CMPT 361 Written Questions

Problem 3:

We know that the equation of the plane is

Ax + By + Cz + D = 0

so the normal vector to the plane is

(A, B, C)

So any point (e,f,g) can be projected onto the plane with the equation

(A,B,C) \*t + (e,f,g) = -d

Solving for T would give the point on the plane so then 2T would give the reflection of the point on the plane (e,f,g)

So now we know the reflection coordinates (e',f',g') from which we can get the Transformation matrix from after we solve for t in the original equation

at+e + bt+f + ct+g = -d

Then inputting the values of t into the Reflection matrix we can get the Transformation matrix

Problem 4:

Lets first take 2 objects. These object's bounding boxes do not collide in the X-Y Plane

Both of these Algorithms render this in different ways

BSP has 2 possible cases:

* the first case is if the root of the tree is the back object and the front object is obviously is a left node attached to the root
* the second is if the root of the tree is the front object then the back object is the right node attached to the root
* BSP will always render the back object first

Depth - Sort:

* Since the two objects don’t collide in the X-Y plane it will render the two in any orde

So BSP returns the correct order while Depth will render them in any order

Problem 5:

In order to get the silhouette edges of all the objects, lets first assume that the 3d objects are contained in an infinite field of view. So, the 3d object will be visible to the camera if it is facing the camera.

The silhouettes edge represents the boundary between the object facing front or facing back. Since silhouettes represent the boundary of the faces of the object that are visible to the camera, they then form a closed loop when the object is seen front he camera

Bonus Problem:

We know that if a line is parallel to the projection, it will maintain a constant distance to the projection plane

This means if 2 lines are parallel they will look parallel to the projection as well because the ratio b.w the distance b.w the lines and the distance to the parallel stays the same

If 2 parallel lines are not parallel to the plane, this distance from the plane increases. So, using this the lines will appear closer and closer as they go off and meet at a vanishing point at infinity.