INB383 AI for Games

Assignment 2

Swarm Intelligence or Predator versus Prey

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| **Assessment Overview** | |
| **ITEM:** | **Assignment 2: Swarm Intelligence or Predator versus Prey** |
| **WEIGHTING:** | 30% (25% for Part A and 5% for Part B) |
| **OBJECTIVES:** | Unit Objectives 1, 2, 3 & 4 from unit outline |
| **DUE DATES:** | **Friday May 29th 2015** |
| **DESCRIPTION:** | This is an individual assignment. Your deliverable for this assignment will be in two parts archived into a single .**zip** file and submitted via the **Blackboard**:   1. A practical component. 2. A statement of completeness, issues and how you solved those issues.  Part A – Practical Component For this part, you **must** use Unity3D. You will create a world and setup Boids using physics for swarming and behaviours according to the outline later in this document.  **Development Features**: In this parts, can choose to develop **one** of the two following simulations:   * 1. A Beehive simulation: Implement a hive of bee Boids and the Bee’s algorithm.   2. A Predator and Prey simulation: Implement predator and prey Boids using Tau’s model for fear, Blumberg’s top-up and decay model for hunger and hunt and flee logic as presented in the lectures.  Part B – Written Component In this part of the assignment, you will each write a statement of completeness along with any issues that you encountered, your theories on these issues and how you solved the issues. |
| **CONTENT:** | You will submit via Blackboard in a .**zip** file the following items:   1. The executable that contains your solution in answer to part A. 2. A copy of your code 3. Part B – your statement of completeness. 4. The criteria sheet for this assignment.   **All submissions via the Blackboard.** |

# Requirements

You will create **one** of the following two possible simulations:

1. You may choose to implement the Bee’s Algorithm to simulate bees in a foraging field around their hive.
2. Otherwise, you may choose to implement a predator prey simulation involving schools of sharks and fish swimming in a bowl above the ground.

## Option 1: The Beehive Simulation

Your scene should have the following features:

1. **A beehive:** This can be a traditional box-shaped beehive used in commercial or hobby apiaries with the lid open so that bees can easily enter and leave the hive.
   1. The beehive will operate as a data centre where:
      1. Returning scout bees will submit the location and the fitness (quality of food) of any flower patches they have visited in the field.
      2. Directives will be given to bees according to the Bee’s algorithm (see video on Blackboard).
2. **Twenty bees:** Bees can be small spheroids (you can texture them to look like bees if you like).
   1. These are physical objects.
   2. Each bee will have a maximum fly radius of 20 meters.
   3. Have a buoyancy (they can sit suspended in space)
   4. Use Separation, Alignment and Cohesion forces for steering (the parameters for these forces are at your discretion).
   5. Each bee maintains its own list of flower patches, their locations and fitness values found on a scouting adventure.
      1. Each bee will submit their list to the hive on each return and then clear their list.
   6. Each bee will follow the following rules concerning hive directives:
      1. If no directive then fly about randomly (see slide on Wandering) visiting flower patches in a radius that decays and converges on the hive over time (time at your discretion).
      2. If given a directive from the hive then follow that directive.
3. **Five flower patches:** Each patch can just be a 2x2x1box with a flower garden image assigned to its texture.
   1. Each flower patch will have a different **maximum** fitness (quality of food) value.
   2. Each flower patch will use Blumberg’s top-up and decay model, where “decay” moves to **increase** the fitness of the flower patch over time up to the maximum and “top-up” moves to **deplete** its fitness with each visiting bee (Blumberg’s top-up and decay model in reverse).
   3. Flower patches will be distributed at random within a 20-meter radius about the hive.

## Option 2: The Predator Prey Simulation

Your scene should have the following features:

1. **Fifteen fish:** should be small spheroids (you can texture them to look like fish)
   1. These are physical objects.
   2. Have a buoyancy (they can sit suspended in space)
   3. Each fish will have a maximum swim radius of 20 meters.
   4. A maximum food value that can be used by sharks in satisfying their hunger.
   5. Use Separation, Alignment and Cohesion forces for steering, so that fish swim in a school (the parameters for these forces are at your discretion).
   6. A dead fish stops functioning as a Boid, turns semitransparent and cannot be detected by sharks.
   7. Dead fish become living opaque fish after a period (at you discretion and not greater than 30 seconds).
   8. All reliving fish recover their previous living Boid state.
   9. Fish will flee from sharks.
2. **Five sharks:** should be larger spheroids (you can texture them to look like sharks)
   1. These are physical objects.
   2. Have buoyancy (they can sit suspended in space)
   3. Each shark will have a maximum swim radius of 20 meters.
   4. A maximum appetite value.
   5. Use Separation, Alignment and Cohesion forces for steering (the parameters for these forces are at your discretion). The shark school will not be as cohesive as the fish school.
   6. Each shark will use Blumberg’s top-up and decay model, where “decay” moves to **increase** hunger over time up to the maximum appetite and “top-up” moves to **deplete** hunger with each fish it eats.
   7. Sharks will hunt and attack fish.

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| **INB383 Assignment 2: MARKING CRITERIA**  The assignment is designed to assess certain aspects of the objectives for this subject  Performance standards and criteria for each objective appear below | | | | | | |
| **Criteria** | **Performance Standards** | | | | | |
|  | **High Distinction** | **Distinction** | **Credit** | **Pass** | **Fail** | **Mark** |
| **Specifications** | Adhered to every requirement. And, did some additional research. | Did some research but missed one minor requirement. Or  Did no additional research but adhered to every requirement | Missed several minor requirements.  Or  Did some research but missed one major requirement | Missed a major requirement. | Missed many major requirements. |  |
| 10 – 9 marks | 8 marks | 7 marks | 6 – 4 marks | 3 – 0 marks |  |

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| **Visual Affect** | Simulation was particularly convincing. Considerable attention to Boid formation behaviours. | Simulation was particularly convincing. Attention to Boid formation behaviours. | Simulation was convincing. Attention to Boid formation behaviours. | Simulation was passable. More attention to Boid formation behaviours needed. | Simulation failed to impress or little or no consideration to Boid behaviours. |  |
| 10 – 9 marks | 8 marks | 7 marks | 6 – 4 marks | 3 – 0 marks |

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| **Communication**  relates to:  Outcomes 1, 2 & 3 in the unit outline | Gave an excellent two paragraphs on what was learned from this exercise by stating the problems, theories and solutions. | Gave a very good two paragraphs on what was learned from this exercise by stating the problems, theories and most of the solutions. | Gave a good two paragraphs on what was learned from this exercise by stating the problems, theories but not quite getting all of the solutions. | Gave two paragraphs on what was learned from this exercise by stating the problems, theories but no real solutions. | Gave one or zero paragraphs on what was learned from this exercise. State the problems but did not have nay theories. |  |
| 5 – 4.5 marks | 4 marks | 3.5 marks | 3 – 2 marks | 1.5 – 0 marks |  |

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|  | **High Distinction** | **Distinction** | **Credit** | **Pass** | | **Fail** | **Marks** |
| **Software**  relates to:  Outcomes 3 & 4 in the unit outline | All scripts compile. Clean programming style. Correct & efficient code. No logical errors. | All scripts compile. Good programming style. Correct code. No logical errors. | All scripts compile. Reasonable programming style. Correct code. Non-invasive logical errors. | 80% of scripts compile. Minor programming style issues. Correct code. Some minor logical errors. | | Less than 50% of scripts compile. Major programming style issues. Incorrect code. Major logical errors. |  |
| 5 – 4.5 marks | 4 marks | 3.5 marks | 3 – 2 marks | | 1.5 – 0 marks |  |
| **Comments:** | | | | | Total Mark Awarded | |  |