UNIVERSITY OF BOLTON

SCHOOL OF CREATIVE TECHNOLOGIES

BSC GAMES PROGRAMMING

SEMESTER ONE EXAMINATION 2018/2019

ADVANCED GAMES TECHNIQUES

MODULE NO: GAP6000

Date: **Thursday 17th January 2019**   Time: **10:00 – 12:00**

INSTRUCTIONS TO CANDIDATES: There are **SIX** questions on this paper.

Answer **ANY FOUR** questions.

All questions carry equal marks.

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Games Programming
Semester One Examination 2018/2019
Advanced Games Techniques
Module No. GAP6000

Rendering

Question 1

a)   What is ambient occlusion and how is it typically used in a real-time lighting?

(5 marks)

b)   Detail the pipeline for how a modern 3D scene is rendered to a 2D screen, be sure to include details of each stage (5 marks for each stage accurately described in detail) and pay particular attention to the transform and lighting stage.

(20 marks)

Question 2

a)   You are asked by your lead programmer to create a weather effect (e.g., "rain and wetness") effect for your render engine. Describe in detail the effect and how it would be presented to the user, paying particular attention to how the effect is composited and controlled by artists and designers.

(10 marks)

b)   Modern games are often distinguished by the quality of their lighting and shadowing, with many techniques being used by the various companies to differentiate their technology. Discuss the properties that a lighting and shadowing pipeline needs to exhibit and detail how **THREE** different approaches have been used in their respective game engines. Be sure to describe the render architecture with regard to lighting and shadowing in detail.

(15 marks)

Question 3

You are asked by your lead programmer to write a brief essay describing a typical render pipeline for a third person open world exploration/action game such as Assassins Creed. Describe the pipeline, paying particular attention to the various texture/memory buffers used during each step of the pipeline and how they are composited to produce the final scene.

(25 marks)

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AI

Question 4

a) Which architecture would you use to provide navigation capabilities for an AI "town guard" agent for an open world game such as assassins creed, where the guard must be able to "parkour" or navigate by jumping and climbing across many different kinds of environmental obstacles.

(10 marks)

b) How would you extend the architecture you detail in question 6a such that it is possible to allow for the same architecture to be used in a sci-fi setting where a robot sentry guard is now deployed (which actually takes the form of a small spider-tank and is roughly twice the height and four times the width of a normal human agent).

(10 marks)

c) What is the funnel algorithm and how can it be used with string pulling techniques to improve the paths of agents using navigation meshes in 3D worlds.

(5 marks)

Question 5

a) Draw a behaviour tree diagram for a behaviour tree to be used with a security guard in a stealth based game (such as the Thief, Dishonored or Splinter Cell games). Be sure to describe the functionality of each node in the tree, any conditions being used and the blackboard data that would be needed to make the tree functional.

(15 marks)

b) Detail a perception system that might be used in a stealth based game as described in question 5a, paying particular attention to how the perceptions could be used to increase the gameplay for the stealth based genre.

(10 marks)

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Question 6

a)   Describe the concept of "response curves" with respect to their usage with utility based decision making architectures.

(5 marks)

b)   Discuss how you would use a utility-based architecture to choose which target to attack in a turn based combat game (such as the final fantasy games, or the Advanced Wars Games). Be sure to include details of how the architecture would make the decision and how we might alter the decision making process in order to make the resulting decision more interesting to the player, also discuss how the resulting decision might be presented to a tester or designer of the game so that they could understand and/or debug why the decision was made.

(15 marks)

c)   What is "expected future utility" and why might it be useful to incorporate into a utility decision making architecture?

(5 marks)

END OF QUESTIONS