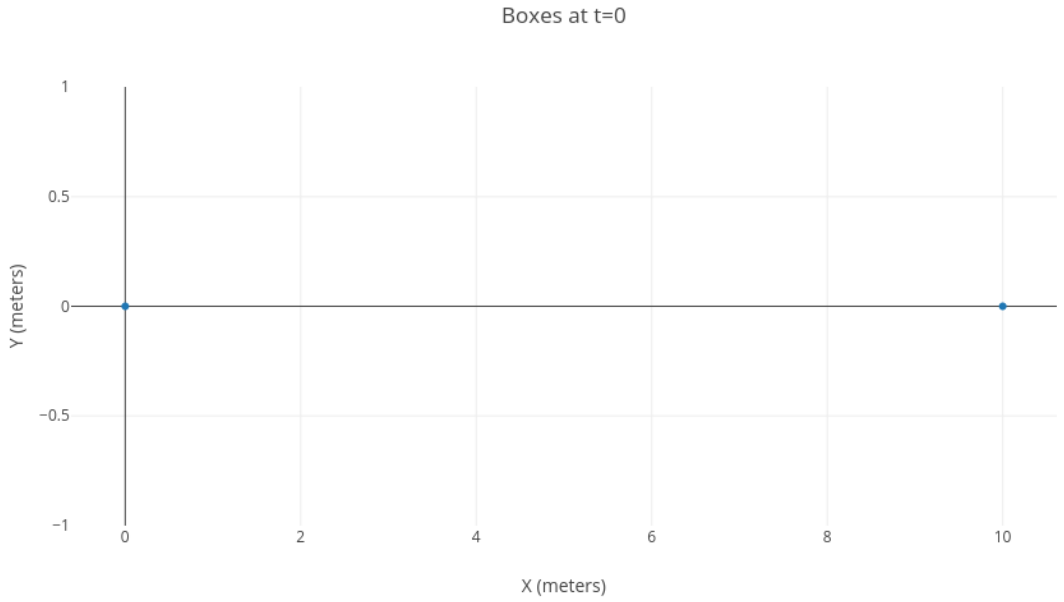
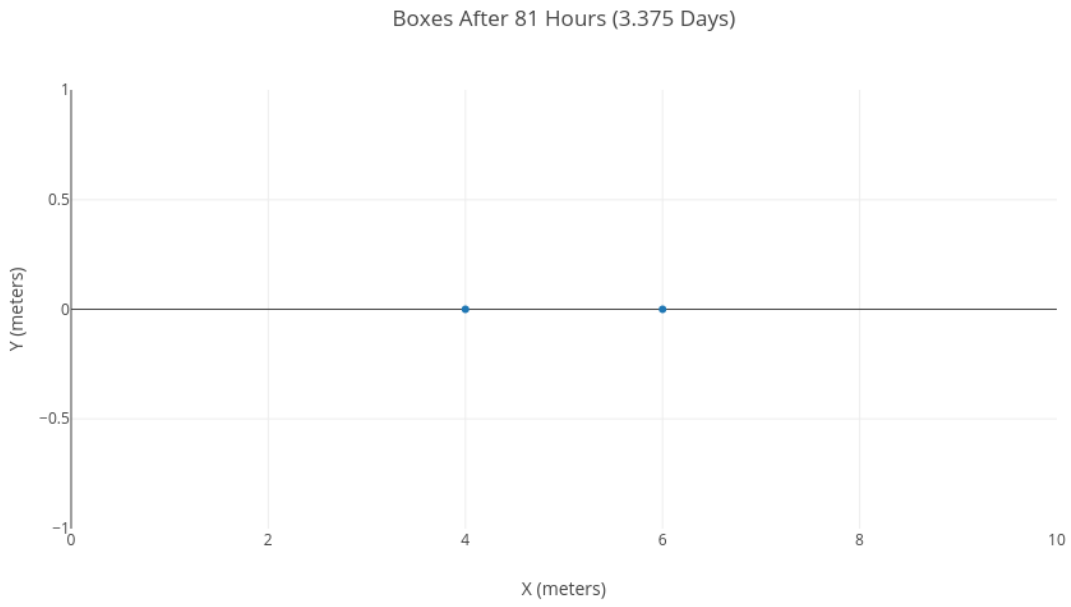
Morgan Douglas (Period 7)

N-body Project Graphs

First, I modelled the movement of two, 2-meter-wide 100 kilogram boxes beginning 10 meters apart from eachother. As shown in the graphs below, the boxes collide (when widths are taken into account) after 81 hours with this set-up. (boxes are represented by the tiny blue dots)





Next, I modelled the movement of the Earth around the Sun (single point in the middle represents sun). The following graph shows the result of running the simulation for 364 days. Each point has been kept on the graph to show the circular shape of the Earth's motion. The graph depicts a 364-day simulation rather than a 365-day simulation in order to demonstrate that beyond just moving in a circle, the simulation moves Earth at a reasonable velocity, evidenced by the small gap in the circle that would be filled in a final day of the simulation.

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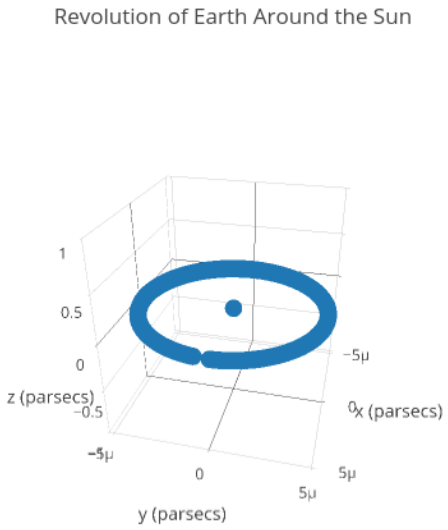
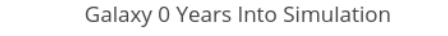
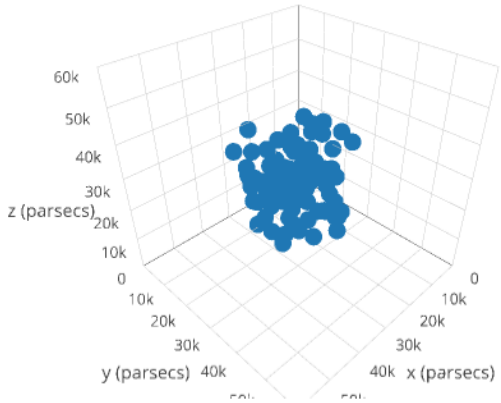


Finally, I modelled the evolution of a galaxy. I began by constructing 100 stars with randomly generated attributes: Masses were anywhere from .25 to 400 solar mass units (this galaxy was unrealistic in that it contained a very large fraction of large stars). Generated x, y, and z positions were from 0 to 30,000 parsecs (based on the approximate diameter of the Milky Way). Generated x, y, and z velocities were from 0 to 150 km/sec. This galaxy was flawed in that, theoretically, the distribution of values in this model would be even throughout the possible ranges (ignoring any trends that may arise due to small galaxy size and random number generator bias). This is not very realistic, because it causes a much greater incidence of stars with attributes that are only seen in extreme cases in nature. More research would be required to account for this and create a more realistic galaxy.

My computer was able to run thousands of stars in a reasonable amount of time—however, the graphs display an evolution of a 100-star galaxy for the sake of visibility. (again, this is very unrealistic since I started with only 100 stars in a space roughly the size of the Milky Way… which has hundreds of billions of stars).

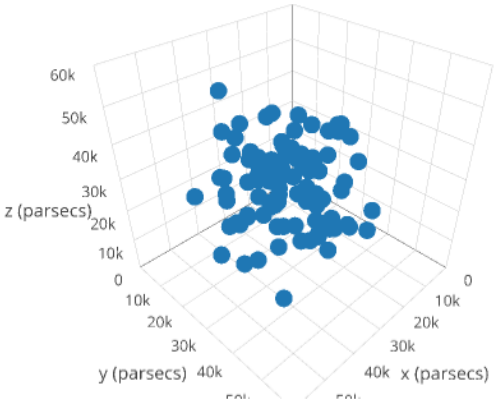


Galaxy 0 Years Into Simulation



(graphs of simulation continue on next page)

Galaxy 1.3E8 Years into Simulation



Galaxy 3.7E8 Years into Simulation