3D計算機圖學期末考 / 3D Computer Graphics Final Exam

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※ Some questions are out of contents of course as bonus!!!

題組 (共 7 題)

1. 3D Rendering Pipeline:

1 (1) (4%) Please draw a diagram describing each stage of 3D rendering pipeline.

> transform -> illumination -> flatten shadow -> Z buffer algorithm & rgb

分數: 尚未評分

4 分

2 (2) (4%) Please indicate in which stage(s) the "rasterization" is involved?

> projection transform

分數: 尚未評分

4 分

3 (3) (4%) Please indicate in which stage(s) the "clipping" is involved?

> view transform
> projection transform

分數: 尚未評分

4 分

4 (4) (4%) Please indicate in which stage(s) the "lighting/illumination" is involved?

> projection transform

分數: 尚未評分

4 分

5   (5) (4%) Please indicate in which stage(s) the "z-buffer HSR algorithm" is involved?

> Z buffer algorithm & rgb

分數: 尚未評分

4 分

6   (6) (4%) Please indicate in which stage(s) the "Gouraud shading" is involved?

> projection

分數: 尚未評分

4 分

7   (7) (4%) Please indicate in which stage(s) the "Phong shading" is involved?
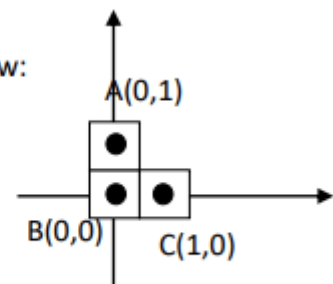
> projection

分數: 尚未評分

4 分

8

2. (12%) An object with three points (in 2D space) are given as below:

A(0,1) B(0,0) C(1,0)

A series of transformation are applied to this object as below:

Rotate (30 degree) → Translate (2,4) → Scale (2,1)

Please show the final results of points A, B & C.

> https://imgur.com/gallery/Jd8Qilp

分數: 尚未評分

12 分

題組 (共 3 題)

3. Considering two projection methods:
A. Perpendicular Parallel Projection
B. Perspective Projection
Please indicate which method is applied in each case below:

9 (1) (4%) Camera

> B. Perspective Projection

分數: 尚未評分

4 分

10 (2) (4%) Human eye

> A. Perpendicular Parallel Projection

分數: 尚未評分

4 分

11 (3) (4%) Computer Aided Engineering (CAD)

> A. Perpendicular Parallel Projection

分數: 尚未評分

4 分

題組 (共 3 題)

> 5. Considering illumination methods:
>   A. Ambient Lighting
>   B. Diffuse Lighting
>   C. Specular Lighting

12 (1) (4%)Which method(s) is "position of light source" dependent?

> B. Diffuse Lighting
> C. Specular Lighting

分數: 尚未評分

4 分

13 (2) (4%)Which method(s) is "position of viewer" dependent?

> C. Specular Lighting

14 (3) (4%)Which method(s) is "position of illuminated spot" dependent?
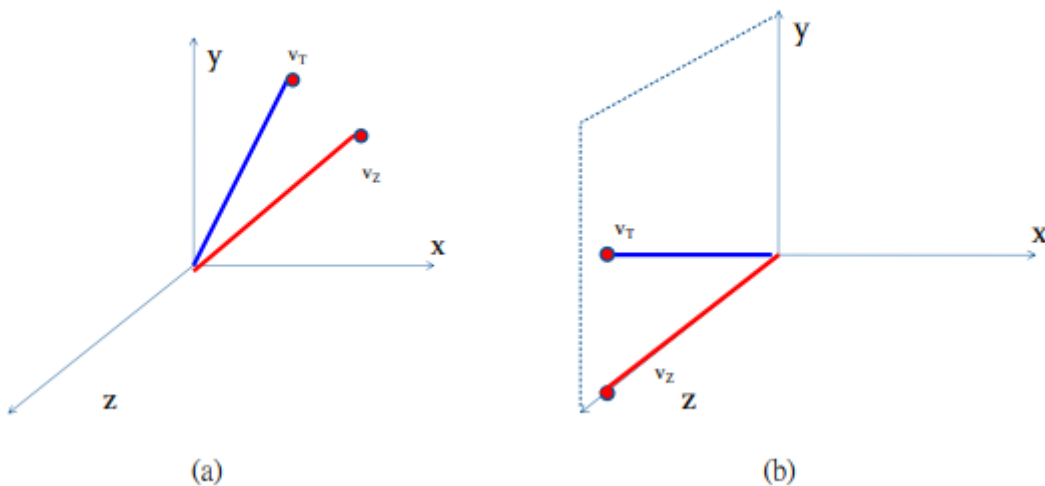
A. Ambient Lighting
B. Diffuse Lighting

15 6.(10%) In figure
(a), there are two vectors VT and VZ. Please transform both vectors in order to align VZ A(0,1) B(0,0) C(1,0) with Z axis and locate VT at Y-Z plane, as shown in fig
b). Please derive the GRM (General Rotation Matrix) with information below:

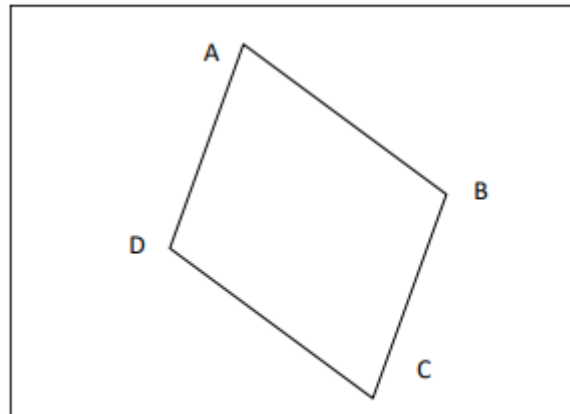$$V_T = (a, b, c) \quad , \quad \|V_T\| = 1$$

$$V_Z = (d, e, f) \quad , \quad \|V_Z\| = 1$$

(a)   (b)

沒圖

16 7. (10%) Considering the information provided below, please calculate the color(r, g, b) of pixel at (600, 200) with Gouraud Shading algorithm.

	Position (x,y)	Color (r, g, b)
A	(600, 50)	(0.8 , 0 , 0.2)
B	(900 , 300)	(0.2, 0.8 , 0)
C	(800 , 700)	(0.6 , 0.2 , 0.4)
D	(300 , 500)	(0 , 0.8 , 0.4)

沒圖

分數: 尚未評分

10 分

題組 (共 4 題)

8. Considering the illumination equation below:

$$I = KaIaOd + KdIp(NL)*Od + KsIp(RV)^n + KrIr + KtIt$$

(a) KaIa   (b) Od   (c) KdIp   (d) N   (e) L   (f) KsIp   (g) R   (h) V   (i) n   (j) KrIr   (k) KtIt

17 1) (2%) Which part(s) is "Texture Mapping" involved?

a, b

分數: 尚未評分

2 分

18 2) (2%)Which part(s) is "Bumping Mapping" involved?

c, f, j

分數: 尚未評分

19 3) (2%)Which part(s) is "Displacement Mapping" involved?

d, g

分數: 尚未評分

20 4) (2%)Which part(s) is "Reflection Mapping" involved?

d, e, i

分數: 尚未評分

21 9. (10%) What is the purpose of "Bounding Box" and how to utilize it?

A bounding box is an imaginary rectangle that serves as a point of reference for object detection and creates a collision box for that object

分數: 尚未評分

22 10. (10%) Please describe two methods about how to tell if a point is inside a polygon or not.

A: Planner polygon
    polygon as a plane
    calculate the equation of polygon plane , check the point is equal to equation.
B: Non - Planner polygon (curvef surface)
    Draw a horizontal line to the right of each point and extend it to infinity
    Count the number of times the line intersects with polygon edges.
    A point is inside the polygon if either count of intersections is odd or point lies on an edge of polygon. If none of the conditions is true, then point lies outside.

分數: 尚未評分

題組 (共 2 題)

11. Please describe the attenuation of Light Intensity by:

23 1) Distance (5%)

a reduction in the intensity of a light beam as the beam propagates in matter owing to the joint action of the absorption and scattering of light.

分數: 尚未評分

5 分

24 2) Atmosphere (5%)

a reduction in the intensity of a light beam as the beam propagates in matter owing to the joint action of the absorption and scattering of light.

分數: 尚未評分

5 分

題組 (共 3 題)

12. Please describe the disadvantages of:

25 1) Z-Buffer Algorithm (at least three points) (6%)

1. 在象素上以z座標決定顯示順序(近物取代遠物)，與物體在螢幕的出現順序無關，是在象素級上的消隱算法。
2. 沒有利用圖形的相關性與連續性去做運算。
3. 使用大量的記憶體作為緩衝區，而由於它是以像素為處理的單位，所以需耗用相當大量的運算資源。

分數: 尚未評分

6 分

26 2) Displacement Mapping (at least one point) (2%)

當物體上面的節點不多時，displacement mapping 能的到的效果就相當有限，是一個看情況的算法。

分數: 尚未評分

2 分

27 3) Bump Mapping (at least one point) (2%)

著色時需要很多計算，需耗用相當大量的運算資源。

分數: 尚未評分

2 分

28　13. Please explain why clipping at screen space or at image space is not a good idea. (10%)

在著色時會有不正確的過度曝光問題。

分數: 尚未評分

10 分

著色時需要很多計算，需耗用相當大量的運算資源。

分數: 尚未評分