

## The Cohen Algorithm

1-Determine the endpoint ( X1 , Y1 ) code1

    If  $X1 < X_{min}$  Then

        If  $Y1 > Y_{max}$  Then code1=1001

        If  $(Y1 < Y_{max})$  And  $(Y1 > Y_{min})$  Then code1=0001

        If  $Y1 < Y_{min}$  Then code1=0101

    End IF

    If  $X1 > X_{max}$  Then

        If  $Y1 > Y_{max}$  Then code1=1010

        If  $(Y1 < Y_{max})$  And  $(Y1 > Y_{min})$  Then code1=0010

        If  $Y1 < Y_{min}$  Then code1=0110

    End IF

    If  $(X1 \leq X_{max})$  And  $(X1 \geq X_{min})$  Then

        If  $Y1 > Y_{max}$  Then code1=1000

        If  $(Y1 \leq Y_{max})$  And  $(Y1 \geq Y_{min})$  Then code1=0000

        If  $Y1 < Y_{min}$  Then code1=0100

    End IF

2- Determine the endpoint (X2,Y2) code2 [ as code1]

3-Determine the visibility of the line

    If code1= code2 = 0000 then the line is visible; draw the line

    If code1 And code2  $\neq$  0000 then the line is not visible

    If code1 And code2 = 0000 then the line is candidate for clipping

4- Calculate the intersection points of the candidate lines with the window :

$$M = \Delta Y / \Delta X$$

Left : (XL,YS) :  $YS = M (XL - X1) + Y1$  ;  $M \neq \infty$

Right : (XR,YS) :  $YS = M (XR - X1) + Y1$  ;  $M \neq \infty$

Top : (XS,YT) :  $XS = 1/M (YT - Y1) + X1$  ;  $M \neq 0$

Bottom : (XS,YB) :  $XS = 1/M (YB - Y1) + X1$  ;  $M \neq 0$

If the candidates is out side the boundary of the window then it is Rejected.

Notes:

- 1- If  $M=\infty$  we don't calculate the intersection points with the left edge and right edge because the line is parallel to them, we only calculate the intersection points with the top edge and bottom edge.
- 2- If  $M=0$  we don't calculate the intersection points with the top edge and bottom edge because the line is parallel to them, we only calculate the intersection points with the left and right edge.

Example 1 : If the clipping window is  $XL=-4$  ;  $XR=4$  ;  $YT=4$  ;  $YB=-4$

Clip the lines  $KL=(4,5)-(6,5)$  and  $AB=(1,1)-(1,3)$

Solution 1 :

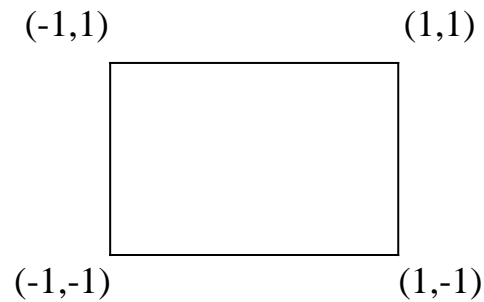
For the line KL : code1 of (4,5) is 1000  
code2 of (6,5) is 1010

code1 And code2 : 1000 And 1010 = 1000 ( not zero)  
then the line KL is not visible

For the line AB : code1 of (1,1) is 0000  
code2 of (1,3) is 0000

code1 And code2 : 0000 And 0000 = 0000 ( zero)  
then the line AB is visible

Example 2: Consider the clipping window



clip the line  $(-3/2, 1/6) - (1/2, 3/2)$

Solution 2 :

Code1 of  $(-3/2, 1/6)$  is 0001

Code2 of  $(1/2, 3/2)$  is 1000

Code1 And Code2 : 0001 And 1000=0000

Then the line is candidate for clipping

We must calculate the intersection points:

$$M = 1.34 / 2 = 0.6$$

Left intersection :  $X_L = -1$

$$Y_L = 0.6 (-1 - (-3/2)) + 1/6 = 1/2$$

Then  $(-1, 0.5)$  is the first point of intersection

Right intersection :  $X_R = 1$

$$Y_R = 0.6 (1 - (-3/2)) + 1/6 = 1.8$$

Then  $(1, 1.8)$  is rejected

Top intersection :  $Y_T = 1$

$$X_T = 1.6 (1 - 1/6) + (-3/2) = -1/4$$

Then  $(-1/4, 1)$  is the second point of intersection

Bottom intersection :  $Y_B = -1$

$$X_B = 1.6 (-1 - 1/6) + (-3/2) = -3.25$$

Then  $(-3.25, -1)$  is rejected

