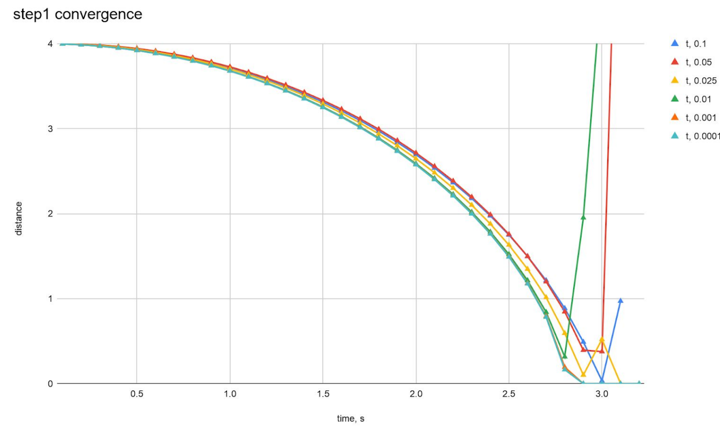
Parallel Scientific Computing 1

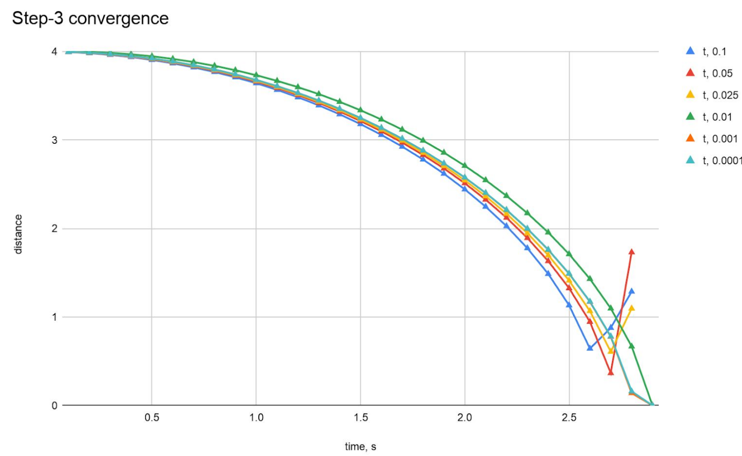
The following is from results from a 2 body setup with two bodies of mass 5 and at {-2,0,0} and {2,0,0}. The graph plots the distance between them dependent on time.

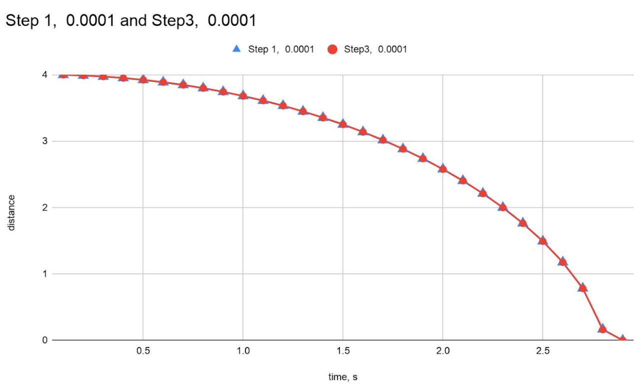
The different plots represent different timestep scales, each a factor of 2 apart.

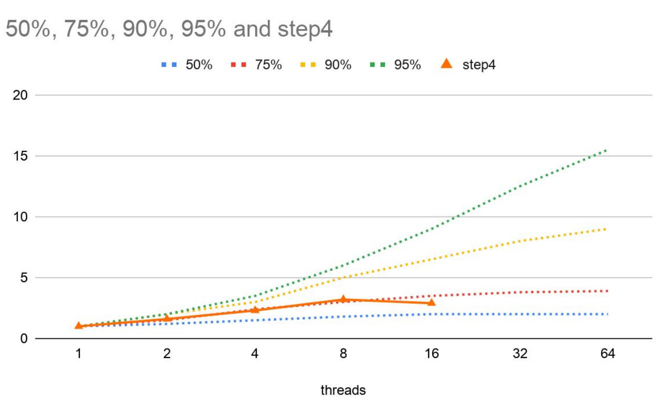
The chart below plots step 1 against 3 step 3, where the results are virtually identical at a timestep of 0.0001. Most notably between the two time stepping methods, RK2 suffers far less from the extreme gravity slingshots that plague any planets that close and do not collide. Perhaps this is due to better collision detection, and those closer encounters are better caught by RK2 than left to shoot off.

While for step 1 each smaller time step pulls the curve closer in to the origin, until 0.001 and 0.0001 are visually the same, for RK2 the plots seem to average to a central plot, with again 0.001 and 0.0001 visually identical.









The chart on the left shows the Amdahl's Law plot for the respective parallel portions, and the measured speed up from step 4's implementation.

The curve follows the 75% curve closely.

Although the speedup for step 4 begins encouragingly, after 8 logical threads the plot drops off and actually deteriorates. Admittedly this was tested on a 16 logical core machine so extraneous variables may have come into account. The results were gathered from a 216 body problem at 0.0001 s timesteps which lasted 97 seconds at 1 thread.

All data was recorded from a windows machine running the linux subsystem, compiled with g++ at O3 and run on an 8 core 16 thread laptop with base clock 2.2GHz, 4GHz boost, although task manager said this was usually around 3GHz. Not sure the extent of the performance impact running on the linux subsystem had.