Clipping Line

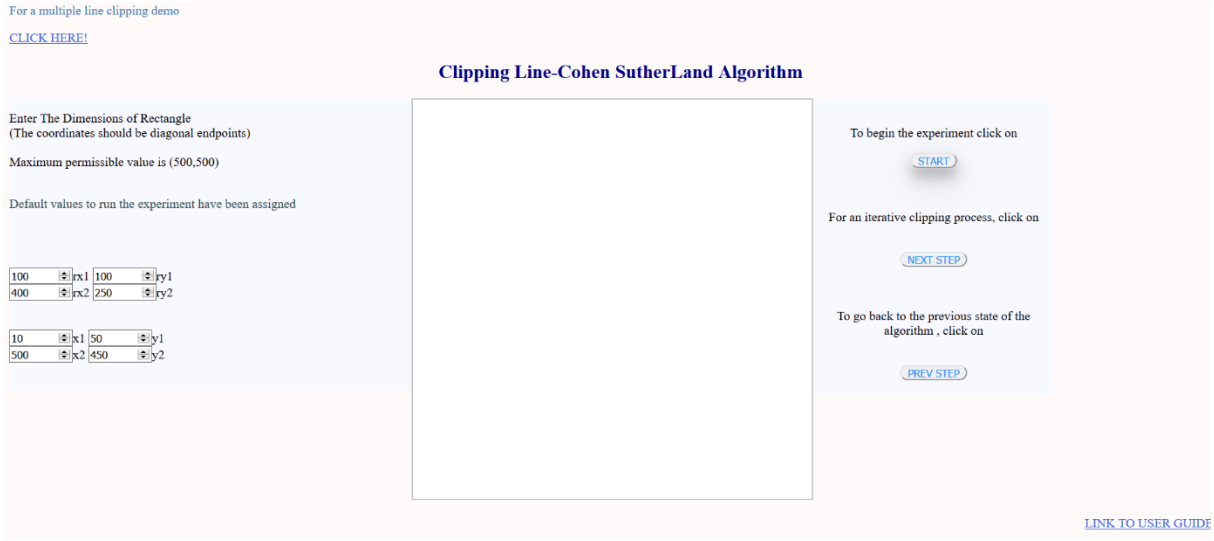
Experiment procedure documentation

Introduction :

This document contains the stepwise instructions and supporting images to run this experiment and understand the working of the Cohen Sutherland algorithm through it.

Instructions:

1. To open the webpage , run LineClippinng.html on your preferred browser.

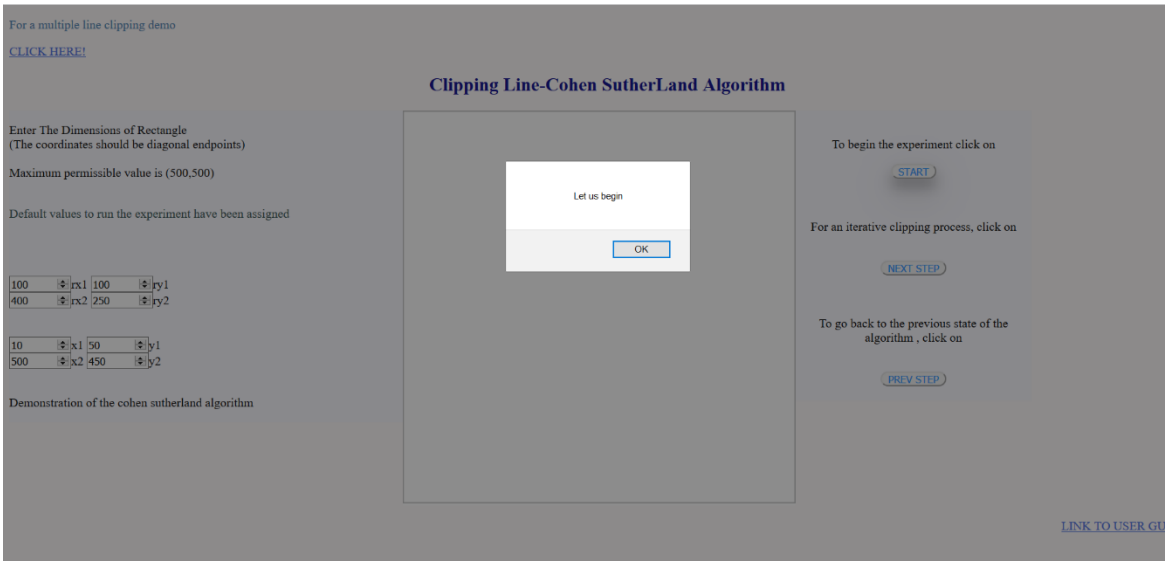


The user can run the experiment with the default values, or enter their own set of coordinates , for the bounding rectangle(our viewport) and for the line to be clipped.

Maximum Permissible value for each is 600 . If the user tries to enter a value greater than 600 , the values will be set to 600.

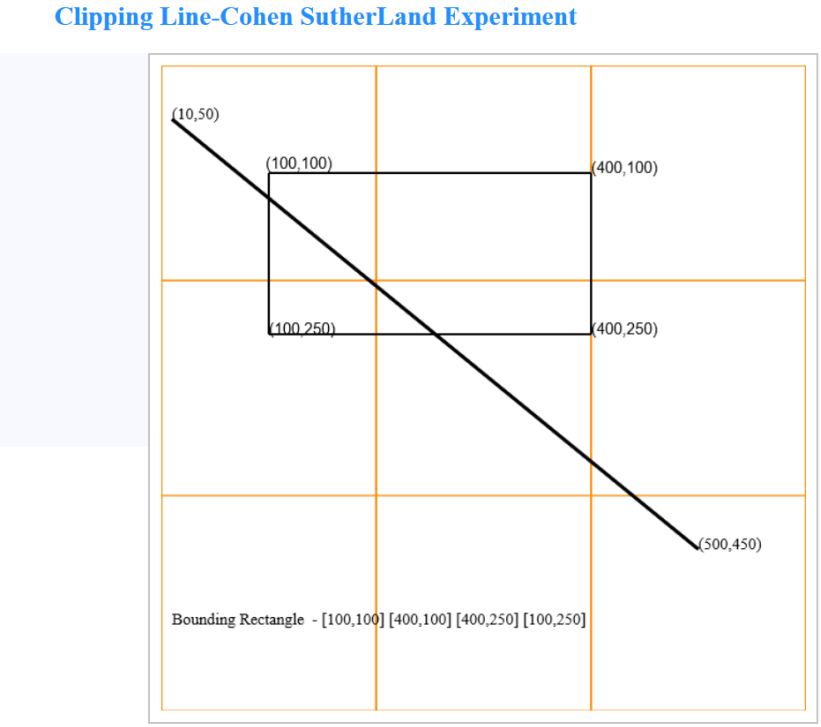
2. To start the experiment, click on the "**START**" button.

This will first generate an alert

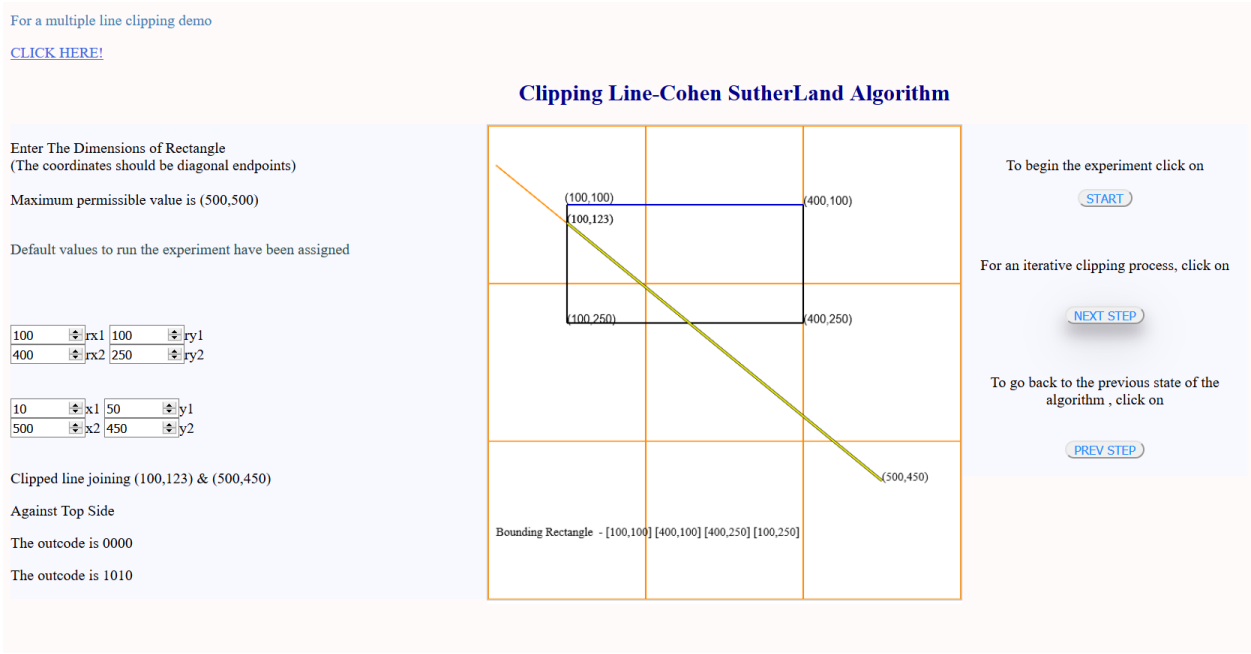


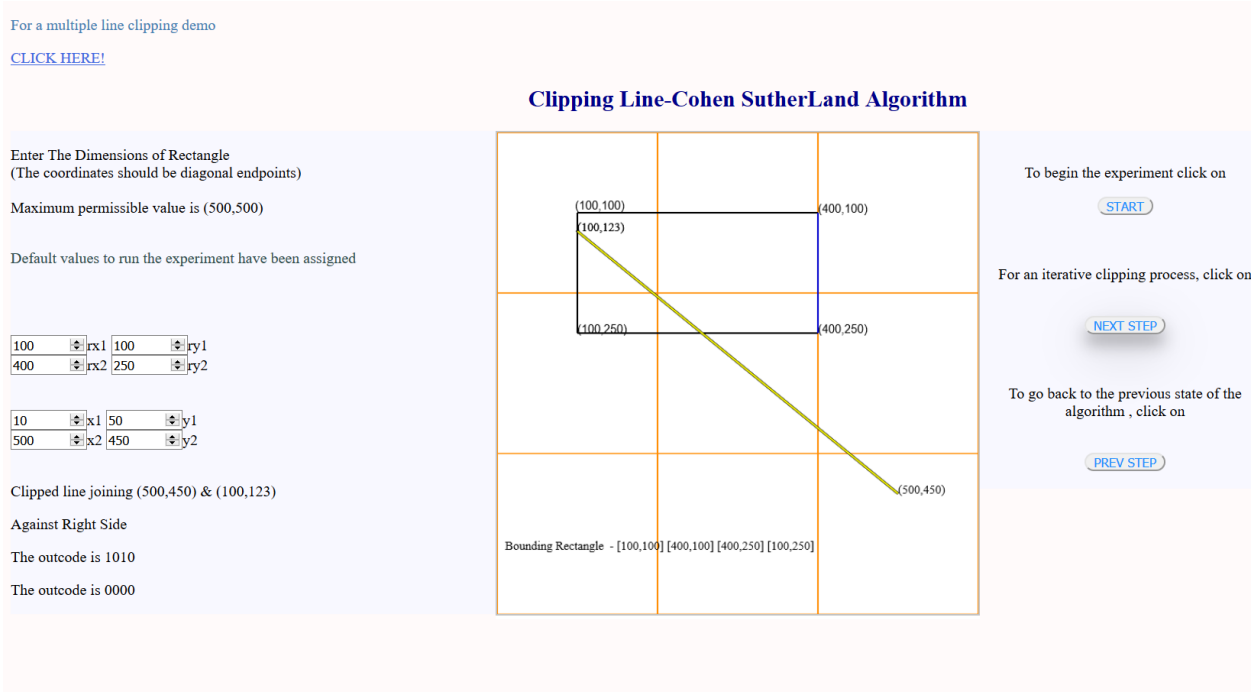
3. Click on "**OK**"

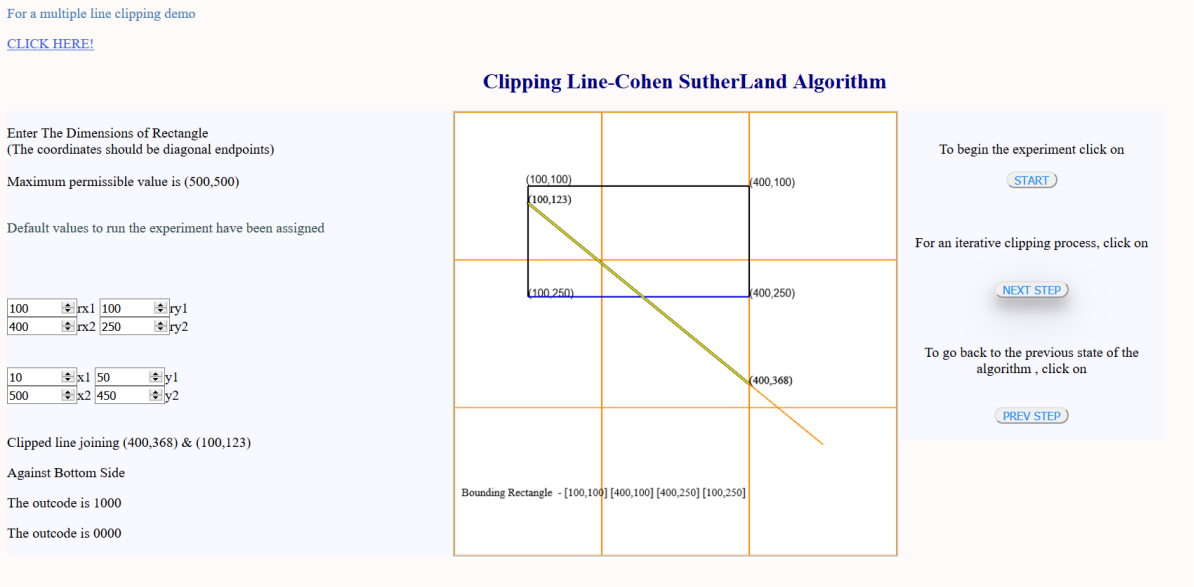
This will now draw the bounding rectangle and the Line to be clipped .
A Grid will also be generated which denotes the 9 regions the canvas is divided into , which correspondingly have their own out-codes.



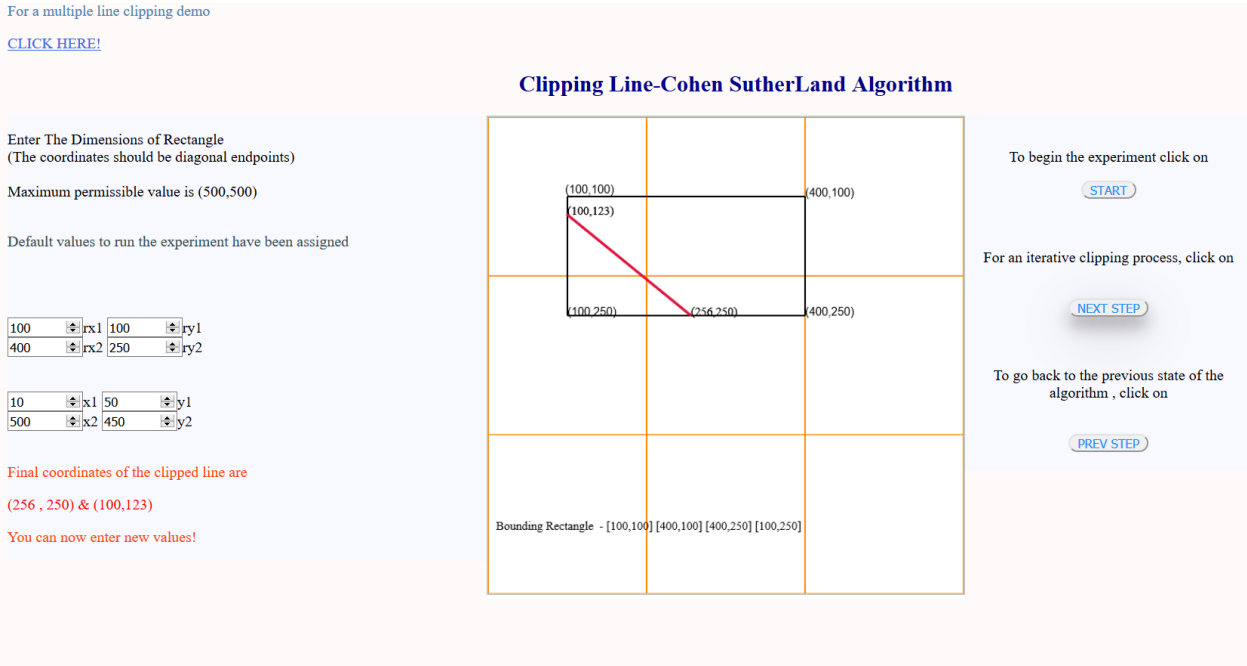
4. Click on “NEXT STEP” for the algorithm to proceed and iteratively clip the line w.r.t each edge of the bounding rectangle starting from the left and moving clockwise.







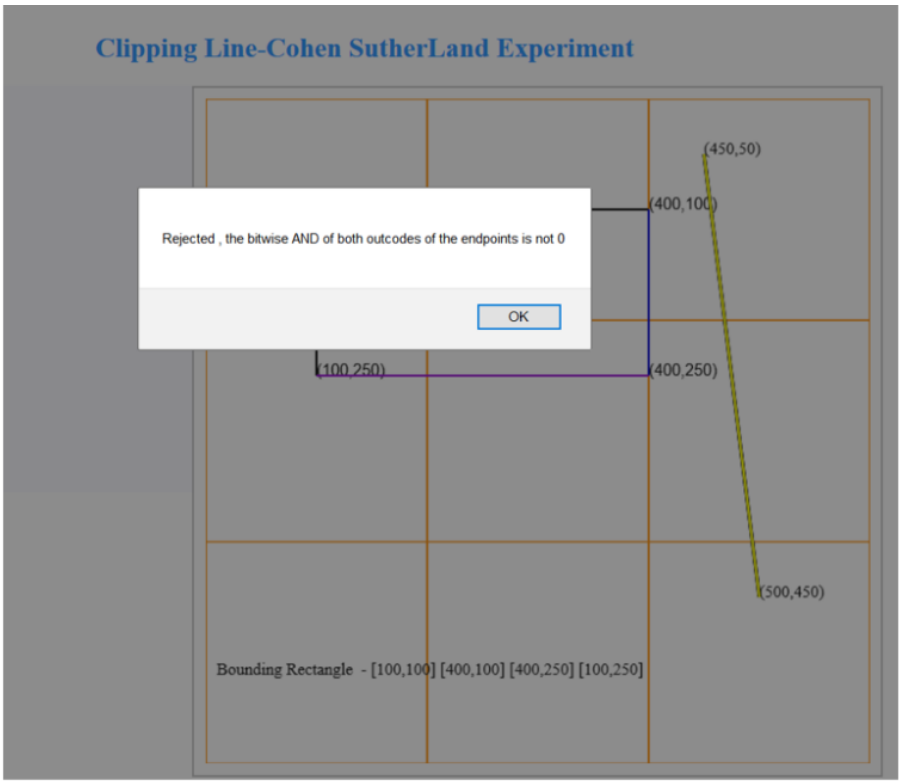
5.Once the Line is accepted, it will be highlighted in red and its final coordinates will be displayed on the left.



The above image is the result of the iterations shown in point no.4

The Line has been clipped and the new coordinates have been filled on the canvas along with their display on the left side of the webpage.

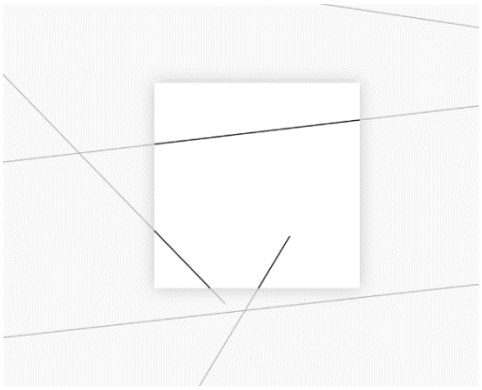
7.If the line is not accepted , there will be an alert generated along with a message on the left.

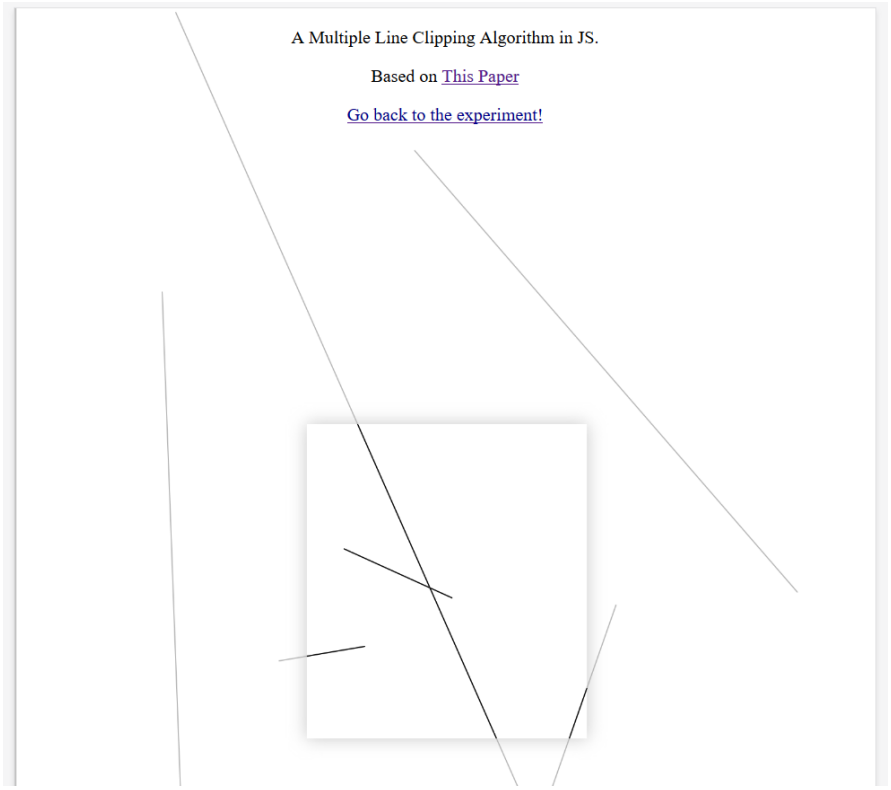


Line is rejected, No part is inside the Bounding rectangle

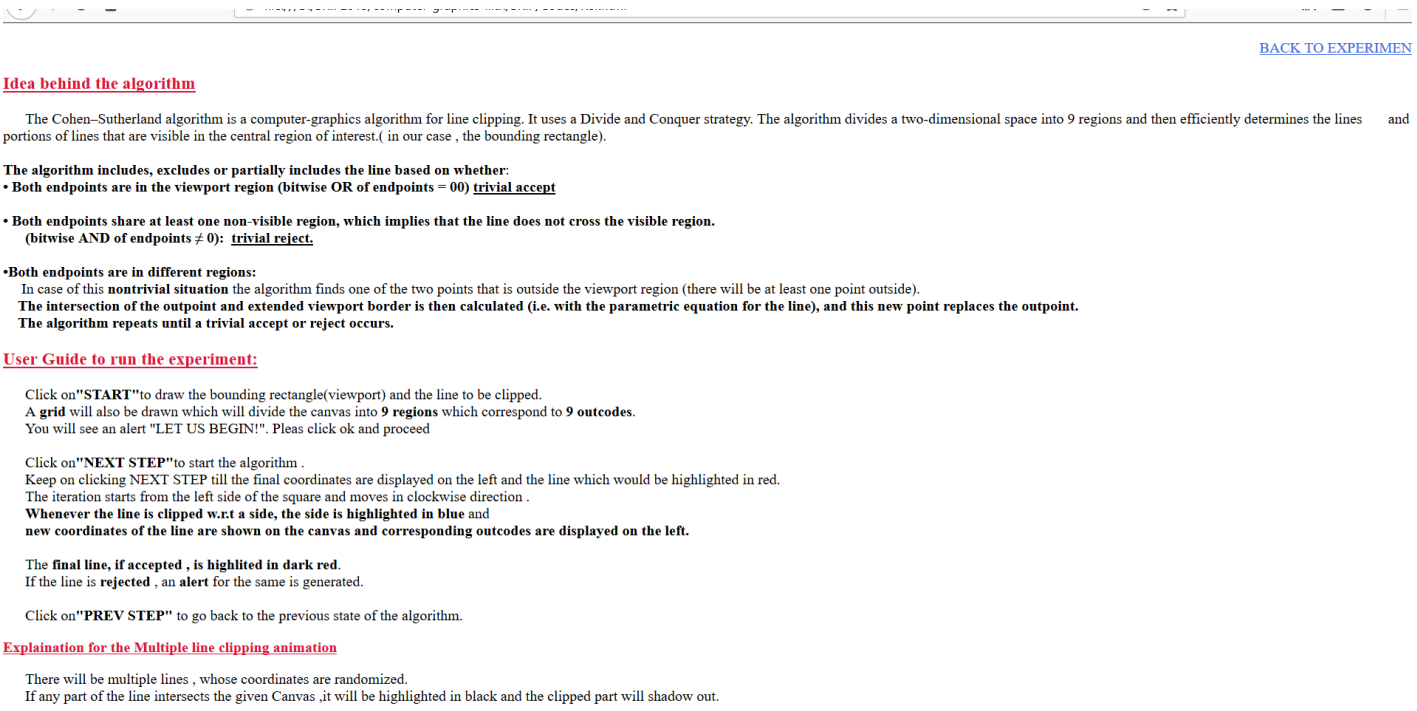
Experiment Ends Here

8. There is also an added functionality for viewing a multiple line clipping animation which generated random lines ,shadows out the clipped part and highlights the accepted part of the line by the bounding rectangle , in black.





This is how the user guide looks.



BACK TO EXPERIMEN

Idea behind the algorithm

The Cohen–Sutherland algorithm is a computer-graphics algorithm for line clipping. It uses a Divide and Conquer strategy. The algorithm divides a two-dimensional space into 9 regions and then efficiently determines the lines and portions of lines that are visible in the central region of interest.(in our case , the bounding rectangle).

The algorithm includes, excludes or partially includes the line based on whether:
• Both endpoints are in the viewport region (bitwise OR of endpoints = 00) trivial accept

• Both endpoints share at least one non-visible region, which implies that the line does not cross the visible region.
(bitwise AND of endpoints ≠ 0): trivial reject.

•Both endpoints are in different regions:
In case of this **nontrivial situation** the algorithm finds one of the two points that is outside the viewport region (there will be at least one point outside).
The intersection of the outpoint and extended viewport border is then calculated (i.e. with the parametric equation for the line), and this new point replaces the outpoint.
The algorithm repeats until a trivial accept or reject occurs.

User Guide to run the experiment:

Click on**"START"**to draw the bounding rectangle(viewport) and the line to be clipped.
A **grid** will also be drawn which will divide the canvas into **9 regions** which correspond to **9 outcodes**.
You will see an alert "LET US BEGIN!". Pleas click ok and proceed

Click on**"NEXT STEP"**to start the algorithm .
Keep on clicking NEXT STEP till the final coordinates are displayed on the left and the line which would be highlighted in red.
The iteration starts from the left side of the square and moves in clockwise direction .
Whenever the line is clipped w.r.t a side, the side is highlighted in blue and
new coordinates of the line are shown on the canvas and corresponding outcodes are displayed on the left.

The **final line, if accepted , is highlited in dark red**.
If the line is **rejected** , an **alert** for the same is generated.

Click on**"PREV STEP"** to go back to the previous state of the algorithm.

Explaination for the Multiple line clipping animation

There will be multiple lines , whose coordinates are randomized.
If any part of the line intersects the given Canvas ,it will be highlighted in black and the clipped part will shadow out.

Please press “START” to begin the experiment .

You can enter your own values and run the experiment.

The user guide has all the steps and explanation of the algorithm and how it has been implemented in Javascript in an iterative fashion.