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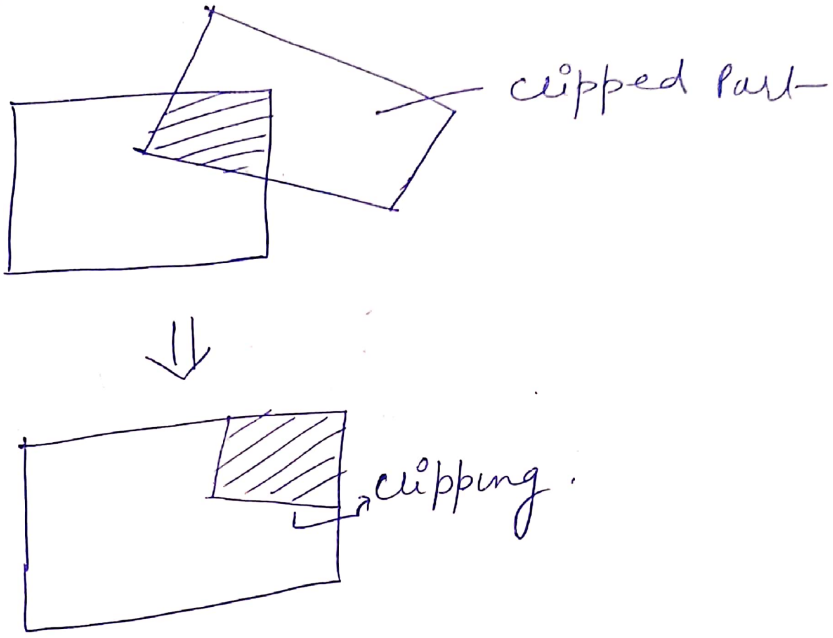
CLIPPING :-

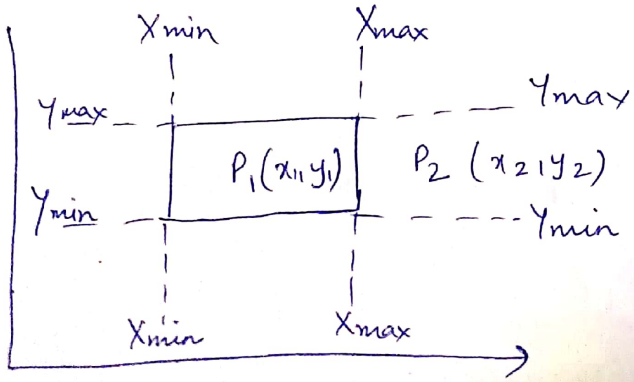
The portion left outside the region of the window in CG is called clipped part and the process of displaying inside image of the window is called clipping.

Eg :



Types of clipping :-

① Point clipping :- If the point is lying inside window than accept that point and if it lies outside the window then discard that point.

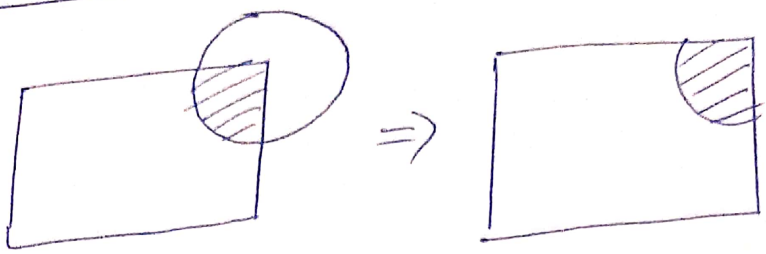


The condition for acceptance:

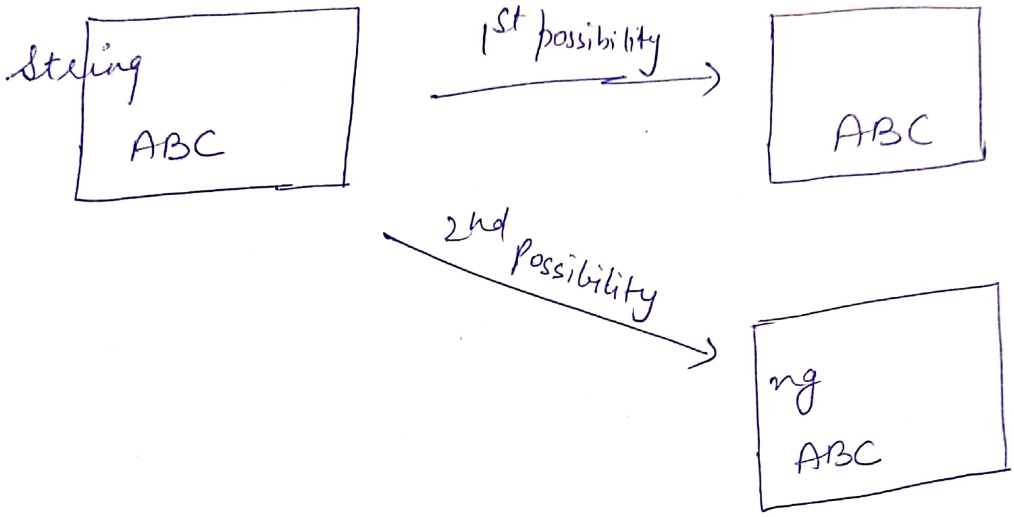
$$X_{min} \leq X \leq X_{max}$$

$$Y_{min} \leq Y \leq Y_{max}$$

② Curve clipping :- Removing curve outside the window



③ Text Clipping :- Removing Text outside the window

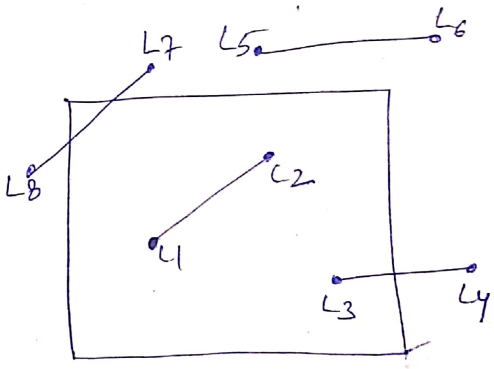


④ Line Clipping : Removing lines outside the window

① Visible :- both end points inside the window, ∴ accept the line

② Not visible : both points outside the window, ∴ discard the line

③ Partially visible : 1 point inside & other outside the window



∴ L_1 ~~And~~ L_2 ~~are crossed~~ is visible ⇒ accept without clipping
L_3 and L_4 is partially visible → accept / clipping required
L_5 and L_6 is not visible → Discard
L_7 and L_8 is partially visible → accept but clipping required

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line clipping Algo :-

① Cohen Sutherland clipping Algo :-

Let's take the screen

Region ①	code 2	code 3
code 4	code 5	code 6
code 7	code 8	code 9

→ 4 bits

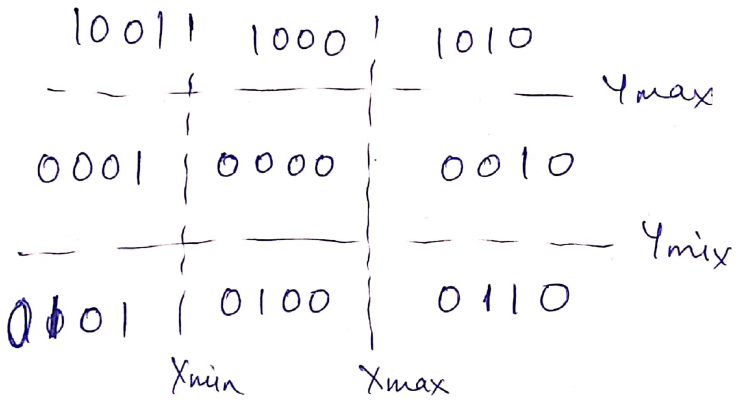
0 1

T B R L

Top Bottom Right left

① Divide the screen into 9 region

② Assign the code (TBRL)
↳ 4 bits



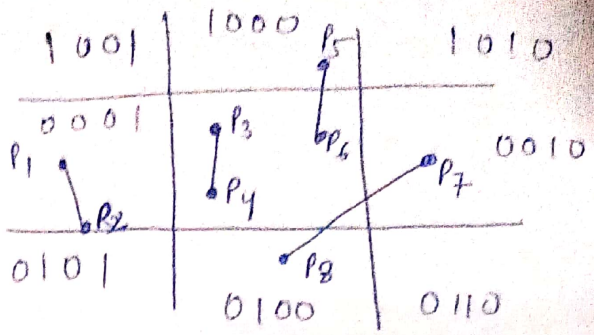
T : $y > y_{max}$ (assign 1)

B : $y < y_{min}$ (assign 1)

R : $x > x_{max}$ (")

L : $x < x_{min}$ (")

Q1 ① Write each region code



Case 1:- Region Code P_1 and P_2

$P_1 = 0001$
$P_2 = 0001$
0001

} Apply AND operation

AND

0 0 = 0
0 1 = 0
1 0 = 0
1 1 = 1

if the value is non-zero then it indicates that it is completely outside the window.

(Reject the line P_1 & P_2)

Case 2: P_3 and P_4

$P_3 = 0000$
$P_4 = 0000$
0000

| AND

if all the values is zero, then it indicates all the value is inside the window.

Accept the line P_3 and P_4 (No clipping is required)

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Case 3:- P_5 and P_6

$$\begin{array}{l} P_5 = 1000 \\ P_6 = 0000 \\ \hline 0000 \end{array} \Big| \text{AND}$$

It indicated some portion lies inside and some position lies outside the window.

Now, check for the intersection point.

$$\begin{array}{l} P_5' = 0000 \\ P_6 = 0000 \\ \hline 0000 \end{array} \Big| \text{AND}$$

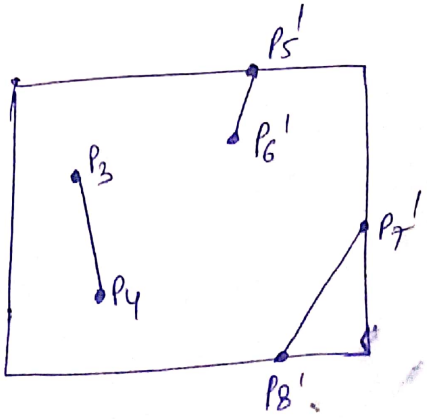
Now Accept P_5' and P_6

Case 4:- P_7 and P_8

$$\left.\begin{array}{l} P_7 = 0010 \\ P_8 = 0100 \\ \hline 0000 \end{array}\right\} \text{AND} \Rightarrow \text{it required clipping. select the intersection pt.}$$

$$\begin{array}{l} P_7' = 0000 \\ P_8' = 0000 \\ \hline 0000 \end{array} \Big| \text{AND}$$

Accept the P_7' and P_8' for clipping



Algorithm :-

Step 1 : For each region the 4 bit code is assign based on the (TBRL)

Step 2 : The line is accepted if end pts have a region code (0000)

Step 3 : else the logical AND operation is performed for both regions code

Step 3.1 if the result is not (0000) then reject the line

Step 3.2 else clipping is required

Step 3.2.1 The end pt is selected that is outside the window.

Step 3.2.2 Find the intersection pt. at clipping window

Step 3.2.3 The end pt is replaced with intersection pt. & region code is updated.

Step 3.2.4 Repeat step 2 until we find clipped line.

Step 4 : Repeat step 1 for the line.