Assignment 2 Analysis

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**Implementation details, notes and interpretations:**

**NOTE: After importing the project into a new unity project, be sure to open up ALL 3 scenes BEFORE running in order for the proper tagging to be created (otherwise this will result in an “undefined tag” error)**

Before discussing beginning the analysis of the behavior of the players in this game, I would first like to discuss some implementation details

* There may be some “leftover”, or old scripts that have been left in the unity assets section. I have decided to leave these in for the sake of completeness and to show the development/thought process. These scripts are clearly marked with comments at the top of the file. The most important scripts are:
  + UpdatedFlying:
    - Implements the flocking and flying behaviors of the players, as well as the tackling and ground collision
  + SnitchFlying:
    - Implements the snitch behavior, as well as scoring behavior
  + TeamController:
    - Used for keeping track of team members, used primarily in the UpdatedFlying script to allow communication between players
  + CameraMovement and MainCamera
    - Both of which are used to implement the WASD + shift + space camera movement system. As stated in the overlay
    - W moves up, A moves left, D moves right, S moves back, Shift moves down and space moves up. The camera always points towards the snitch
  + Score display and Globals
    - Displays the score of the game

Furthermore, there was an implementation detail that I was unsure of and made my own interpretation:

* The assignment states that in the base game, players should “attempt to avoid other players”. My interpretation of this was that they should avoid players “of the same team”. As a result, the base game implementation essentially has 2 “flocks” of players (1 for each team). Therefore, a red player for example has no urges to avoid a green player. I made this assumption this because players should be encouraged to collide with members of the other team to make tackles.
* In my 3rd scenario “Sportsmanship” however I implemented a version where both teams flock together simultaneously

**Analysis**

**Scenario 1: Base Scene**

**Details:**

This scenario has all of the parameters set as specified in the assignment description.

**Analysis:**

Generally speaking, after running the game for many iterations, the Gryffindor (red) team seems to have a significant advantage due to their speed and acceleration advantage. Although the Slytherin team is much more successful in making tackles and staying on the field, they have a much more difficult time capitalizing on this advantage due to their speed. Furthermore, being tackled can sometimes provide the Gryffindor team with an advantage. Since they were respawning more often, the Gryffindor team did a much better job when the snitch was close to their spawn relatively to the Slytherin team.

If I were to make changes to this version to make the game more balanced, I would likely begin by adding a bigger punishment to being tackled. A significant delay in spawn time, or even a queue for players to re-enter the game would likely improve the performance of the Slytherin team, as there would be a much more significant reward for making a successful, tackle.

**Scenario 2: AggroSlyth**

**Details:**

In this scenario, both teams have their speed and acceleration equalized, and their tackle percentages greatly reduced. Furthermore, whenever a Slytherin player unsuccessfully tackles a Gryffindor player (which is much more often now that the tackle percentages are low), the Slytherin player will actively chase the Gryffindor player until the tackle is successful. Furthermore, the “neighbor distance” (distance in which 2 players are considered “flocking together”) has been reduced to encourage tighter flocking

**Analysis:**

Although this change in parameters had less of an impact than expected, the results were still interesting. First and foremost, the equalization of speeds greatly improves the balance of the game. After many games, the score distribution seemed to be much more equal between the two teams. The behavior of Slyth players chasing Gryff players isn’t as noticeable as I would think, however I noticed that forcing the Slyth players leaning into their advantage of tackling actually improved their performance. Generally speaking, this allowed them to limit the opportunities of the Gryff players to break away from the pack which improved the chances that a fellow Slyth player would catch the Snitch.

If I were to improve this model to make the “aggressiveness” of the Slyth players more noticeable, I would instead have 3 quarters of the Slytherin team pick a single player on the Gryffindor team to chase for the duration of the game (unless they are currently falling). I think this “man on man” strategy would produce different results and significantly more varied behavior.

**Scenario 3: Sportsmanship**

**Details:**

In this scenario, both teams have their tackle percentage greatly reduced, and their neighbour distance significantly increased. Furthermore, players will exhibit “flocking” behavior with both their teammates, as well as their opponents. This will reduce the number of collisions between players and make for a smoother and less “physical” game.

**Analysis:**

Overall, the speed advantage was still a noticeable advantage for the Gryffindor players. However, one interesting thing to note was that the Gryffindor players had a more difficult time maneuvering towards the snitch. I assume that this is for two major reason. The increased flocking range makes it so the Gryffindor players closest to the snitch have their direction manipulated by players that are much further back than in the base Scene scenario. This is amplified by the fact that they are also forced to flock with Slytherin players who are less fast and maneuverable by definition. As a result, the games tended to be more even than in the base scenario.