

香港中文大學
The Chinese University of Hong Kong

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二〇一六至一七年度下學期科目考試
Course Examination 2nd Term, 2016-17

科目編號及名稱
Course Code & Title : CSCI4120 Principle of Computer Game Software

時間
Time allowed : 2 hours 00 minutes

學號
Student I.D. No. : 座號
Seat No. :

ANSWER ALL QUESTIONS

FULL MARKS: 100

(1) Game Design (16 marks in total)

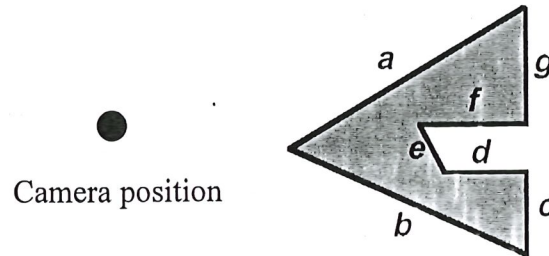
- (a) If you are a game developer (of a startup company) planning to launch a game on Android phones and the game is 2D, will you adopt the game engine in your development? Justify your decision (6 marks).
- (b) Do you think a sandbox design is suitable for implementing action-adventure game like Tomb Raider? Why? Or Why not? (5 marks)
- (c) Jack wants to develop a horror game like Biohazard. He plans to use the isometric view for this game. Do you think it is a good idea? Why? (5 marks)

(2) Hardware and Shader (19 marks in total)

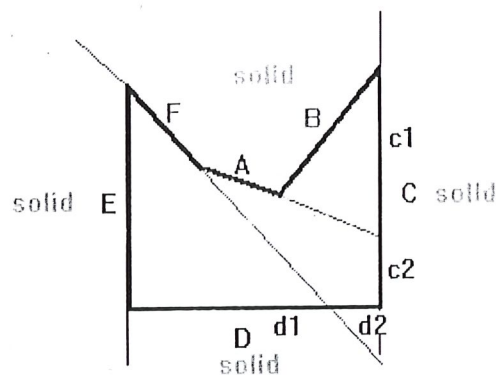
- (a) Most graphics hardware are depth-buffer based, what visual effects are not native to it? (5 marks)
- (b) Modern GPU can create new geometry during the rendering process. Hundreds of thousands new triangles can be created during each rendering pass (e.g. 1/30 sec), and then dumped after being rendered. Such creation and deletion are repeated in each rendering pass. It seems wasteful. Can you illustrate the strength of such approach with one example application (5 marks)?
- (c) Can I first execute the fragment shader before executing any vertex shader? Why? (4 marks)
- (d) Some new games, e.g. No Man Sky, adopt the procedural approach. Describe your understanding of procedural approach. (5 marks)

(3) Visibility (32 marks in total)

- (a) Design a suitable BSP tree for the following 2D polygon. Draw the tree structure and partitioning of the polygon (If your partition segment a into two, name them a_1 and a_2). (4 marks)



- (b) Explain what a solid leafy BSP tree is. Given the following polygon and partition, draw the solid leafy BSP tree. (6 marks)



- (c) In portal rendering, after we detect room of current camera position, render the room, and locate any portals, what the remaining tasks are for each portal? (4 marks)
- (d) List at least three techniques that are useful in outdoor terrain rendering. (4 marks)
- (e) Give an example to illustrate the concept of virtual textures. (4 marks)
- (f) In our discussion of sparse virtual texture, there are several mip levels. If level-1 virtual texture coordinate (TC) is

0.01001001010011101

Page TC within-page TC

What is the level-4 texture coordinate (TC)? (4 marks)

- (g) Given the following sparse virtual texture tables in four levels, please fill in the missing data. (6 marks)

			0	1					
		2	3	4					
	5	6	7	8					
	9	10	11	12					
			13	14					15
				16	17	18	19		
				20	21	22	23		

	27	28	
29	30		
31			

25	
	26

24

(4) AI (33 marks in total)

- (a) Draw the Finite State Machine (FSM) for the following descriptions. **(5 marks)**
- The guard stays idle
 - If he sees you, he will chase you
 - He carries a sword and if in close contact, he will stop and hit you with the sword
 - If you are dead or get lost, the guard will go back to where he should stay
- (b) Change the above FSM to the pseudo-code in a function and complete the following “{missing}” and “{missing script}” parts. **(4 marks)**

```
#define {missing} //initial state
#define {missing} //state
{missing}
    case {missing}: {missing script} break;
{missing}
```

- (c) Explain what nondeterministic automata is. Give an example. (4 marks)
- (d) Change the conditions in (a) into a rule system (RS) where each rule is written as “**Condition \Rightarrow Action**”. (5 marks)
- (e) Directly map the rules into codes and scripts using if-then-else. (4 marks)
- (f) Explain the A* search algorithm. Does it guarantee the global optimality? (6 marks)
- (g) What is the philosophy of Q-learning and explain the general procedure. (5 marks)

END