

Abstract:

Building a simple intuitive tool to draw curves on image using Bezier Spline rules which will be the core function of many graphics and image designing tools.

TASK 1 – Drawing Bezier curve:

Initially in the plain white canvas window the dynamic points are laid with the help of mouse function (to locate the coordinates of pixels) and circle function (to draw a point in the respective coordinates) as shown in the screenshots.



Fig 1.1: canvas with 3 points

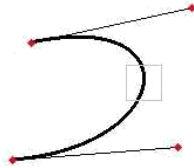


Fig 1.2: Canvas with spline drawn between 4 points

The below mentioned equations has been used in draw spline function to draw the Bezier curve,

$$[x \ y] = [t^3 \ t^2 \ t \ 1] \cdot \text{Result}$$

Where,

$$\text{Result} = M \cdot G$$

$$M = \{ \{-1, 3, -3, 1\}, \{3, -6, 3, 0\}, \{-3, 3, 0, 0\}, \{1, 0, 0, 0\} \}$$

$$G = \{ \{x_1, y_1\}, \{x_2, y_2\}, \{x_3, y_3\}, \{x_4, y_4\} \}$$

TASK 2 – Bezier controlling points:

The Bezier points which has been drawn in the canvas can be moved dynamically within the canvas.

CV_EVENT_LBUTTONDOWN:

This mouse event continuously calculates the distance between the selected point and the points on the canvas. If distance between the points are very less then, the coordinates of the selected point will be replaced with the nearest point.

CV_EVENT_LBUTTONDOWN:

The Button up event will set the final coordinates of the point among which the spline will be drawn.

CV_EVENT_MOUSEMOVE:

The mouse move event will dynamically assign the coordinated to the point while dragging within the canvas.

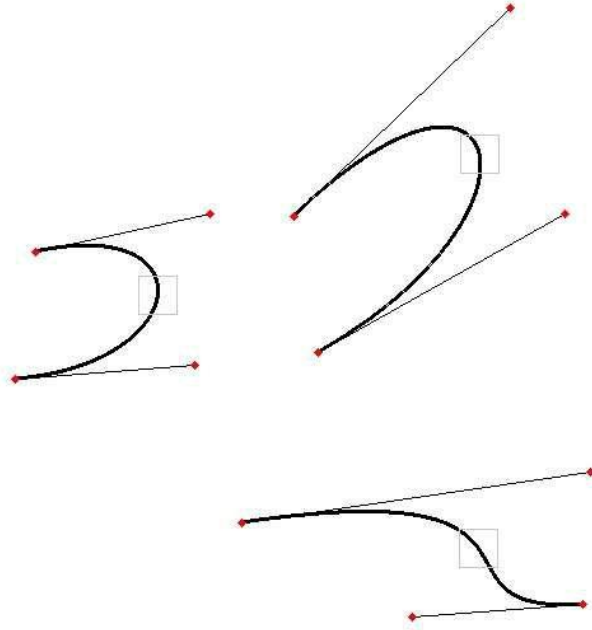


Fig 2.1: Spline with various points

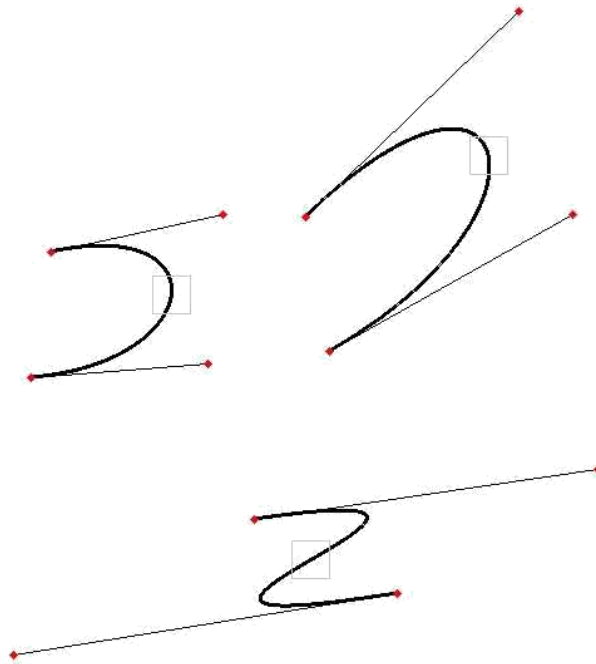


Fig 2.2: modified spline with controlling points.

TASK 3 – Multiple Splines:

The below screenshot shows the multiple splines drawn in the canvas. An user defined structure has been used in the code to store the points coordinates which helped me to draw the multiple spline with stored points.

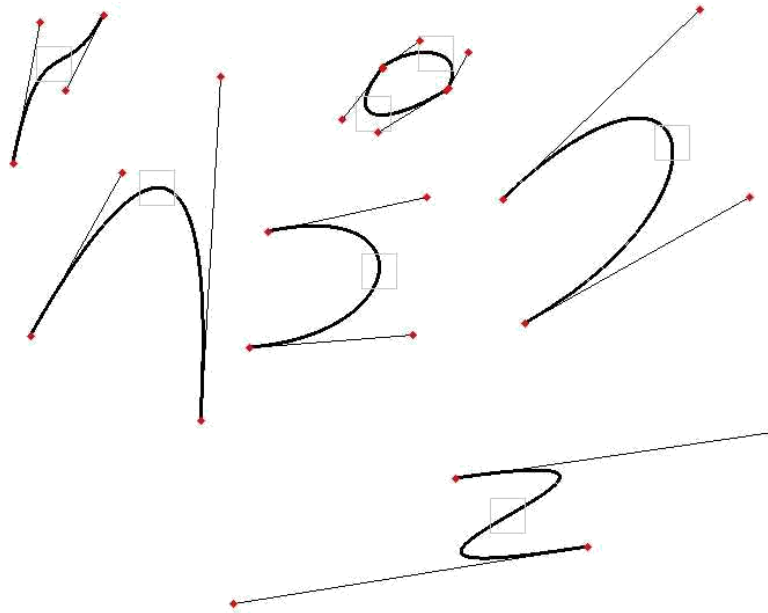


Fig 3.1: Multiple splines in the canvas

RBUTTONDOWN: Right-click mouse button to remove spline point and thus remove the corresponding spline.

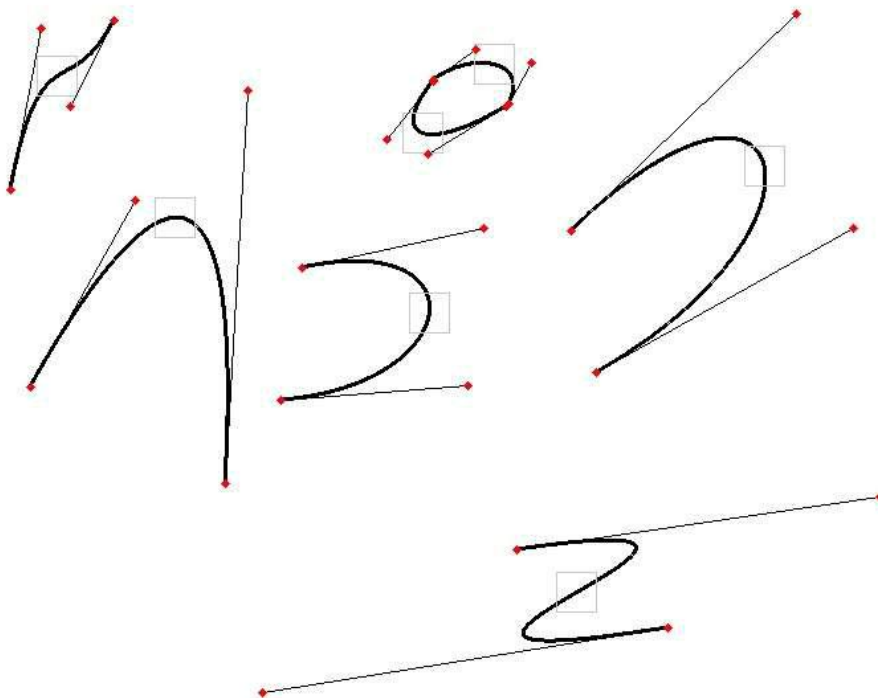


Fig 3.2: Points are kept with left button click

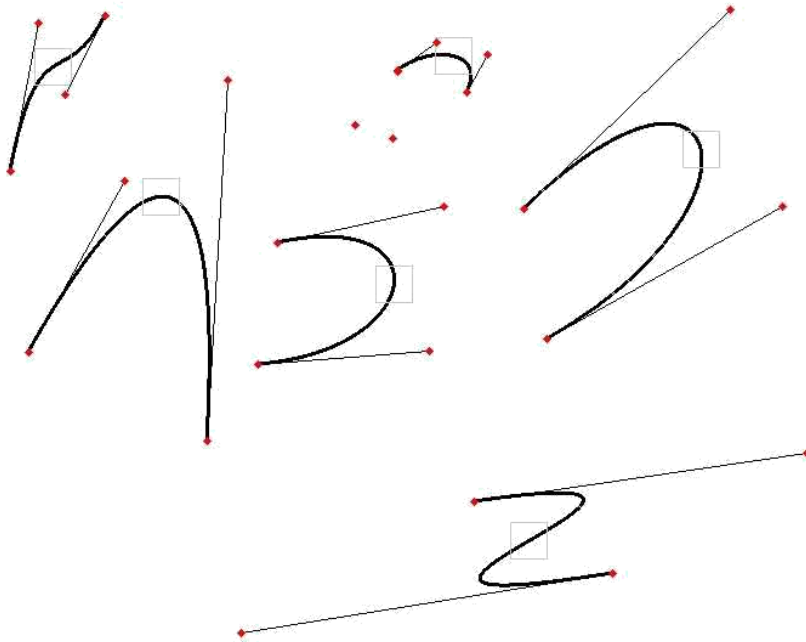


Fig 3.3: Points are removed with right button click

TASK 4 – Spline Highlight:

Draw a little square around the center of each spline in grey color (200, 200, 200)

When the mouse moves into the spline “editing region”, this region should turn to green (0, 200, 0).

When the mouse moves out of the region, the square should turn back to grey.

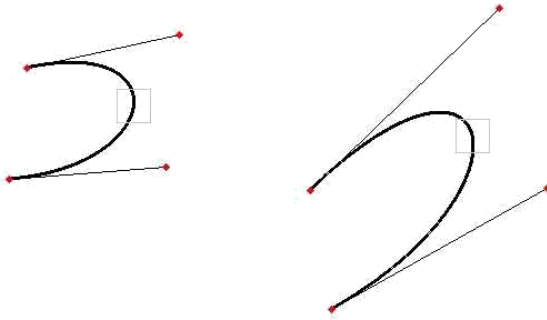


Fig 4.1: A little square around the center of each spline

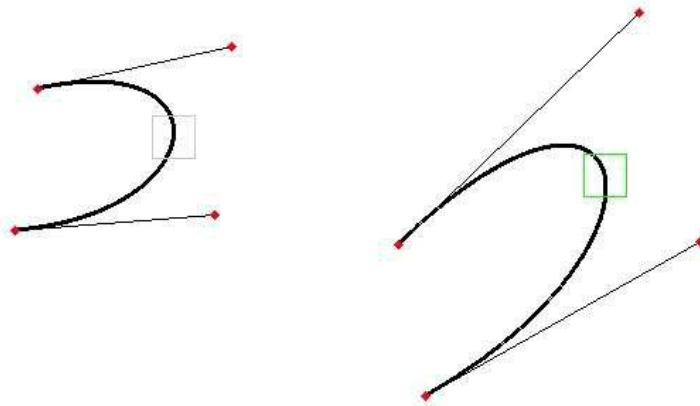


Fig 4.2: A green colored square when the mouse moves on region

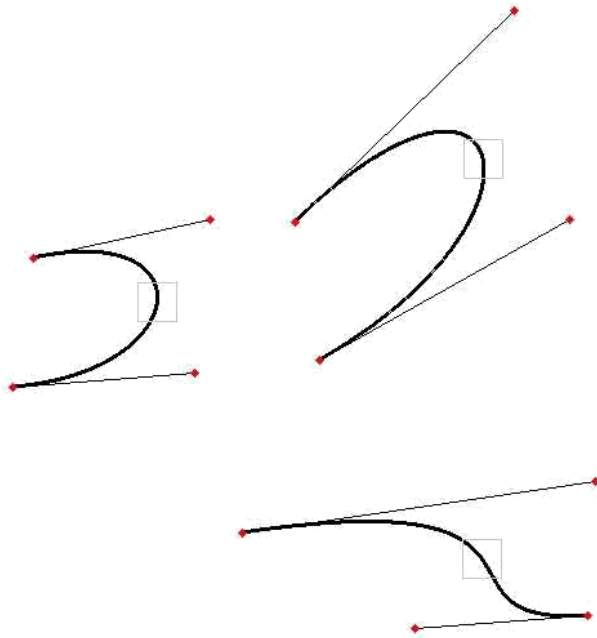


Fig 4.3: A gray colored square back when the mouse moves out of region

TASK 5 – Translation Operation:

Move the spline to any position by mouse dragging

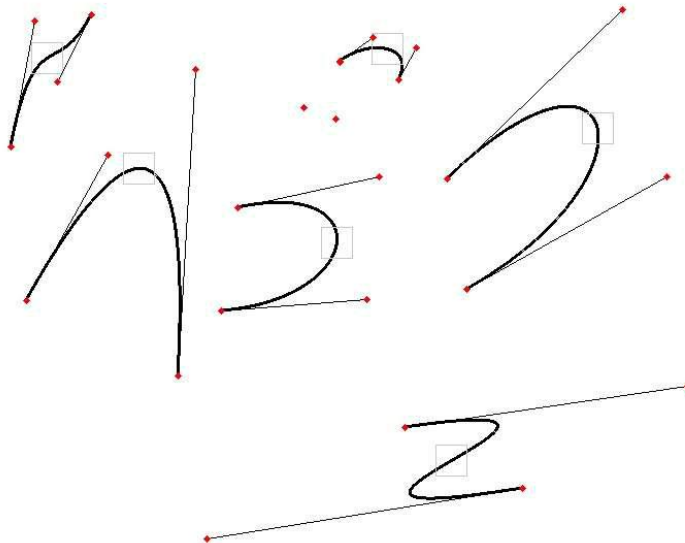


Fig 5.1: Before translation

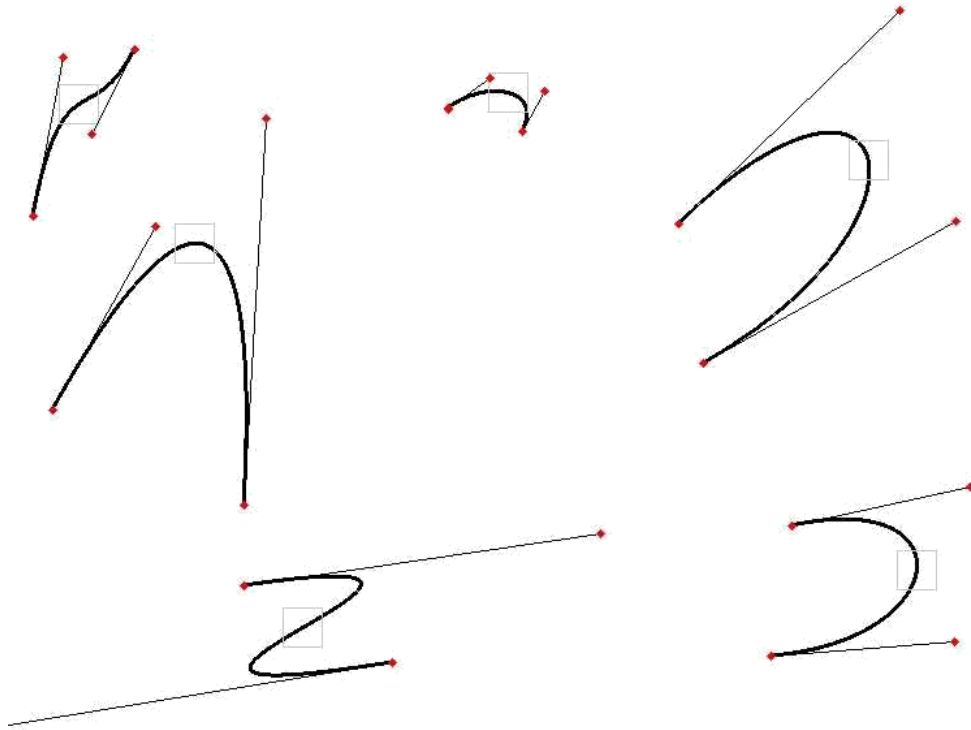


Fig 5.2: After Translation

TASK 6 – Coloring Operation:

When the spline is highlighted with the “editing region” turning to green, you can use keyboard to change the highlighted spline to different colors:

‘R’ or ‘r’ – red color

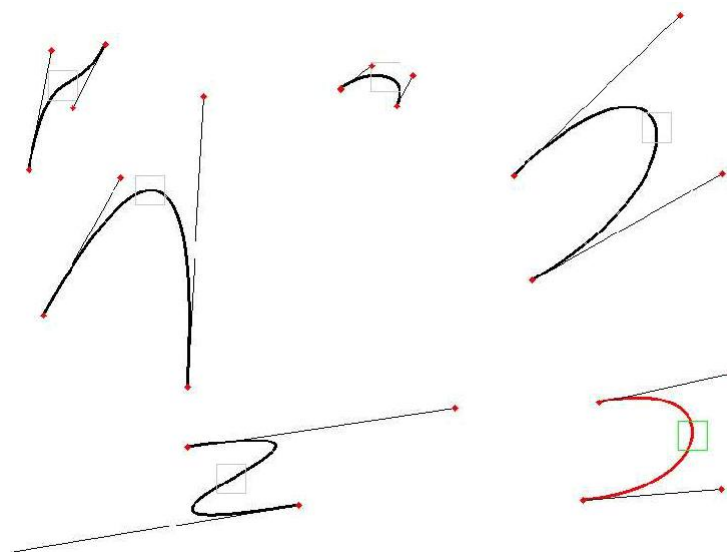


Fig 6.1: Red colored spline

'G' or 'g' – green color

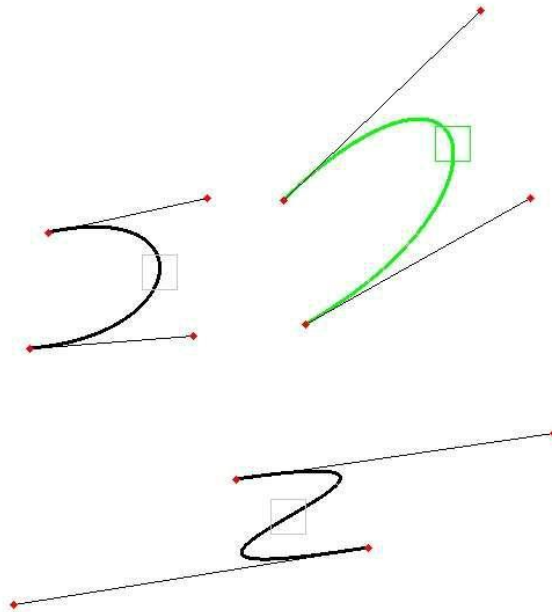


Fig 6.2: Green colored spline

'B' or 'b' – blue color

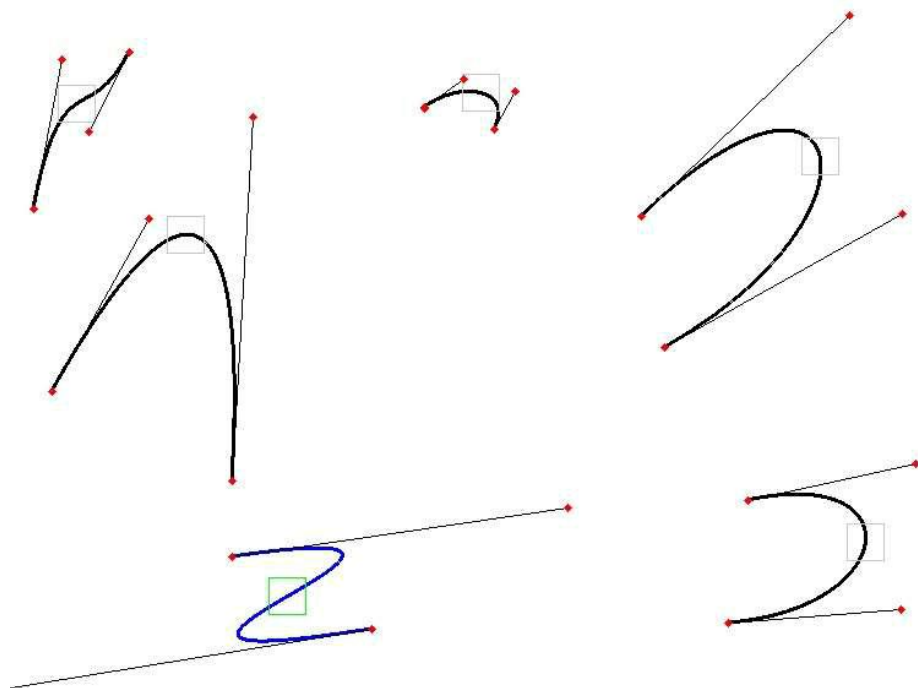


Fig 6.3: Blue colored spline

'P' or 'p' – pink color

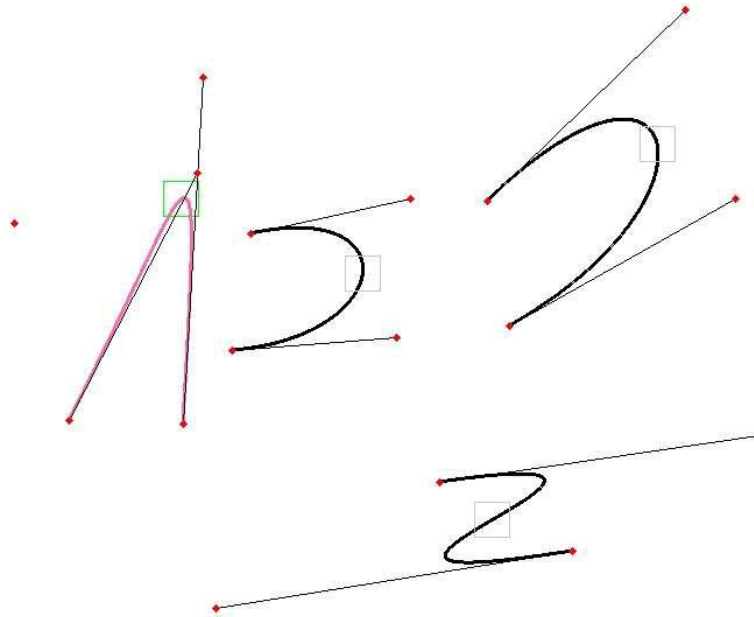


Fig 6.4: Pink colored spline

'Y' or 'y' – yellow color

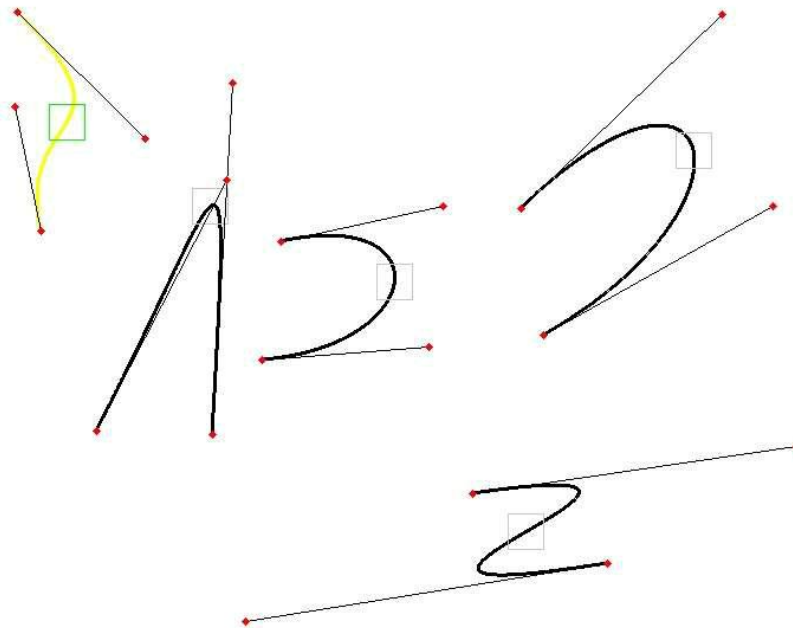


Fig 6.5: Yellow colored spline

TASK 7– Thickness Operation:

When the spline is highlighted with the “editing region” turning to green, you can also adjust the highlighted spline to different thickness by keyboard operation. the result by increasing the spline’s thickness .

‘l’ or ‘i’ – increase the spline thickness by 1

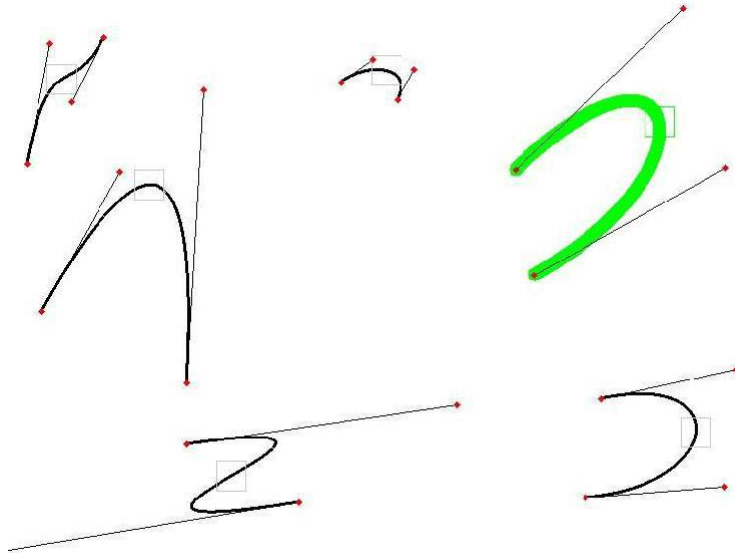


Fig 7.1: Increase the spline thickness by 1

‘D’ or ‘d’ – decrease the spline thickness by 1 (the minimum is 1)

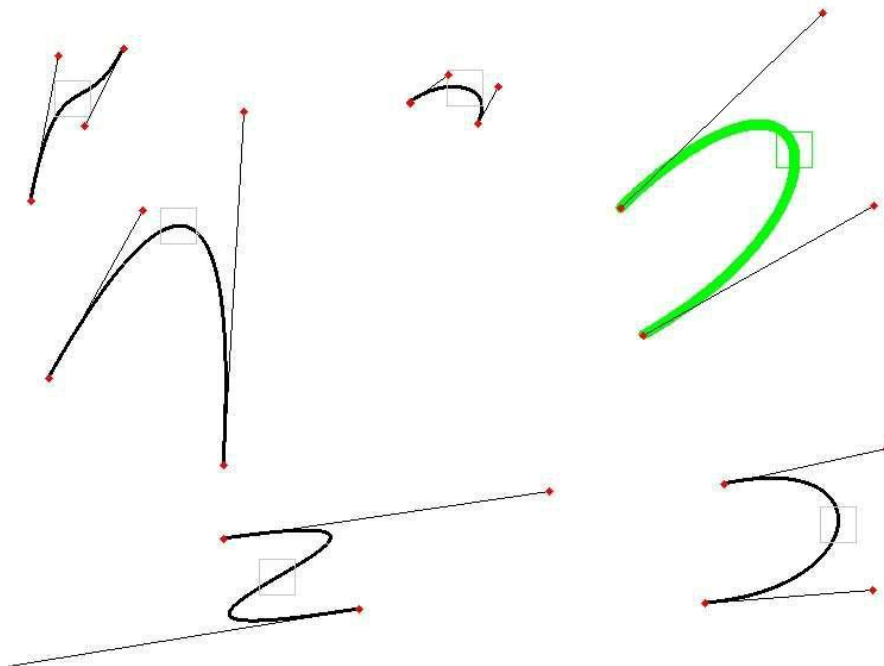


Fig 7.2: Decrease the spline thickness by 1

TASK 8:

Hit the “.” period key to remove all the points and straight-lines. So only the spline curves remain on the canvas as shown in below figure.



Fig 8.1: The removed points and lines as shown in the image.

TASK 9:

Hit the “s” or “S” key to save the work to a local file (“.jpg”)

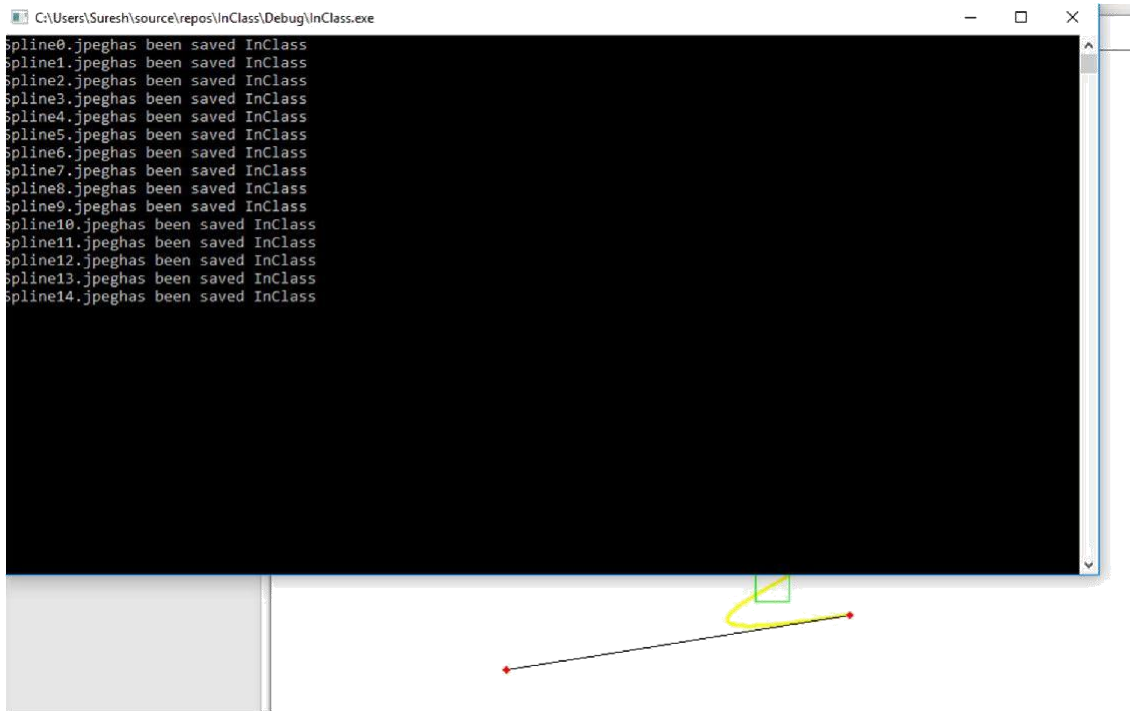


Fig 9.1: The image is saved as displayed in the message.