Back face culling

Removes faces in the back of an object away from the viewer.

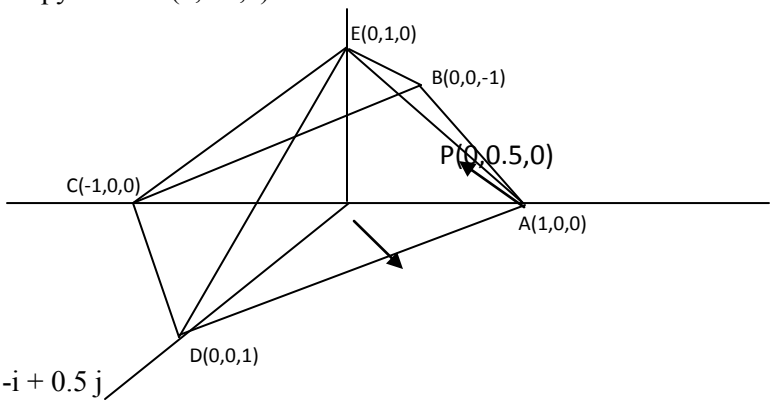
Compute the outward normal to face AED in the rectangular pyramid

The normal is found by the cross product of vectors

AE = -i + j AD = -i + k and is given by

$$n = AE \times AD = \begin{pmatrix} i & j & k \\ -1 & 1 & 0 \\ -1 & 0 & 1 \end{pmatrix} = i + j + k$$

Choosing a point inside the pyramid P(0,0.5,0)



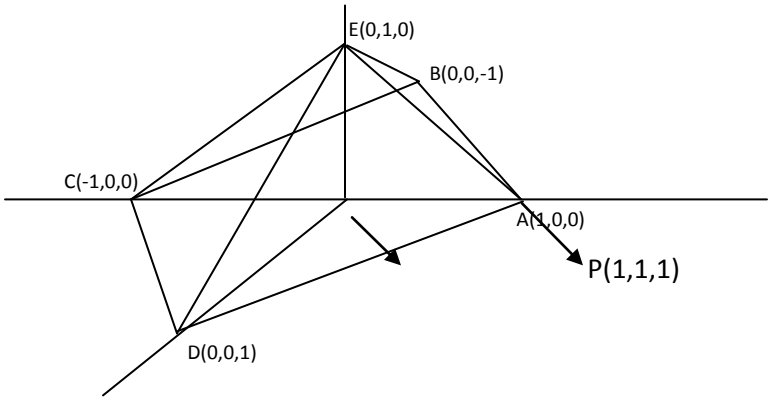
The AP vector is AP = -i + 0.5 j

The dot product of this vector and the normal will indicate the normal orientation:

n. AP = (i + j + k) . (-i + 0.5 j) = 1 * -1 + 1 * 0.5 = -1 + 0.5 = - 0.5

Since this value is negative the normal is pointing outward hence is a invisible or backface

If the vector V is established from the view point P(5,5,5) to a point in AED such as point A (1,0,0)



Then V = 4i + 5j + 5k

The dot product of n and V is

n.V =(1)(4) +(1)(5) + (1)(5) = 14 since n.V is greater than 0 the face AED is visible.