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(6) Liang-Barsky line clipping algorithm is faster line clipper algorithm based on analysis of the parametric equation of line segment.

$X = X1 + U\Delta X$

$Y = Y1 + U\Delta Y$, where $\Delta X = X2 - X1$ and $\Delta Y = Y2 - Y1$

Using these equations this algorithm is developed and is more efficient. In this algorithm we first the point clipping condition in parametric form:

$$X_{min} \le X1 + U\Delta X \le X_{max}$$

$$Y_{min} \le Y1 + U\Delta Y \le Y_{max}$$

Each of these four equations can be expressed as: $uP_k \le q_k$ for $k = 1, 2, 3, 4$

The parameters p & q are defined as

$p1 = -\Delta X$ and $q1 = X1 - X_{min}$ {Left Boundary}

$p2 = \Delta X$ and $q2 = x_{max} - x1$ (Right ")

$p3 = -\Delta Y$ and $q3 = Y1 - Y_{min}$ (Bottom ")

$p4 = \Delta Y$ and $q4 = Y_{max} - y1$ (Top ")

If a line is parallel to a view window boundary, the p value for that boundary is 0. If this is parallel to the X-axis, for example the $p1$ and $p2$ must be zero.

→ Given $p_k = 0$, if $q_k < 0$ then line is trivially invisible because it is outside view window.

→ Given $p_k = 0$, if $q_k > 0$ then line is inside the corresponding window boundary.

When $p_k < 0$, as U increase line goes from the outside to inside i.e entering

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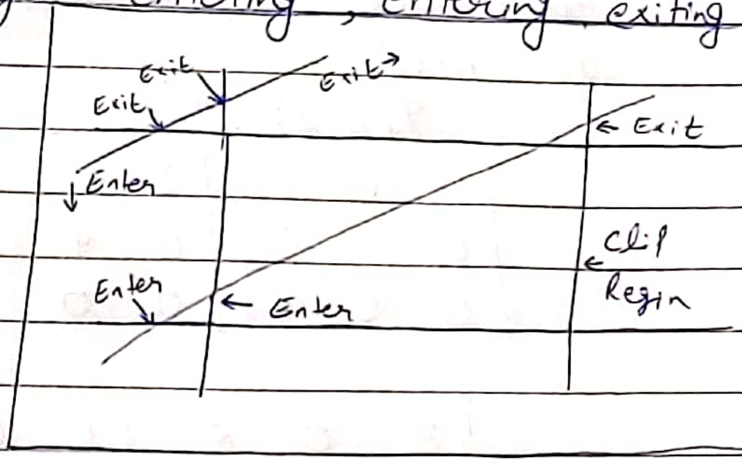
When $P_k > 0$, line goes from inside to outside i.e exiting.

If there is segment of line inside the clip region, a sequence of infinite line intersection must go entering, entering, exiting and exiting.



Algorithm :

I. Set $U_{min} = 0$ and $U_{max} = 1$

II. If $U < U_{min}$ OR $U > U_{max}$
Then Reds

Else

I. Set $t_{min} = 0$, $t_{max} = 1$

II. Calculate the values of t

i) If $t < t_{min}$ ignore

ii) Else
seperate t values as entering or exiting values using inner product

iii) If t is entering, set $t_{min} = t$; If exiting set $t_{max} = t$

III. If $t_{min} < t_{max}$, draw line from $(x_1 + t_{min}(x_2 - x_1),$ $y_1 + t_{min}(y_2 - y_1))$ to $(x_1 + t_{max}(x_2 - x_1), y_1 + t_{max}(y_2 - y_1))$

IV. If the line crosses over the window $(x_1 + t_{min}(x_2 - x_1), y_1 + t_{min}(y_2 - y_1))$ and $(x_1 + t_{max}(x_2 - x_1), y_1 + t_{max}(y_2 - y_1))$ are intersection point of line