Damon Hughes

Dr Li

Hw5

CSCI 4250/5250 Homework 5 (Due beginning of class, Tuesday Oct 31st)

You are required to type your answers. Submit to the D2L Dropbox labeled “homework 5”

1) Given the 3D cube example in programs: ortho.js and ortho.html (available on the course web

page), if the view position and the orthographic viewing volume is changed into each of the

following situations, how will the final 2D image change from its original image? Justify

your answer.

1. mvMatrix=lookAt(vec3(-4, 0, 0), at, up); // pMatrix does not change

eye rotated around the x axis and became level with the object it looking at only showing the left side of the object

1. mvMatrix=lookAt(vec3(3, 3, 3), at, up); // pMatrix does not change

we move the eye to the top right of the object looking down on it

C. mvMatrix=lookAt(vec3(3, 3, 3, at, up);

pMatrix=ortho(-3, 3, -3, 3, -1, 1);

The object is not showing up because it is not between the near and far plane

1. pMatrix= ortho(-6, 6, -3, 3, 2, 10); // mvMatrix does not change

We are now able to see the object because it is in the near and far plane

But the viewing area increased which caused the object to shrink on

1. pMatrix=ortho(0, 4, 0, 3, 2, 10); // mvMatrix does not change

we are changing the left,right,top and bottom to smaller size so were are just clipping top right corner

2) Given:

=lookAt(vec3(4, 4, - 4), at, up);

pMatrix=ortho(-2, 2, -4, 4, -10, 10);

show:

• the mvMatrix

• the pMatrix

• the coordinates of a point F(1, 1, -1) when converted into the final clip coordinates.

(show intermediate steps in deriving the results)

|  |  |  |  |
| --- | --- | --- | --- |
| .5 | 0 | 0 | 0 |
| 0 | .25 | 0 | 0 |
| 0 | 0 | -.1 | 0 |
| 0 | 0 | 0 | 1 |

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | 0 | 0 | 0 |
| 0 | 1 | 0 | 0 |
| 0 | 0 | 1 | 0 |
| 0 | 0 | 0 | 1 |

mvMatrix= pMatrix=

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | 0 | 0 | 4 |
| 0 | 1 | 0 | 4 |
| 0 | 0 | 1 | 4 |
| 0 | 0 | 0 | 1 |

|  |  |  |  |
| --- | --- | --- | --- |
| .5 | 0 | 0 | 0 |
| 0 | .25 | 0 | 0 |
| 0 | 0 | -.1 | 0 |
| 0 | 0 | 0 | 1 |

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|  |  |  |  |
| --- | --- | --- | --- |
| .5 | 0 | 0 | 0 |
| 0 | .25 | 0 | 0 |
| 0 | 0 | -.1 | 0 |
| 0 | 0 | 0 | 1 |

P V P\*V

|  |  |  |  |
| --- | --- | --- | --- |
| .5 | 0 | 0 | 2 |
| 0 | .25 | 0 | 1 |
| 0 | 0 | -.1 | -.4 |
| 0 | 0 | 0 | 1 |

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | 0 | 0 | 4 |
| 0 | 1 | 0 | 4 |
| 0 | 0 | 1 | 4 |
| 0 | 0 | 0 | 1 |



=

P\*V F F’

|  |  |  |  |
| --- | --- | --- | --- |
| .5 | 0 | 0 | 2 |
| 0 | .25 | 0 | 1 |
| 0 | 0 | -.1 | -.4 |
| 0 | 0 | 0 | 1 |

|  |
| --- |
| 1 |
| 1 |
| -1 |
| 1 |

|  |
| --- |
| 2.5 |
| 1.25 |
| -.3 |
| 1 |

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3) Changing the orthographic viewing volume in problem 2) to a frustum with left=-2, right=2,

bottom=-4, top=4 for the near plane, and the near plane at distance 4 and far plane at distance

10 from the eye/camera. How would you call the perspective function to set up the

corresponding pMatrix in the .js program?

Perspective(1.57,0.5,4,10)

4) With the perspective viewing volume defined in problem 3), what will be the x and y

coordinates of the two points F(1, 1, -1) and B(1, 1, 1) when projected onto the near plane?

|  |  |  |  |
| --- | --- | --- | --- |
| 2 | 0 | 0 | 0 |
| 0 | 1 | 0 | 0 |
| 0 | 0 | -7/3 | -40/3 |
| 0 | 0 | -1 | 0 |

P=

Fprojected=P.F=(2,1)=>Xf=2;Yf=1

Bprojected=P.B=(2,1)=>Xb=1,Ya=1