UNIVERSITY OF LONDON

GOLDSMITHS COLLEGE

Department of Computing

B. Sc. Examination 2020

IS53032C
3D Virtual Environments and Animation

Duration: 2 hours 15 minutes

Date and time:

This paper is in two parts: part A and part B. You should answer ALL questions from part A and TWO questions from part B. Part A carries 40 marks, and each question from part B carries 30 marks. The marks for each part of a question are indicated at the end of the part in [.] *brackets.*

There are 100 marks available on this paper.

THIS PAPER MUST NOT BE REMOVED
FROM THE EXAMINATION ROOM

Part A

Multiple choice

Question 1

(a) Which of these is a characteristic of VR that is not typical of other displays? [4]

a) High resolution displays
b) User Dynamic Control of Viewpoint
c) Fragment Shaders
d) 3D graphics models based on polygons

(b) Place illusion in VR is primarily achieved using: [4]

a) Visual-Motor synchrony
b) Tactile-Motor Synchrony
c) Head Tracking
d) Hand Tracking

(c) What is an agent? [4]

a) a 3D virtual character that is controlled by computer algorithms and represents a non-player character
b) a 3D virtual character that is controlled by and represents a user
c) a 3D virtual character whose movements are based on live tracking or motion capture of a users' movements
d) all of the above

(d) Mobile phone based VR typically only tracks head rotation, not position. This is an example of: [4]

a) 1 DOF tracking
b) 3 DOF tracking
c) 4 DOF tracking
d) 6 DOF tracking

(e) In VR games it is common to have floating menus for doing tasks like saving games or selecting levels. This is an example of: [4]

a) Non-diegetic interaction
b) Real-world interaction
c) Passive Interaction
d) Magical Interaction

(f) Which of these would be best animated using physics simulation? [4]

a) The path of a tennis ball that has been hit by a racquet
b) The movement of a tennis raquet that is being held by a user
c) A children's cartoon character
d) The movement of a character that is played by a particular actor

(g) How many keyframes a second are there in Unity? [4]

a) 25
b) 60
c) depends on the speed of your computer
d) depends on the details of the animation

(h) A point light has: [4]

a) a position but no direction
b) a direction but no position
c) neither position or direction
d) both position and direction

(i) Which of the following VR navigation methods are most likely to cause nausea? [4]

a) A first-person controller
b) Real walking
c) Re-directed walking
d) Teleportation

(j) Morph Targets (also known as blend shapes) are typically used to animate: [4]

a) Arms and legs
b) Bouncing balls
c) Facial Expressions
d) Complex objects made out of several independently moving rigid elements

Part B

Question 2 Virtual Reality

(a) The components of VR are VR display, VR interaction, VR content. Give an example of each [3]

(b) Describe embodiment illusion and the technologies you need to create it [6]

(c) There are three different types of synchronies to trigger an embodiment illusion. What are the three types? How does each work in VR? [12]

(d) Describe how you designed the technical implementation of your VR project so that it supports the three illusions of virtual reality. Evaluate how successful it was [9]

Question 3 Graphics

(a) What are the three main transforms in 3D graphics [3]

(b) Explain the role of Virtual Cameras in VR. [8]

(c) What are the differences between Global and Local Illumination? [6]

(d) What does *Baked Shadow* mean and how is it used in VR? [4]

(e) Describe the graphics or animation techniques you used in your project. Explain why they were appropriate to the aims of the project [9]

Question 4 3D Interaction

(a) What is the difference between the graphics object and the physics object? [3]

(b) A popular form of navigation in VR is room scale real walking, where you move around a virtual environment by walking normally in your real room. Describe what technologies are needed to implement this and what the limitations and drawbacks are. [6]

(c) What are the alternatives to real walking in VR? Give three examples. [9]

(d) Decribe one technique you could use in VR to select objects that are out of reach. [3]

(e) Describe the interaction techniques you used in your project. Explain why they were appropriate to the aims of the project [9]