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Assignment - B3

Title: Cohen Sutherland line clipping algorithm

Problem:

Write C++/Java program to implement cohen sutherland line clipping algorithm for given window. Draw line using mouse interfacing to draw polygon.

Objectives:

- To study the concept of line clipping
- To understand & study the 2D clipping.
- To study the cohen sutherland line clipping algorithm

Outcomes:-

- To implement cohen-sutherland algorithm for given window.
- To study and use mouse interfacing.

Software and Hardware:

Linux based 64 bit OS

Qt creator.

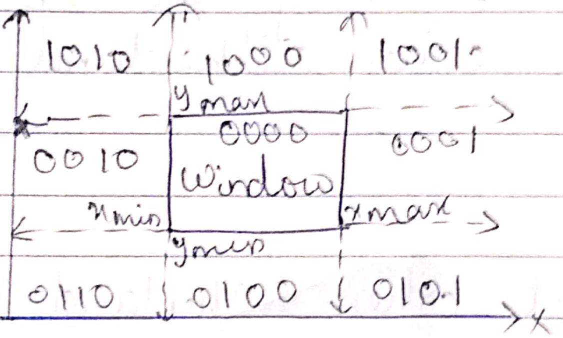
Theory:

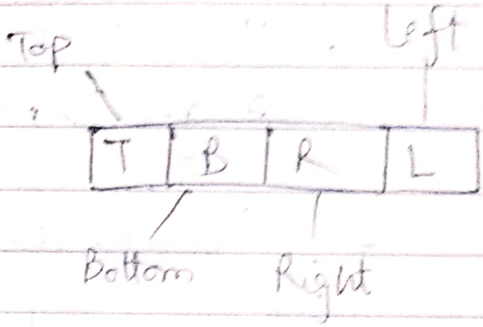
Cohen Sutherland line Clipping Algorithm.

- Cohen Sutherland line Clipping Algorithm.

This line clipping algorithm cuts line to partitions which are within a rectangular area.

- It divides the 2-D plane into 9 regions and assigns the binary number to each part.
- This makes the algorithm to efficiently determines the line and performed the portions of line that are inside the given rectangular area.





+ For any endpoint (x, y) of line

- First bit set 1 : point lies to left of window; $x < x_{min}$
- Second bit set 1 : point lies to right of window $x > x_{max}$

Third bit set 1 : point lies to ~~right~~ bottom : $y < y_{min}$

Fourth bit set 1 : point lies to top of window; $y > y_{max}$

The sequence of reading code's bit is LRBT.

There are 3 possibilities for the line -
- It can be completely inside the window.
- It can be completely outside the window.
It can be partially inside the window.

Once the code for each endpoint of the line is determined. The algorithm quickly detects & dispenses two common cases.
1) trivially accepted : both endpoints completely inside window
~~2) trivially rejected :~~
2) trivially rejected : both endpoints completely outside window.

Algorithm:

1) Assign the region code for two endpoints of given line.
2) If both the endpoints have a region code 0000 then the given line is completely inside. Display this line.
3) Else perform the logical AND operation for both region codes.
~~4)~~ 3.1) If the result is not 0000. then the given line is completely outside.
3.2) Else the line is partially inside.
3.2.1) Choose an endpoint of the line that is outside the given rectangle.
3.2.2) Find the intersection point ~~of~~ and update the region code of rectangular

boundary.

3.3.3) Replace end point with the intersection point and update the region code.

3.3.4) Repeat step 2 until we find a clipped line either trivially accepted or rejected.

4) Reapeat step 1 for all the lines.

Advantages.

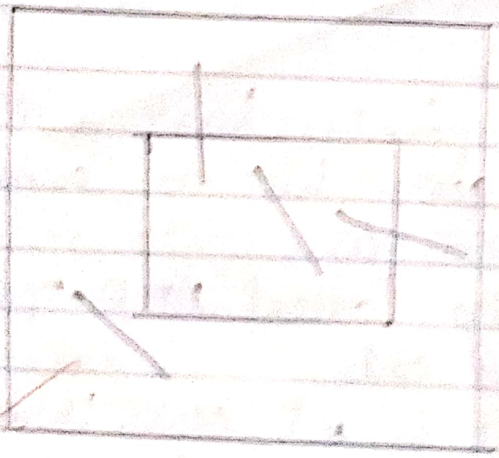
1) Easy to program

2) Clipping and Testing are done in fixed order.

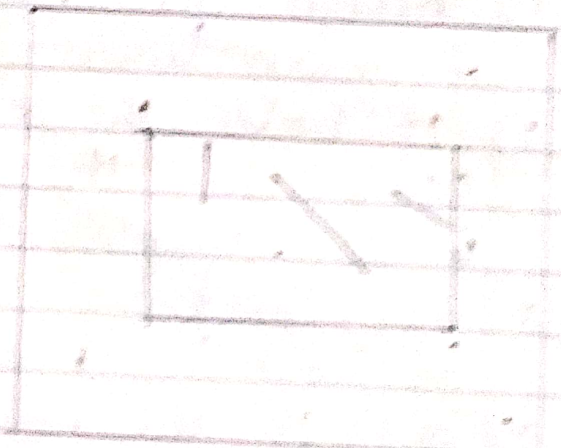
Disadvantages:

1) Clipping window region must be rectangular.

Test Cases.

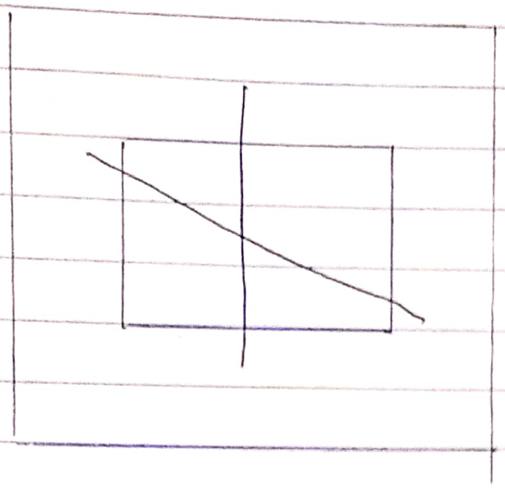


Input

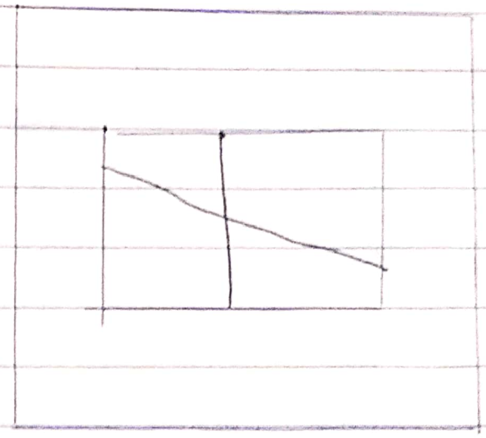


Output

2)



Input



Output

Conclusion:

In this assignment we have studied & implemented the cohen sutherland line clipping algorithm for the given window.