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| Code Review Report |
| Project Summary |
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| Report Date | Project Name | Student Name / Number | Code Reviewer |
| 01/12/2023 | *Interactive Boid Simulation* | Alec Robinson - 4203312 | *Toby King* |

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| Project Summary |
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| Students are tasked with creating a 3D Boid Simulation using basic steering and flocking behaviour AI. This simulation must be created using the C++ programming language, utilizing Unreal Engine 5.   Submissions should include:   * Flocking and avoidance using steering behaviours, which may be implemented using an entity-component-system. * Allow control over certain parameters using a UI Widgets * Students are required to create the above using C++ and the Unreal Engine, using Blueprints only sparingly. |

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| Unit Testing |
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| Test Summary | Test Steps | Expected Result | Actual Result | notes |
| **Spawning objects** | **Can manager spawn boids and a shark** | **Spawn’s boids correctly** | **UI messes up when number is changed** | **Added to bug tracking** |
| **Separation** | **Do the boids use separate** | **Separation occurs in boid** | **Boids separate** | **Working** |
| **Cohesion** | **Do the boid use cohesion** | **Cohesion occurs in boid** | **Boids are cohesive** | **Working** |
| **Alignment** | **Do the boid use alignment** | **Alignment occurs in boid** | **Boids Align** | **Working** |
| **Shark Seeks Boids** | **Does the shark move towards the closest boid** | **Shark catches the closest boid** | **Boid Caught** | **Working** |
| **Boids Flee from Shark** | **Do the boids move away from the shark** | **Boids swim away from shark** | **Shark doesn’t catch boids** | **Working** |
| **Containment** | **Do the boids leave the bounds** | **Boids stay within the bounds with small amount of room outside allowed for fluid movement** | **Boids work correctly** | **Working** |
| **Seek and flee updated to pursue and evade** | **Do they now follow the new rules** | **Pursuing and evading** | **Boids evade. Shark purses.** | **Working, also help fix issue involving shark movement.** |
| **Find Boids if Alone** | **Wait for a boid to wander off and see if it comes back** | **Boid leaves pack and then returns when too far away** | **When boid is alone it will wander to find other boids again and rejoin a pack** | **Working** |
| **Object Avoidance** | **Add some obsticals to the level** | **Boids move around the obstruction** | **Boids attempt to avoid object that are put in thier way** | **Working** |
| **UI changes variables** | **Change slider value and see if boids repond** | **Boids respond to value change** | **Yes the boids respond** | **Working** |

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| BUG Tracking LOG |
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| Bug Details | STEPS TO Reproduce | DATE Found | Date Resolved |
| **Velocity of boids is incorrect** | **Maths is wrong and forces are not being added correctly** | **01/12/2023** | **05/12/2023** |
| **Separation, cohesion and alignment not working correctly** | **Change percentages and boids go wild** | **05/12/2023** | **05/12/2023** |
| **Shark stopped moving** | **Seek function is bugged and won’t run correctly** | **12/12/2023** | **15/12/2023** |
| **Incorrect spawning when using UI inputs** | **Start at main menu and try spawn a different number of boids** | **15/12/2023** | **Unresolved** |
| **Boids getting stuck on containment borders** | **Increase flee weight to max** | **18/12/2023** | **19/12/2023** |

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| Conclusions/Areas for further expansion |
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| ***Steering and flocking behaviors correctly added with all functionality completed. A containment has been set to keep boids from drifting too far away. A ‘shark’ boid has been included to mix up the pack and keep the boid moving around. Object avoidance has been added to allow the boids more movement around their environment.***  ***Additional features that could be added would include a UI system on the main menu that can select how many boid are spawned in what radius(this was started but has unresolved errors). Boid and boid leader could be integrated and together and use inheritance to reduce the amount of scripts being run.***  ***Adding artwork to the boids and boidleader to make them fish and a shark would immerse the player in the simulation. Also adding a skybox of a ocean would help with this. Could also make the object that the boids avoid coral or bits of shipwreck to help immerse the player. This would all require an artists help.*** |

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| Project Checklist – (For Code Reviewer to fill in) |
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| task | notes |
| *What is the code supposed to do, and does it accomplish it? (Is the code easy to understand?)* | **The code is very easy to read and accomplishes its task** |
| *Can this solution be simplified? (How?)* | **Could possibly use inheritance with the boid and boidLeader** |
| *Can this solution be improved in terms of maintainability, readability, or performance?* | **If inheritance is used, then it would make the code easier to read and decrease repeating code.** |
| *Is the code modular enough? How reusable is it?* | **Quite modular with lots of functions** |
| *Are there any best practices or design patterns that could improve this code?* | **Not that I can see** |
| *Does this code adhere to Object-Oriented Principles, like the Single Responsibility Principle?* | **Definitely object oriented** |
| *Can you think of any use case in which the code does not behave as intended?* | **No** |
| *Are debug-logs user friendly?* | **Yes** |
| *Does the code contain user friendly comments or documentation? (Is it up to date?)* | **Many comments through out explaining the purpose behind certain bits** |
| *Does the code make use of user data in a way that might raise privacy concerns?* | **N/A** |
| *Is the code ethical? Does it exploit behavioral patterns, introduce bias, or have the potential to cause harm?* | **N/A** |
| *Is the code testable? If so, what automated tests have been added?* | **Yes tests have been completed on the project** |
| *Are there portions of code that aren’t covered in testing?* | **Test the UI of the game** |
| *Were any parts of the code confusing or difficult to understand?* | **Everything was straight forward for me** |
| *Any final comments or feedback:* | **Good boid project** |
| *Signature/Date:* | **Toby King – 12/12/2023** |