Examen 5 avril 2023

Création de monde virtuel

NOM : _____ Prénom : _____

Part A. True or false (2 points): For each statement, indicate if it is true (T) or false (F)

Q1. With regards to the software used in the course (Blender and Unity):
_____ Blender is a software primarily for 3D animation and modeling.
_____ Unity is the most popular free and open source game engine.
_____ Translation and rotation transforms have a total of 6 DoF (Degrees of Freedom).

Q2. With regards to the 3D interactive and visualization systems :
_____ Feedback is optional but strongly recommended in the perception-action loop.
_____ Immersive analytics can be designed for a 2D screen.
_____ When identifying user needs, both expert and target user feedback is valuable and important.

Part B. Multiple choice (4 points): more than one response is possible, no negative points

Q3. _____ Which processes are part of the game loop? (a) Rendering (b) Rigging (c) Interaction (d) Physics (e) None of the above are part of the game loop

Q4. _____ Which game design pattern addresses *memory efficiency*? (a) Observer (b) Flyweight (c) Event queue (d) None of the above

Q5. _____ Which games served as AI testbeds for *real-time strategy models* such as AlphaStar? (a) Chess (b) Star Craft II (c) Go (d) Jeopardy (e) DoTA

Q6. _____ Which of the following types of environmental lighting are directional? (a) A candle (b) A sun (c) A spotlight (d) Ambient lighting

Part C. Matching (3 points)

Q7. For the following terms calculation, indicate at which step of the graphics pipeline they are addressed: (A) Application, (R) Rasterization, or (G) Geometry

_____ collision detection _____ clipping with frustrum _____ camera projection

_____ z-buffer occlusion _____ viewport calculation _____ physics

Q8. For the following terms, assign them to the corresponding step in the animation pipeline

(a) modeling (b) animatics (c) storyboarding (d) rendering (e) compositing (f) 2D VFX (g) texturing

Pre-production _____

Production _____

Post-production _____

Q9. In the table below on the taxonomy of immersive collaborative presence, indicate the cell numbers (1-5) that correspond to:

Time / Space	Same	Different
Same	① ②	④
Different	③	⑤

_____ Mixed presence

_____ Co-located collaborative presence

_____ Synchronous collaborative presence

<u>Part D. Short questions (3 points)</u> : Choose 3 of the 4 following questions, and answer with 1 sentence

Q10. Give two examples of selection metaphors in 3D environments

Q11. What is the limitation of Gourand shading that Phong shading tries to improve?

Q12. What is the Hitchcock effect and which camera parameters are manipulated to create the effect?

Q13. What are two elements to take into account when creating a squash and stretch animation of a ball rolling on the ground and hitting a wall?

Part E. Long questions (8-9 points) : Choose 4 out of the 5 following questions, and write a long response in 4-5 sentences.

Q14. Describe the mechanics of Lagrangian (particle-based) specification of fluid dynamics. What are its advantages and limitations for real-time, interactive 3D applications? ***(2pts)***

Q15. What opportunities do immersive analytics carry beyond traditional visual analytics? Name and explain three of them. ***(2pts)***

Q16. In multi-agent systems there are three main components: decision-making, path planning, and collision detection. Give two examples of decision-making mechanisms and how they can be used to create emergent behaviors. ***(2pts)***

Q17. Why is occlusion a problem for virtual camera planning, and why is it important to consider genre when considering occlusion for a 3D experience? Use examples such as games or genres to illustrate your point. ***(2pts)***

Q18. You have a 3D scene with 200-500 dogs. Some of them will bark when the user throws a virtual piece of meat. Some of them will jump. Some will bark. Some will do both, and some do nothing. Dogs are generated randomly when the game starts.

What game design pattern would you use to manage the barking (playing an audio) and jumping events (playing an animation)? Describe or use pseudo code to show how this can be implemented. ***(3pts)***