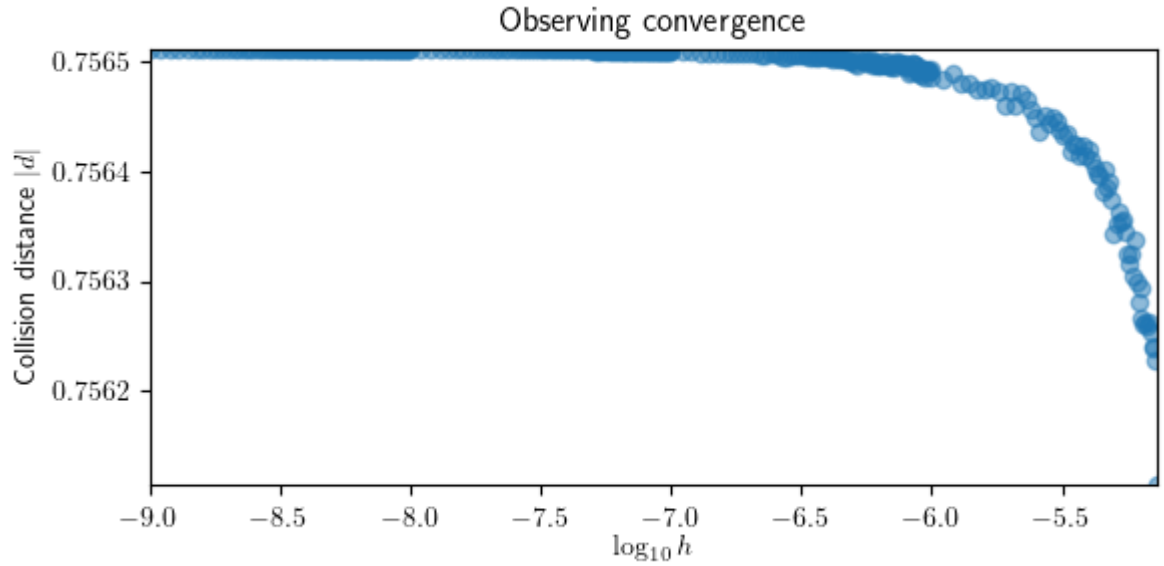
Two nested loops iterate through every particle. The particle in the outer loop, i, is compared to every other particle j in the inner loop. The Euclidean distance between i and j is calculated. If it is smaller than 0.01, the particles are merged. The resultant particle p has mass equal to $m_i + m_j$; the velocity of p is calculated using classical mechanics as if i and j had collided. Various pointers are decremented to remove j. If the two particles do not merge, the force they exert on each other is calculated. Once all particles have been considered, a second loop updates the position and velocity of each particle using the calculated forces.

In this simulation, two collisions occur. Timesteps were in the range $[9.9 \times 10^{-9}, 7.3 \times 10^{-6}]$, with the latter the largest timestep to yield collision points. The accuracy of the simulation is measured using the Euclidean distance between the first and second collision points, d. Results are plotted below. It is clear that d *does* converge, to approximately 0.7565, and that a timestep of approximately 1×10^{-7} is sufficient to achieve this.



The order of convergence p can be calculated using the difference between two errors of different timesteps h and $\frac{h}{2}$, as $y_h - y_{\frac{h}{2}}$ can be experimentally measured: $e_h - e_{\frac{h}{2}} = y_h - y_{\frac{h}{2}} = C\left(1 - \frac{1}{2^p}\right) \cdot h^p$. Using an initial value $h = 7.3 \times 10^{-6}$, below is plotted the distance $|d|$ between the second collision points at timesteps h and $\frac{h}{2}$ against h. Fitting a curve to the data using results in values of $p \approx 1.98$ and $C \approx 1.9 \times 10^7$.