenaeos.

Referat

GPU simulering av stela fibrer

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Mauris purus. Fusce tempor. Nulla facilisi. Sed at turpis. Phasellus eu ipsum. Nam porttitor laoreet nulla. Phasellus massa massa, auctor rutrum, vehicula ut, porttitor a, massa. Pellentesque fringilla. Duis nibh risus, venenatis ac, tempor sed, vestibulum at, tellus. Class aptent taciti sociosqu ad litora torquent per conubia nostra, per inceptos hymenaeos.

Contents

Chapter 1

Introduction

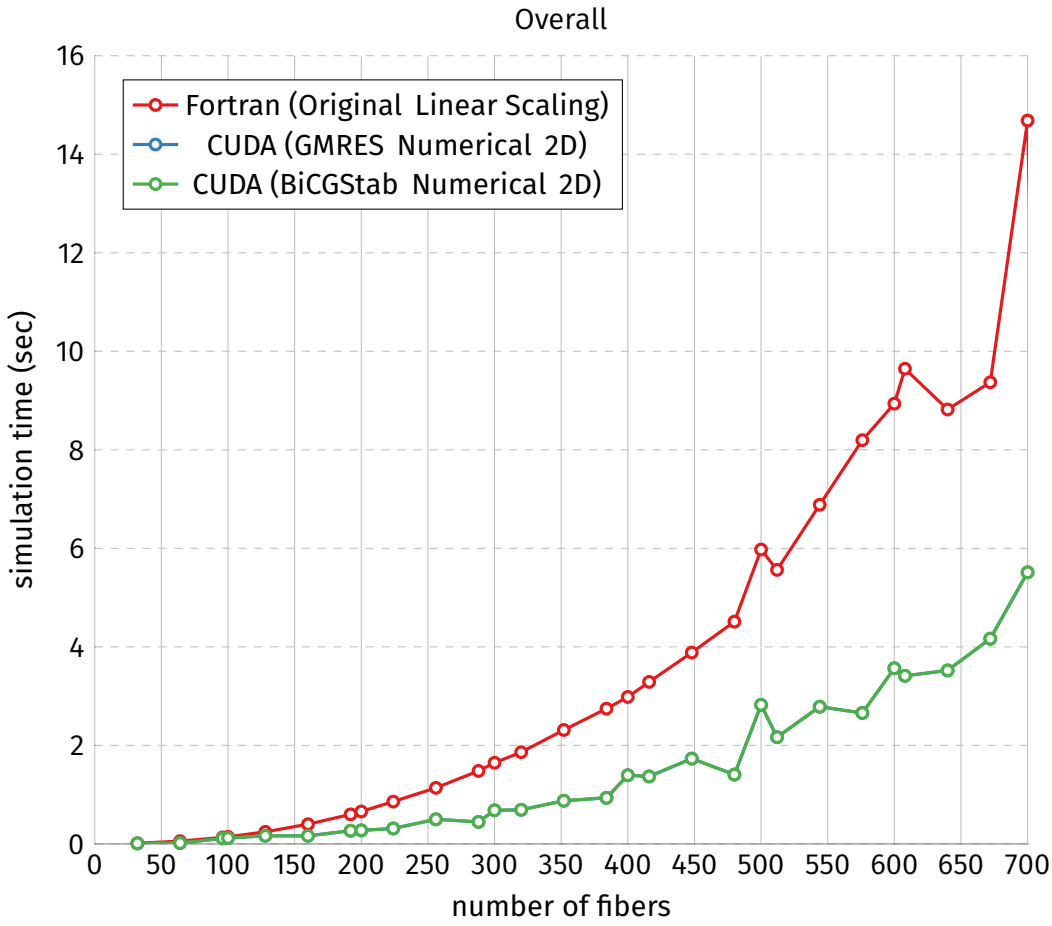

Figure 1.1: Total time per timestep using the average over 10 timesteps. First timestep is excluded as warmup. Assuming linear scaling for Fortran.

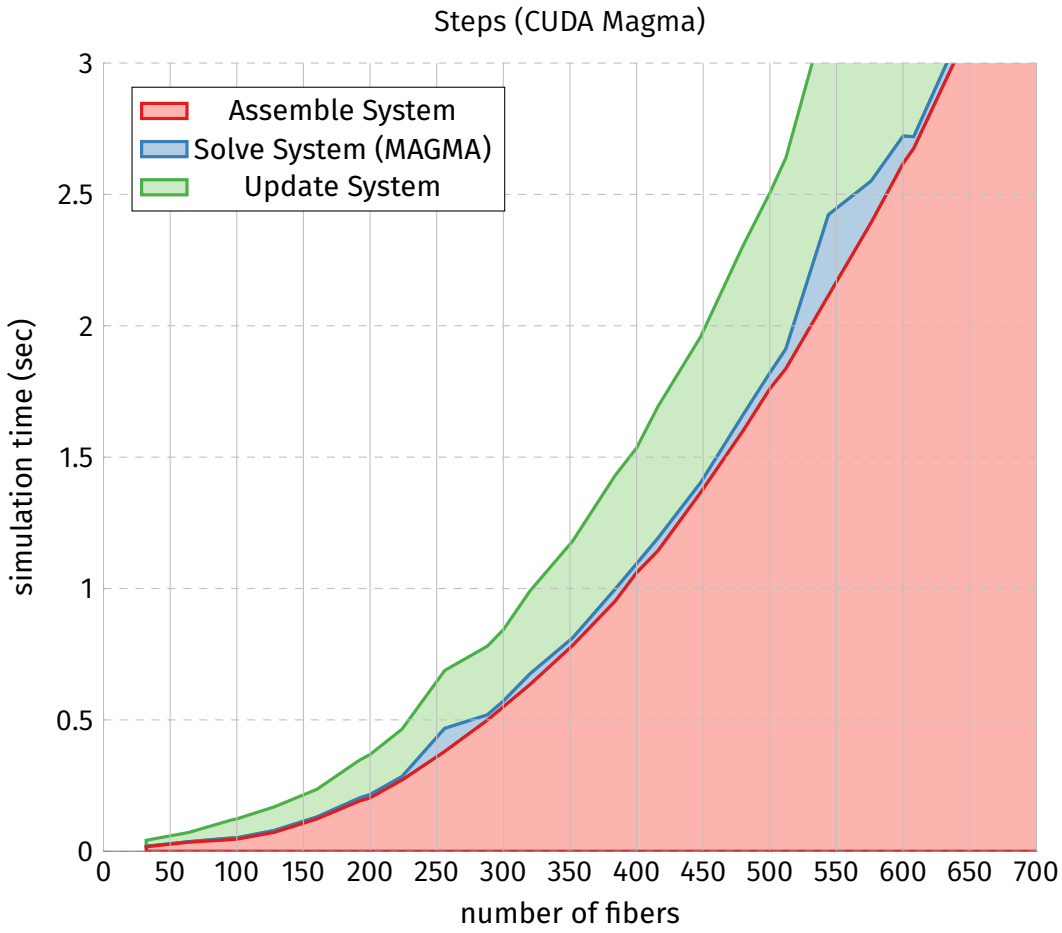

Figure 1.2: Average time for each simulation step over 10 timesteps. First timestep is excluded as warmup.

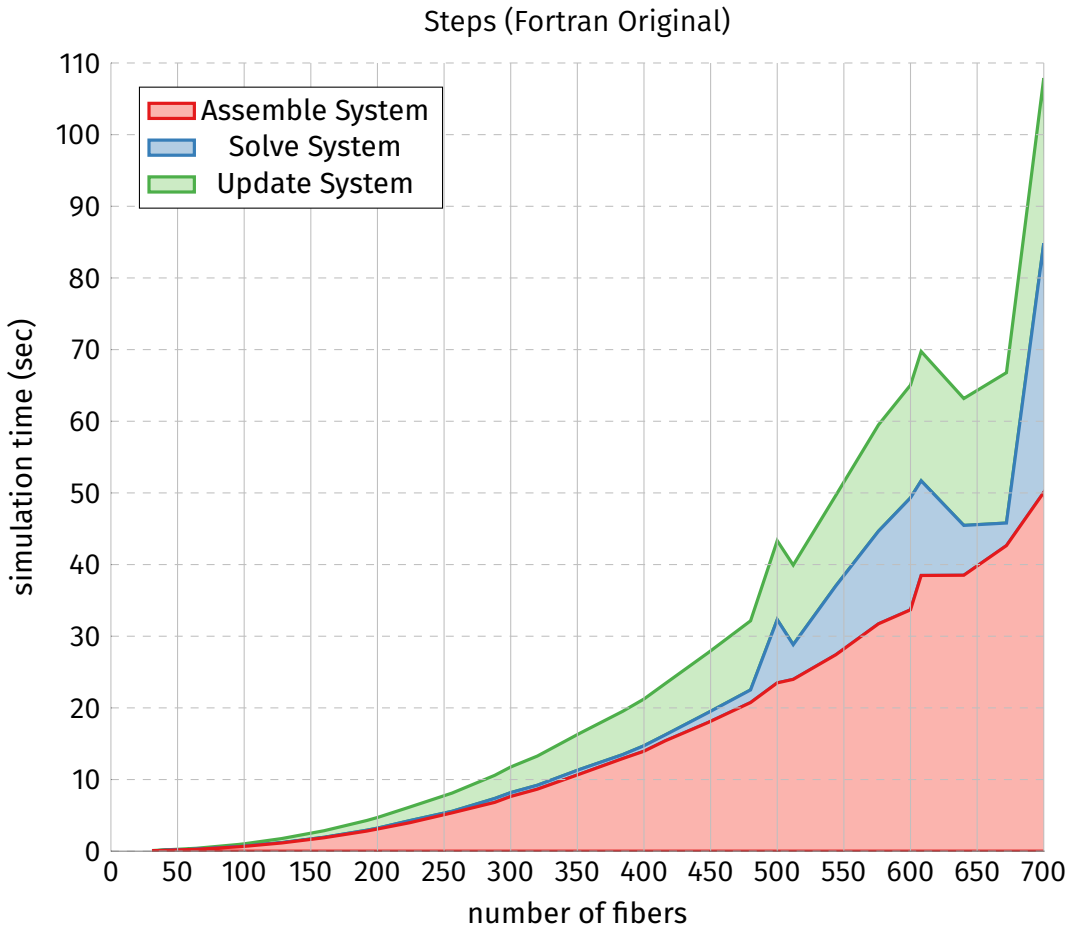

Figure 1.3: Average time for each simulation step over 10 timesteps. First timestep is excluded as warmup. Assuming linear scaling for Fortran.

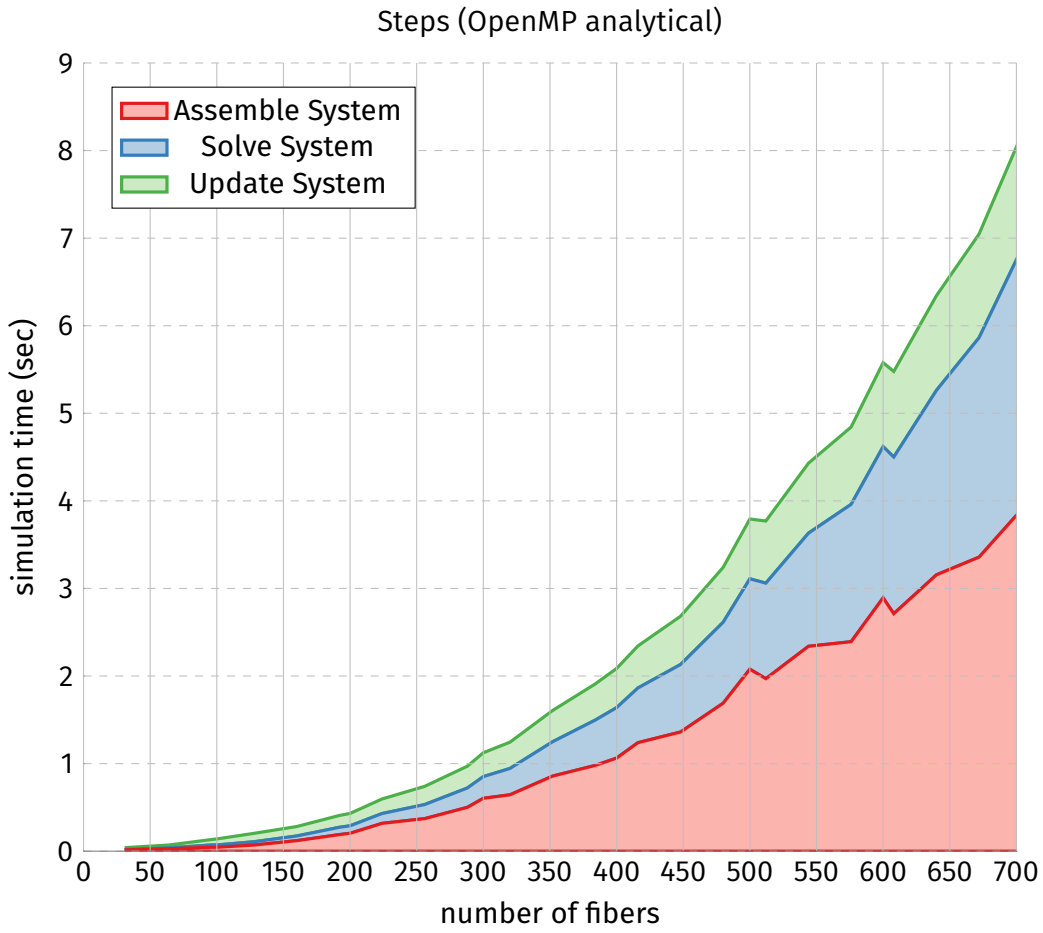

Figure 1.4: Average time for each simulation step over 10 timesteps. First timestep is excluded as warmup. Assuming linear scaling for Fortran.

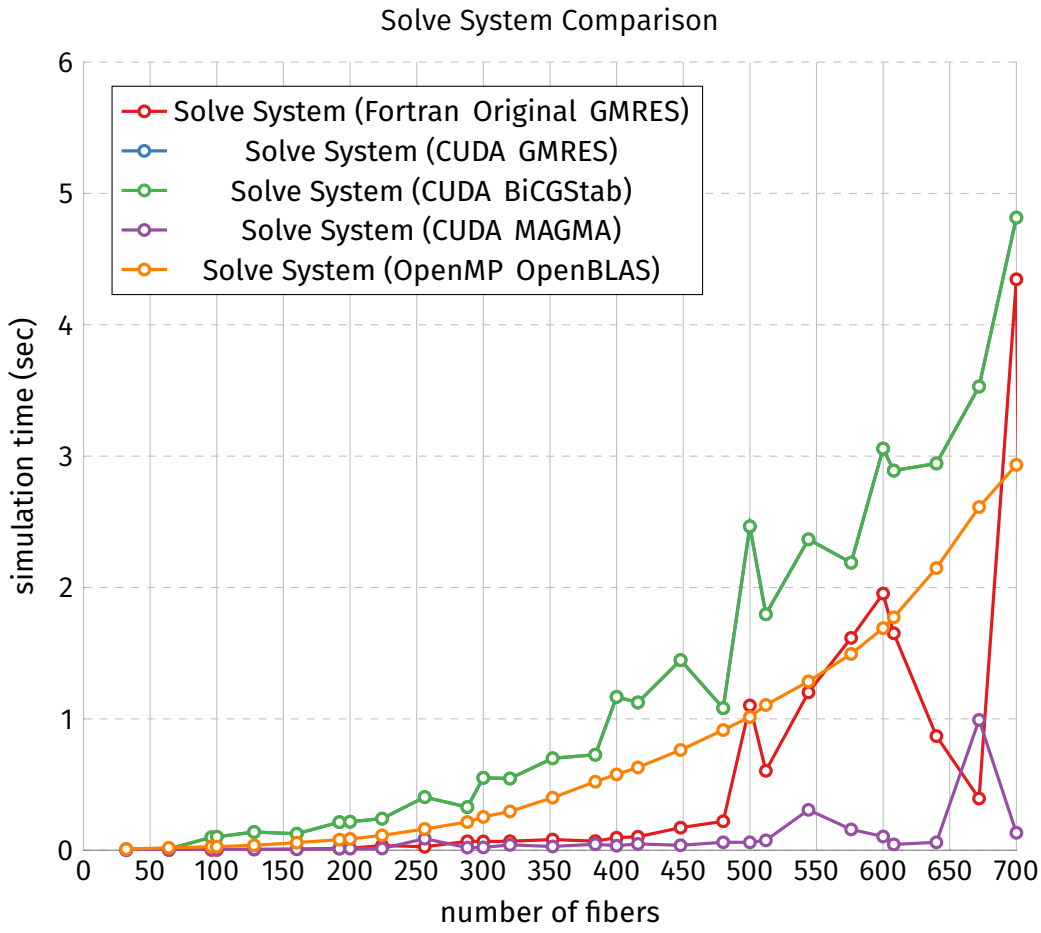

Figure 1.5: Average time for solve system step. Averaged over 10 timesteps (1st excluded). Assuming linear scaling for Fortran.

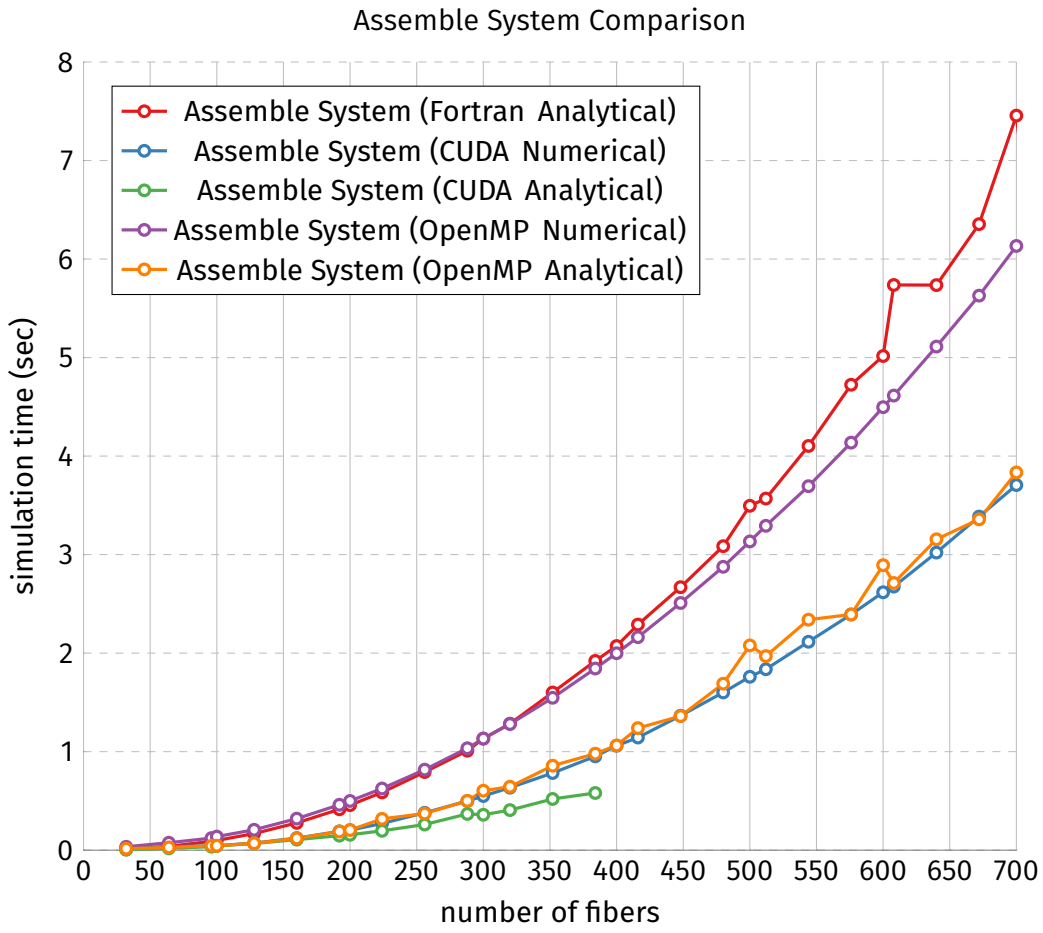

Figure 1.6: Average time for assemble system step. Fortran and CUDA are averaged over 10 timesteps (1st excluded). Fortran New is only 1st timestep. Assuming linear scaling for Fortran.

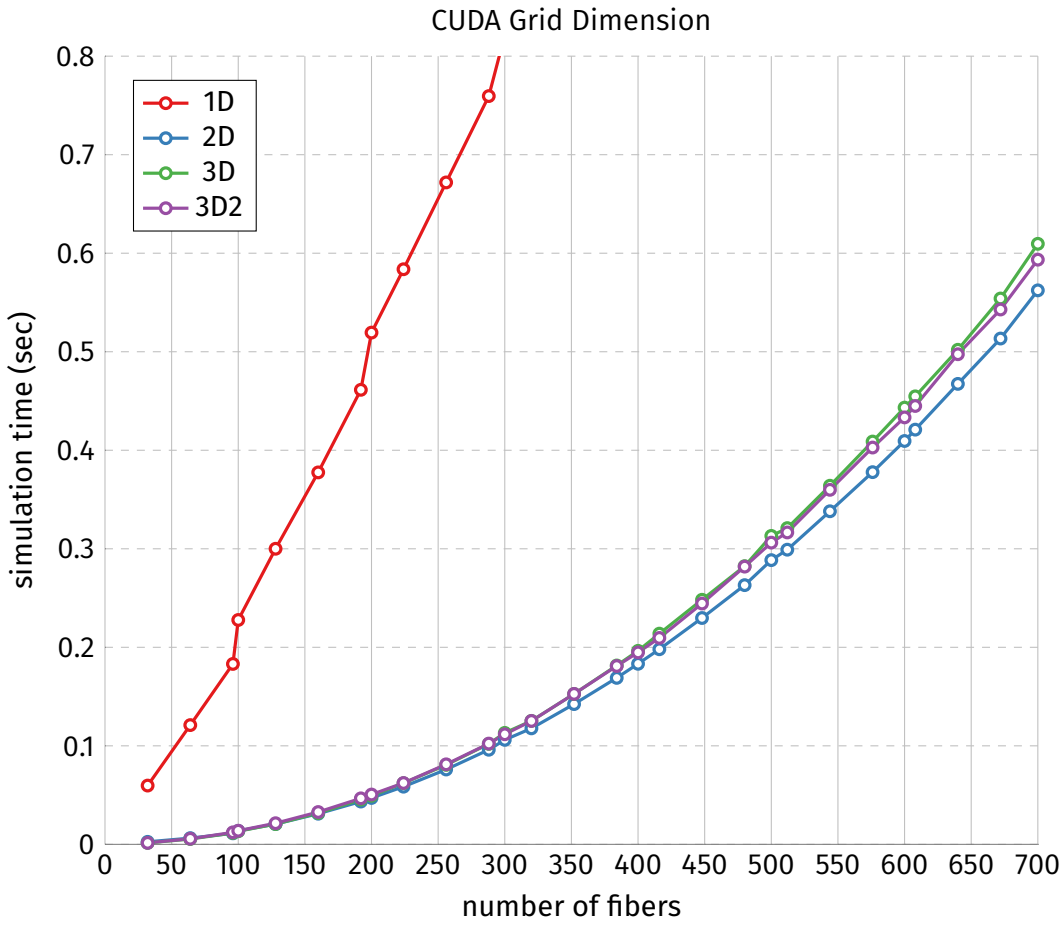

Figure 1.7: Total time per timestep using the average over 10 timesteps. First timestep is excluded as warmup.

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