Scalability and Convergence Report

All Tests in the following report have been carried out on par7.q of Hamilton, with 24 threads per CPU – appropriately adjusting the number of cores used throughout. In addition to this all parallelised runs have been proceeded by '*export OMP_WAIT_POLICY=active*' in order to reduce overhead.

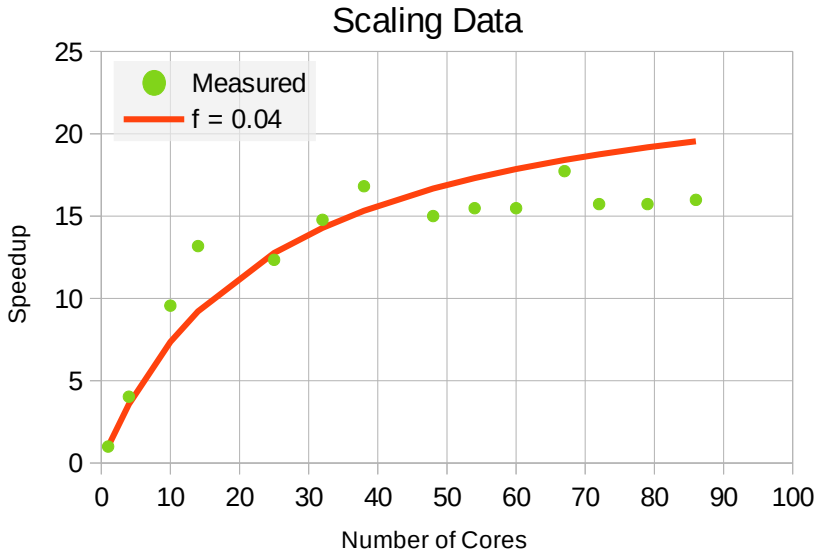

Figure 1: *Speedup curves for both the measured results of my implementation and that of a Strong Scaling model with f = 0.04. Speedup being measured as t(1) / t(p) and where Number of Cores is p.*

To measure the scalability of my code relative to an increase in the number of threads used, I have performed repeated tests on an 8000 body setup, with normalised masses and random initial conditions. Applying parameter fitting following a strong scaling model suggests that the fraction of my implementation that always runs serially is approximately f = 0.04, as is reflected in figure 1.

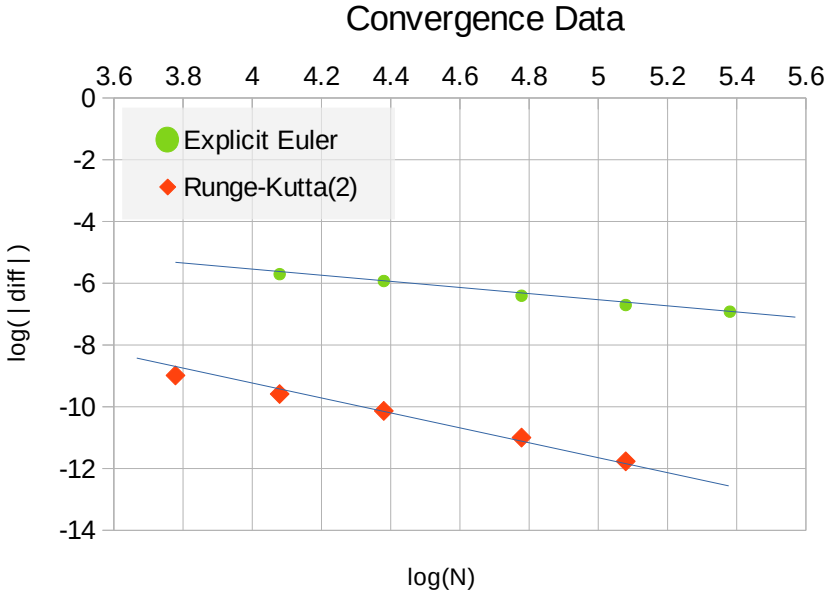

Figure 2: *Convergence data for two particle setup that measures the minimum distance between the two particles at 0.6 seconds. N being measured as T / h where T =0.6 is time and h the time step size, and where diff = $e_h(T) - e_{h/2}(T)$ with e as the truncation error*

Using the lines of best fit seen in figure 2 I was able to calculate the convergence order to be p = 0.9997615 for Explicit Euler and p = 1.69143235 for Runge Kutta.