Rutgers - Computer Graphics Course - Assignment B4

SOCIAL FORCES

Note 1: This is a **GROUP** assignment.

INSTRUCTIONS:

First, download and unzip the sample project. For this homework you need to implement the social forces algorithm for goal-directed collision avoidance.

The execution order of the incomplete functions is already implemented, so you only need to modify the functions within the “Incomplete Functions” region. You can add any helper functions that you need to.

Part 1:

[8 points] The first part of this assignment is to implement the vanilla social forces algorithm, which consists of the following forces: **Goal Force**, **Proximity Force**, **Agent Repulsion Force**, **Agent Sliding Friction Force**, and **Wall Repulsion Force**.

The Goal Force uses the NavMeshAgent’s path computation, which is used for the goal direction.

The Agent Forces (proximity, repulsion, and sliding friction) require nearest neighbor searches to identify the neighboring agents within a radius. For this, there are two options. **1.** Choose from either a K-D tree, quadtree, or bin lattice to perform NN queries. **2.** Alternatively, use triggers to find the neighboring agents within the perceptual range.

The Wall Repulsion Force requires an agent to repel itself from a wall in a direction normal to the wall’s surface. This requires the use of the agent’s collider and book-keeping for the wall’s edges (i.e., you need to know which side of the wall the agent hit in order to push it in the direction normal to the side).

After accumulating the forces, the aggregated force must be applied to the agent’s rigidbody. Create a free-look camera that uses **right-click** to set the destination of the agents using *AgentManager.SetAgentDestinations(Vector3 v)*.

For the implementation you need to write your code in ONLY the **Agent.cs** script. Please do not touch any other files for the regular credit assignment.

Part 2:

[7 points] Now that you having a functioning social force agent, **choose two** of the following single-agent behaviors to implement:

Pursue and Evade

Wall Follower (moves along the side of a wall)

Growing Spiral

Next, **implement two** of the following group behaviors:

Leader Following

Crowd Following

Queueing

For the implementation, you can create different prefabs/scripts for agents in Part 2. It's highly recommended you create separate scenes for different behaviors. You can find the demonstrations of the above behaviors **here**.

Extra Credit opportunities are as follows:

+3 Full flock implementations incorporating cohesion, separation, and alignment.

+3 Deformable agents

+4 Area deadlock resolution

+5 Dribbling a ball toward a goal and avoiding other agents without attaching the ball to the agent controlling the ball

Submission:

Your final submission (ONE per group) will include the following:

- A zip of your source code (**only your Assets/Scripts folder**)
- Links to video demos of **ALL** Part 1 and 2 behaviors. Please clearly state how to start the game and click on several destinations to show the behaviors.
- A report with written explanations of each of the fundamental social force components (goal, proximity, repulsion, sliding friction, wall repulsion) and the 4 behaviors in Part 2. Extra-credit attempts or other relevant information should also be included in the report.
- Your log.txt file containing a log of your last commit.