CSE 622: HW 1

Drew Branum

I opted to simulate the space battles with no inherent advantage to either ship. Each spaceship is represented with a 3D vector for its position and velocity, which are randomly generated at the start of each simulation. Both ships are equipped with a laser weapon featuring a range of 100 units and a firing angle of 30 degrees, as well as a fixed movement speed of 25 units per second. Time is incremented 0.1 second per iteration to update position and check if a ship is within range. The battleground, determined by the starting positions of the ships, is limited to a 500x500x500 space, ensuring the ships remain within a defined area.

The spaceships alternate between pursuit and evasion modes. Pursuit mode involves predicting the target ship’s position 1 second into the future and adjusting the velocity vector to move toward that predicted location. Evasion mode introduces randomness to the ship’s movement, offsetting its direction. The mode alternates based on time: Ship 1 enters pursuit when Time % 3 != 0 , while Ship 2 does so when Time % 3 != 1.

When a ship is within the laser range and firing angle of its target, it can attempt to destroy the target. If both ships are simultaneously in range of each other, the winner is chosen randomly. The simulation runs for 60 seconds or until one ship destroys the other.

The simulation shows that alternating between pursuit and evasion creates non-linear movement patterns, preventing the ships from flying directly at each other. The 3D visualization provides a clear picture of the ships' trajectories, highlighting their paths, final positions, and the outcome of the battle.

Initially I ran the simulation without evasion and the ships would fly directly at each other and the results yielded about 50/50 with no draws. After I added the evasion tactics, the outcomes were more random and there were some draws here and there but still rare.

Example outcomes:

A graph of a ship

Description automatically generated A graph of a ship

Description automatically generatedA graph of a ship

Description automatically generatedA graph of a graph of a ship

Description automatically generated with medium confidence