Explicit List Features I Implemented**:**

* **Single Agent Navigation**
  + You can right click to spawn a single wolf, so if you wait for the initial pack to go away you can see how the single agent navigation works
* **Improved Agent & Scene Rendering**
  + Each individual thing that is drawn to the screen is a textured 2D quad
* **Orientation Smoothing**
  + The Woids smoothly rotate to face whichever direction they are moving in
* **Realtime User Interaction**
  + When you hold left click a ball of fire is spawned at the mouse’s position. The Woids are afraid of fire and will avoid the fireball. (They also move faster to simulate panic)
  + Again, you can spawn a Woid by right clicking. (The fireball is the primary claim here, this functionality was originally intended to help with debugging)
* **Multiple Agents Planning+**
  + I initially was not aiming to get points from this category, but I now realize I have a tentative claim to it. The simulation supports multiple Woids (defaults to it), but they don’t entirely pursue separate goals. They all try to get to the meadow, then when they get to the meadow they pursue whatever rabbit they are closest to. There is always one rabbit for each Woid, and each rabbit/Woid is stored in a list, and each rabbit/Woid tracks their position in their respective list. It would be trivial to have each Woid track the rabbit that spawns in the same index in the list as they do and pursue that rabbit in the meadow instead of whichever rabbit is nearest to them in the meadow. I chose to instead have them pursue the nearest because I felt that it looks better. So technically they don’t pursue separate goals, but the infrastructure exists to do that and the change would be trivial. So I think I have a worthy claim for some points from this category.
* **Challenge: Crowd Simulation**
  + The Woids do their best to avoid colliding with each other. They aren’t perfect and sometimes if there is a large pack of Woids the ones in the center collide a little bit. Collisions also go up a little bit when they are panicked from the fire. However, I think that the collisions are fairly minimized. It works out 99% of the time.
  + Smooth, anticipatory, collision-free motion in two interesting scenarios:
    - The Woids avoid each other in the way that boids do
    - The Woids avoid running into trees using TTC.

Writeup

**The Idea:**

A bunch of wolves spawn in a forest and move in packs toward some rabbits in a meadow. When the wolves get to the meadow, they eat the rabbits.

**How It Works:**

1. A location for the meadow is chosen
2. Trees are spawned such that there are no trees in the meadow
3. An RRT\* is generated with the center of the meadow as the goal.
4. Wolves are spawned (not in trees) around a randomly chosen point
   1. For every wolf spawned in the pack, a rabbit is spawned at a random position in the meadow
   2. Wolves are boids (Woids) that account for forces that:
      1. Pull them toward an ideal node from the RRT\*
         1. For details on what is an ideal node see Woid.updateCurrNode()
      2. Push them away from trees (this force uses TTC)
      3. Push them away from each other
         1. This code was basically copied from Boids2D
      4. Pull them towards each other
         1. This code was basically copied from Boids2D
      5. There is no alignment force.
         1. I played with the numbers a little bit, but ultimately an alignment force caused more problems than it solved
      6. Push them away from the fireball
5. A fireball appears at the mouse’s location while the left mouse button is held
   1. The Woids are afraid of the fireball and will run away
   2. When the fireball is active the Woids panic and have a doubled top speed
6. When a Woid enters the meadow moves toward the nearest rabbit.
7. When a Woid collides with the rabbit that it is targeting they both are removed from the simulation.

**Hotkeys:**

* R: Restart the simulation with a different map
* G: Toggle whether the RRT graph is displayed or not
* B: Toggle displaying the bounding circles for everything (except rabbits)
* Right Click: Spawn a Woid at the mouse’s current position, and a rabbit at a random position in the meadow