Examen 5 avril 2023

Création de monde virtuel

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

Q1. With regards to the 3D interactive and visualization systems :

O Feedback is obligatory in the perception-action loop.

X A virtual reality headset is required for immersive analytics.

X When identifying user needs, expert feedback is more valuable than target user feedback.

Q2. With regards to the software used in the course (Blender and Unity):

X Unity is a software primarily for 3D animation and modeling.

O Blender is a free and open source software for creating 3D content.

X Translation, scale, and rotation transforms have a total of 3 DoF (Degrees of Freedom).

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

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

Q4. a Which game design pattern addresses *efficient message passing*? (a) Observer (b) Flyweight (c) Event queue (d) None of the above

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

Q6. a, d, c Which of the following types of environmental lighting are *not* directional? (a) A moon (b) A spotlight (c) A light bulb (d) Ambient lighting

Part C. Matching (3 points)

Q7. For the following calculations, indicate at which step of the graphics pipeline they are addressed: (1) Geometry, (2) Application, or (3) Rasterization

2 user inputs _____ clipping with frustrum 1 viewport calculation

3 z-buffer occlusion 1 camera transformation 2 physics

Q8. For the following terms (a)-(g), assign them to the corresponding step in the animation pipeline

(a) ideation (b) color correction (c) rigging (d) lighting (e) compositing (f) rendering (g) animatics

Pre-production a

Production c, g, f

Post-production b, e

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

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

3 _____ Asynchronous collaborative presence

2 _____ Distributed collaborative presence

1 _____ Mixed presence

Part D. Short questions (3 points) : choose 3 out of 4 of the following questions and answer with 1 sentence

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

Grabbing something using a VR handle or a joystick.

Changing the view in the environment by moving one's head.

Q11. What are two elements to take into account when creating a squash and stretch animation of a ball thrown upwards, before reaching its highest point?

The animation slows down and the ball is most streched just before hitting the highest point.

Q12. What is the limitation of flat shading that Gourand shading tries to improve?

Q13. What is the Hitchcock effect and which camera parameters are manipulated to create the effect?

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 Eulerian (grid-based) specification of fluid dynamics. What are its advantages and limitations for real-time, interactive 3D applications? ***(2pts)***

Q15. What is camera perspective, and why is it important to consider genre when designing the camera perspective for a 3D experience? Use examples such as games or genres to illustrate your point. ***(2pts)***

Camera perspective determines how closer elements will appear in relationship to those further away in terms of size and sharpness.
Camera perspective determines the view point of the experience within the 3d environment. It can be 1st person, 3rd person, 2nd person or larger view points for games. Camera perspective is an important part of story telling. FPS are designed to be very immersive so they are in 1st person. Whilst sims is more about seeing the character interact with others so it has this general view of the scene.

Q16. In multi-agent systems there are three main components: decision-making, path planning, and collision detection. Explain what heuristics are and how are they used in path planning. Give an example of a type of scene representation and heuristic. ***(2pts)***

Heuristics are simple rules that can be applied in iteration until the agent achieves their goal. At each iteration, the heuristic tells the agent what to do next. For path planning, it can be that the heuristic gives the agent the updated direction they should walk toward, given the position of their goal. An example of heuristic for this particular case is A*.

Q17. What opportunities do immersive analytics carry beyond traditional visual analytics? Name and explain three of them. ***(2pts)***

Q18. You have a 3D scene with 200 dogs and 200 humans. Dogs are randomly assigned to humans, and the human becomes the owner of the dog. When an owner calls, their dogs will either bark, jump, do both, or do nothing.

What game design pattern would you use to notify a dog when their owner calls? Describe or use pseudo code to show how this can be implemented. ***(3pts)***

I would use an observer pattern, making the dog an observer of the human when the dog is owned by them.

```
Human.BecomeOwnerOf(Dog dog) {
    dog.setOwner(this)
    dog.subscribe(this, "call")
}

Dog.On("call") {
    if (this.willBark) { this.Bark() }
    if (this.willJump) { this.Jump() }
}
```