Programming Techniques 2025-2026

Course exercise 2
multithreaded and distributed Barnes-Hut simulation

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Exercise: Multithreaded and distributed Barnes-Hut algorigthm n-body simulation.

- See TAP p. 37-47, p. 74-85, and p. 139-154

To do

1. Create makefile for the project.
2. Separate the main program into its own program source code file.
3. Separate the Barnes-Hut algorigthm into its own module.
4. Modify the code to use the types and routines in the geometry and particle modules.
5. Modify the program to write the simulation data into a file "output.dat", where each line contains the simulation state as "time p1x p1y p1z p2x p2y p2z ... pnx pny pnz".
6. Parallelise the code using OpenMP making sure that the code can be compiled with and without OpenMP support.
7. Write a separate distributed version of the code using MPI.
8. Describe how the code works (in general) in the readme.md file.
9. Compare the execution times of the serial, parallel, and distributed Barnes-Hut simulation for a set of particle setups.