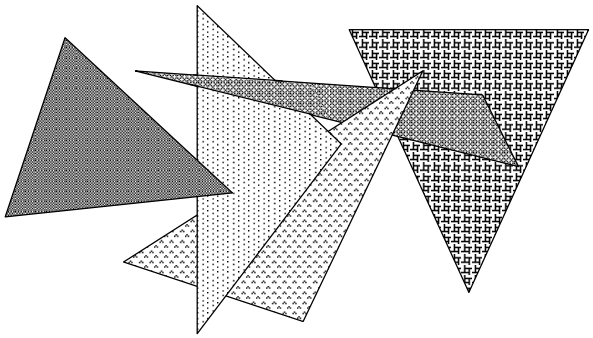
Handouts: Hidden Surface Elimination

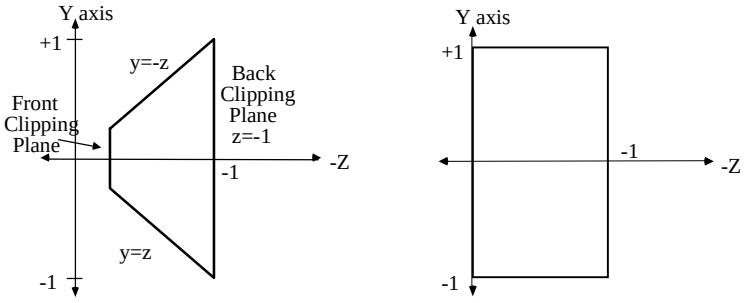
Hidden Surface Elimination

(Visible Surface Determination)



z-Buffer. Which Z?

- Recall canonical view volumes:



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Affects of F & B clipping plane magnitude

- Z in canonical parallel volume = $\frac{z - z_{min}}{-z(1+z_{min})}$
- As z_{min} approaches 0, what happens?

3) Depth Sort

- Sort polygons by distance
- Paint in back-to-front order
- Problems?

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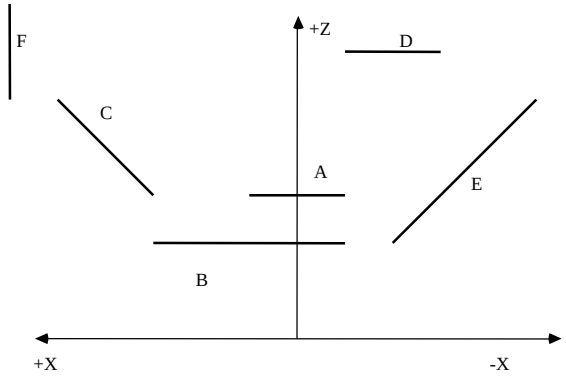
4) Binary Space Paritition (BSP) Trees

Relatively easy way to sort the polygons relative to the eyepoint

To Build a BSP Tree

1. Choose a polygon, T, and compute the equation of the plane it defines.
2. Test all the vertices of all the other polygons to determine if they are in front of, behind, or in the same plane as T. If the plane intersects a polygon, divide the polygon at the plane.
3. Polygons are placed into a binary search tree with T as the root.
4. Call the procedure recursively on the left and right subtree.

BSP Tree Example



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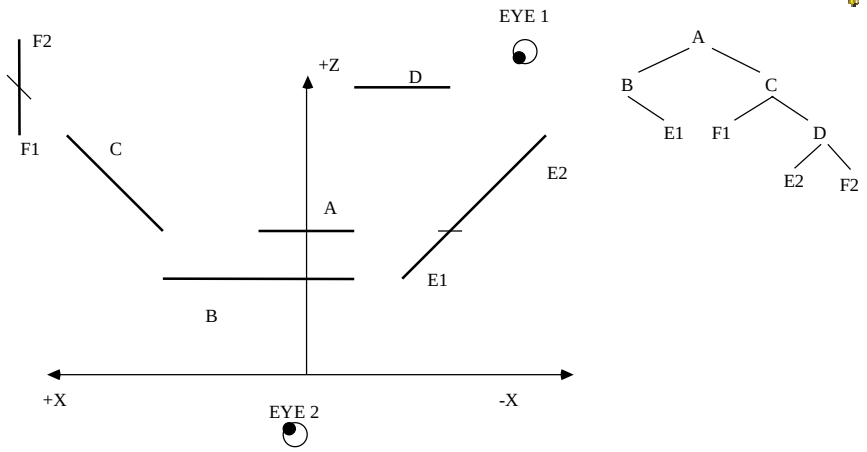
Traversing the BSP-Tree

- Traverse the BSP tree such that the branch decended first is the side that is away from the eyepoint. This can be determined by substituting the eye point into the plane equation for the polygon at the root.
- When there is no first branch to descend, or that branch has been completed then render the polygon at this node.
- After the current node's polygon has been rendered, descend the branch that is closer to the eyepoint.

Traversing the BSP Tree Example



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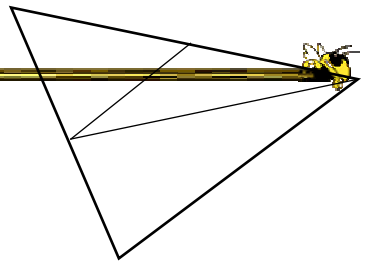
Splitting Triangles



- If all our polygons are triangles then we always divide a triangle into more triangles when it is intersected by the plane.
- It is possible for the number of triangles to increase exponentially but in practice it is found that the increase may be as small as two fold.
- A heuristic to help minimize the number of fractures is to enter the triangles into the tree in order from largest to smallest.