Assignment#4 Volume Randering

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**1. Introduction**

This assignment is making Volume Rendering and ray casting to get MIP and AlphaBlending.

1. Find Box intersection with ray casting

2. MIP(Maximum Intensity Projection)

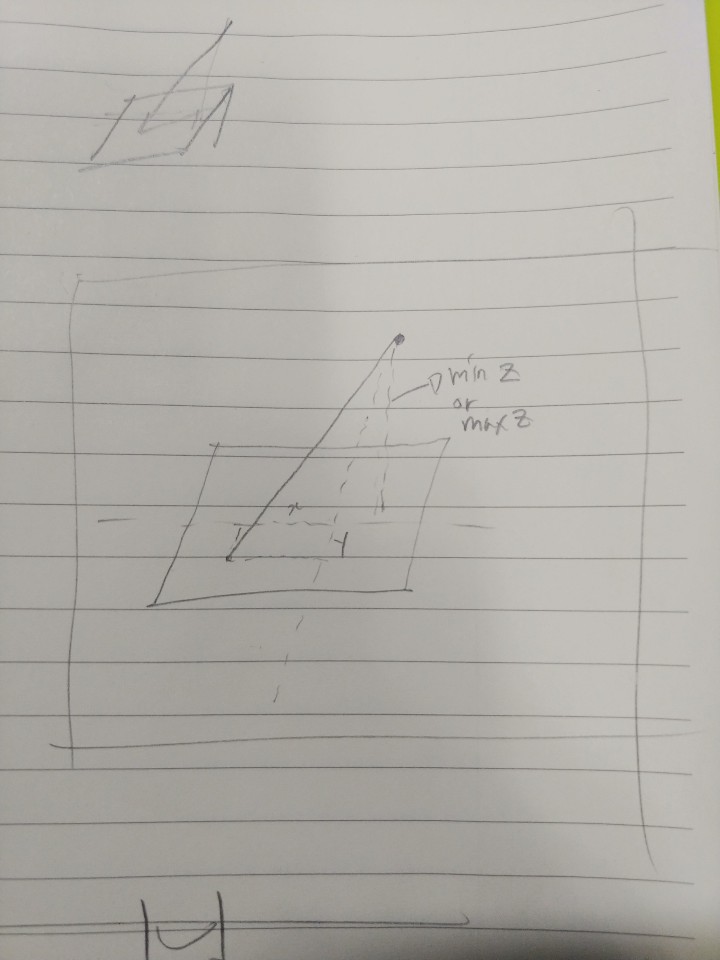
3. Alpha Blending

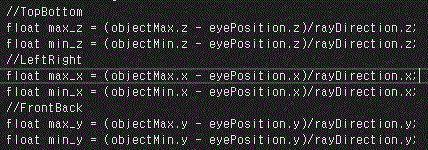
**2. Method**

1) Ray casting.

- Generate the right position.

- Algorithm AABB, OBB





Length of ‘eyePosition’ to Box’s faces.

For example, let’s figure top face and bottom face.

1. Find z length of the ray.

2. multiply the length and ‘rayDirection.x’ is x coordinate Also, the way of calculating y coordinate is the same way.



3. the formula is (eyePosition + max\_z\*rayDirection).x and .y . z is objectMax.z

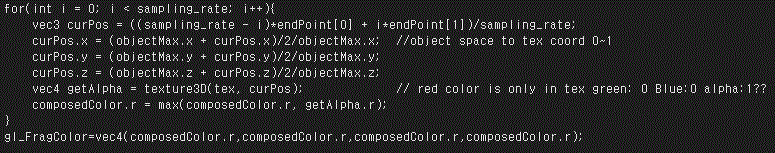
4. Compare with objectMax.x, objectMin.x, objectMax.y, objectMin.y

5. if success then it is the near face or far face. And count +1.

6. Then check this with min\_z same way

7. repeat for x and y.

2) MIP(Maximum Intensity Projection)



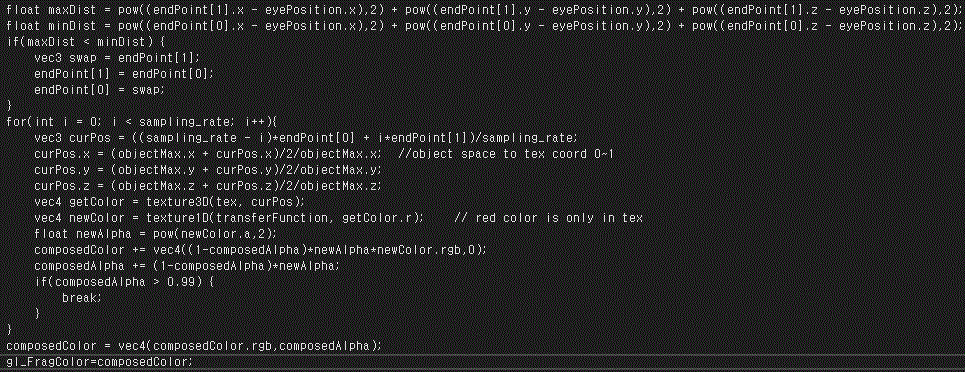
- Divide the position as sampling rate.

- The inside of box is middle of two endpoint. And converted as texture coordinate 0 ~ 1.

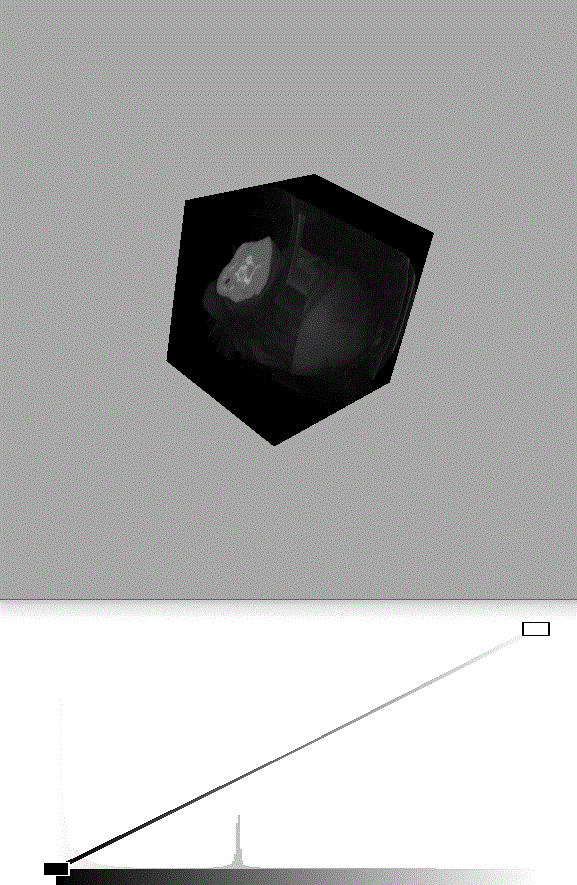
- Get value at tex.

- The problem of tex is only stored r value. This problem occurred all model to red shape.

3)Alpha blend



The alphablend code has an issue of distance flipped.

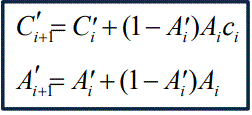


I added distance measure comparing.

If max min is flipped then swap two values.

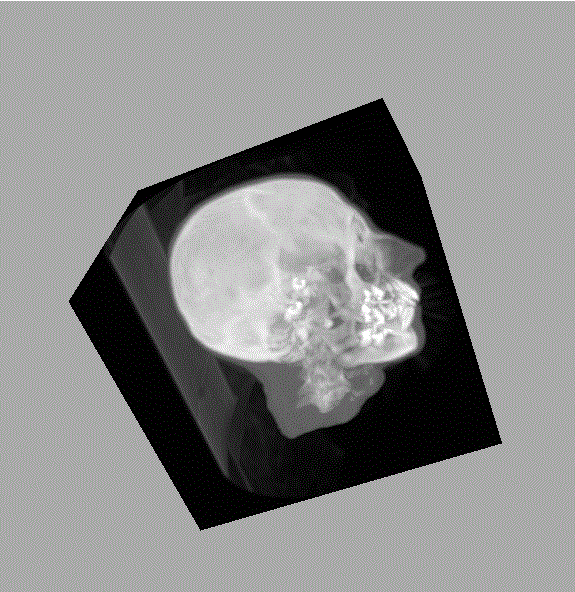
Which is MaxDist and MinDist part.

Alpha blending equation.

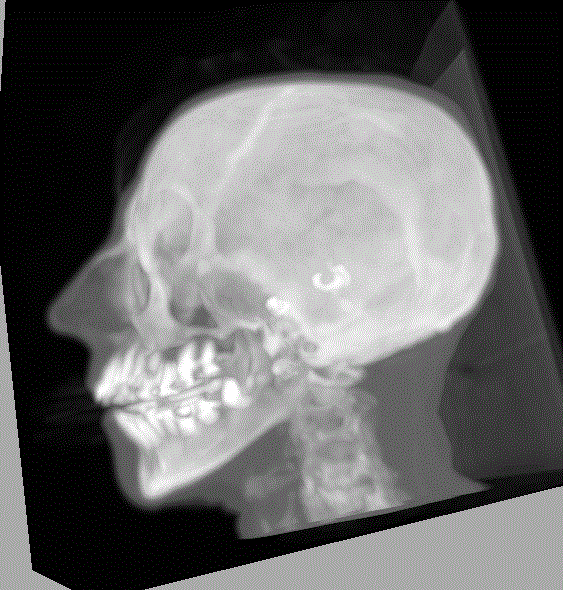


**3. Result**

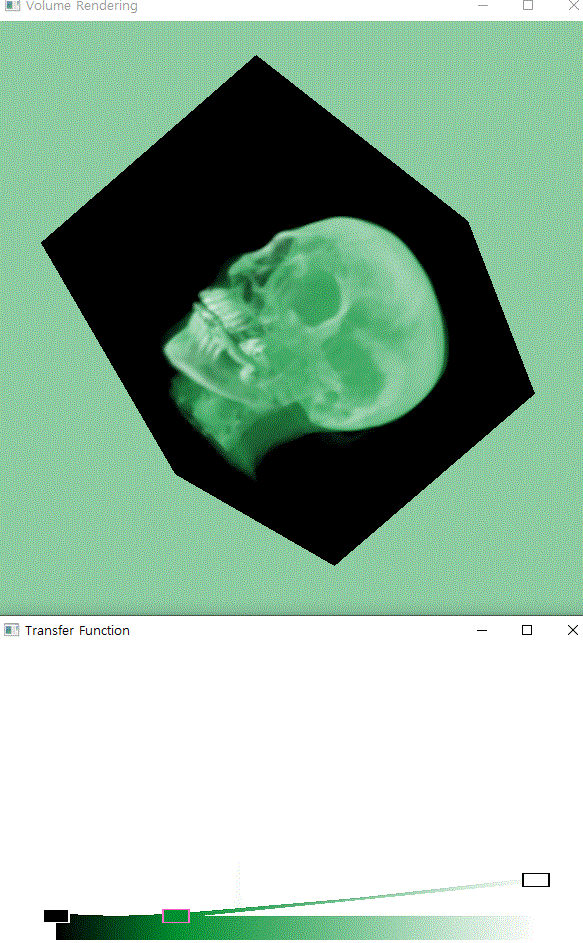
MIP image1

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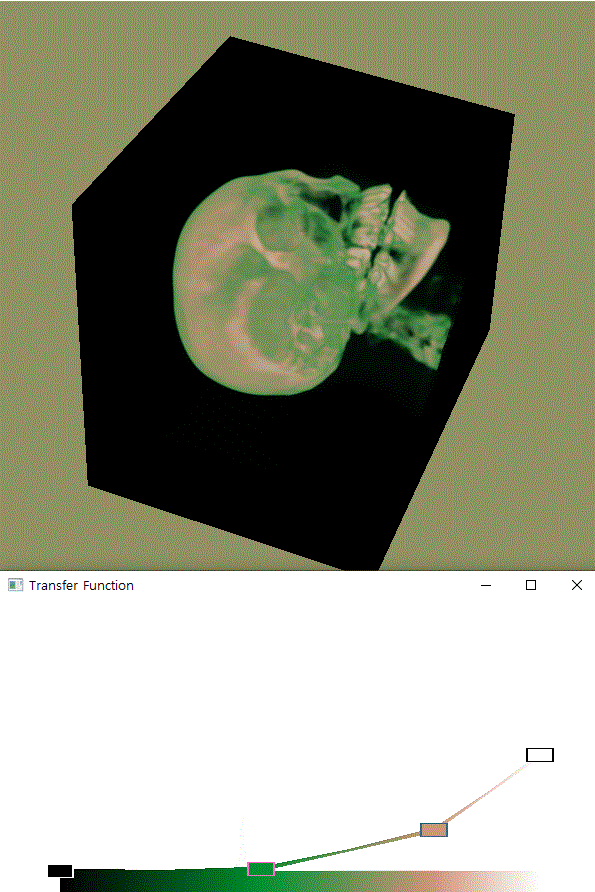
MIP image2



Alpha blending image1



Alpha blending image2



**4. Conclusion**

Calculating ray direction was a hard job in this assignment.

But the MIP and AlphaBlending was easy then intersection calculation.

I think the portion of grade has to be change. 50 to intersection rest to MIP and AlphaBlending.

The total work was so difficult for me but it was a great experience.

**5. reference**

<https://www.scratchapixel.com/lessons/3d-basic-rendering/minimal-ray-tracer-rendering-simple-shapes/ray-box-intersection?url=3d-basic-rendering/minimal-ray-tracer-rendering-simple-shapes/ray-box-intersection>