TECHNOLOGICAL UNIVERSITY DUBLIN
KEVIN STREET CAMPUS

BSc. (Honours) Degree in Computer Science (Infrastructure)

BSc. (Honours) Degree in Computer Science

BSc. (Honours) Degree in Computer Science (International)

Year 4

DT508 BA. (Honours) in Game Design

Year 3

SEMESTER 2 EXAMINATIONS 2018/19

Games Engines 2

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Ms. Pauline Martin – DT211C
Mr. Patrick Clarke – DT228/282

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION 1 (COMPULSORY) AND ANY 2 FROM THE REMAINING QUESTIONS
QUESTION 1 IS WORTH 40 MARKS, THE REMAINING QUESTIONS ARE WORTH 30 MARKS EACH

Question 1

(a) Explain the laws of motion that are used to program a Boid integration function.
(b) What is banking? How can a Boid implement banking?
(c) What is damping? How can a Boid implement damping? How does this differ from real-world friction?
(d) How can a Boid deal with sudden changes in forces, for example due to sensing an obstacle?
(e) Why would you program a custom integration function for a Boid rather than use a rigid body?
(f) How can polymorphism be employed in a design of a Boid behaviour framework?
(g) Explain how behaviours are combined.
(h) Describe how to program a steering behaviour that takes input from a game controller.

(8 x 5 marks)

Question 2

Figure 1 depicts a formation of Eagle landers moving through a scene in Unity. The leader uses the seek behaviour while the followers employ offset pursue.
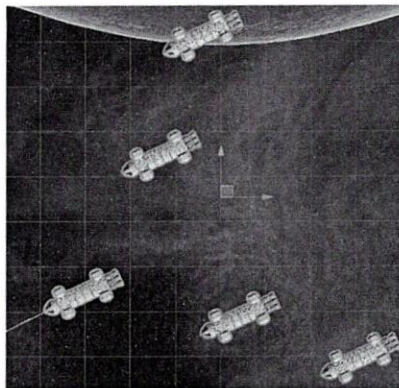
Figure 1

(a) Assuming the models were incorrectly rotated and not centred around the origin when imported into Unity, how would you create a prefab for a spawner MonoBehaviour that instantiates Eagle landers?

(5 marks)

(b) How are the initial positions and rotations of the Eagles calculated?

(5 marks)

(c) How are the initial offsets calculated?

(5 marks)

(d) How would you keep the followers moving in formation with the leader?

(10 marks)

(e) Suggest two methods of adding a certain amount of randomness to the ship's movement.

(5 marks)

Question 3

(a) How do you program Unity to respond to collisions between two objects? What does it mean to assign the static flag on a gameobject?

(5 marks)

(b) Figure 2 shows a screenshot of VR controls for a steering wheel implemented in Unity. In relation to this:
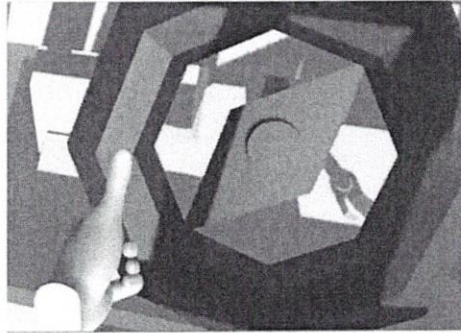
Figure 2

i. Explain in detail how the grab point is calculated. Include a diagram in your answer.

(10 marks)

ii. Explain in detail how to calculate the angle of rotation.

(15 marks)

Question 4

In relation to the obstacle avoidance behaviour we developed on the course:

(a) How are the feelers direction vectors calculated?

(5 marks)

(b) How does the behaviour deal with holes in the geometry of obstacles?

(5 marks)

(c) How are the direction and magnitude of the avoidance force calculated? How does the distance to the obstacle affect the magnitude of the force?

(5 marks)

(d) How is the behaviour programmed to avoid certain objects but ignore others? Include examples in your solution.

(5 marks)

(e) How does the speed of the boid affect the behaviour?

(5 marks)

(f) Is this behaviour efficient? Explain.

(5 marks)