Assignment 1: Rendering 2D objects

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I. INTRODUCTION

The aim of this experiment is to render 2D curves which are generated from a fixed set of points using Bezier and Lagrange interpolation techniques.

II. INTERPOLATION TECHNIQUES

The points are entered by the user using mouse right click.

A. Bezier Curves

Given a set of points P_0, P_1, ... , P_n the bezier curve is defined as a function of t:

$$B(t) = \sum_{i=0}^{n} \binom{n}{i} t^i (1-t)^{n-i} P_i, \ where \ P_i \equiv (x_i, \ y_i) \ and \ 0 \leq t \leq 1$$

For different values of t the function $B(t)$ is evaluated. For each t we get point (x, y) and we construct the curve by drawing lines between consecutive points.

B. Lagrange Interpolation

Given a set of points P_0, P_1, ... , P_n the function which defines the curve which is obtained using Lagrange interpolation is defined:

$$P(x) = \sum_{i=1}^{n} P_i(x), \ where$$

$$P_j(x) = y_j \prod_{k=1, k \neq j}^{n} \left(\frac{x - x_k}{x_j - x_k} \right)$$

For different values of x between x_{min} and x_{max} the function $P(x)$ is evaluated. For each x we get point its y coordinate value and we construct the curve by drawing lines between consecutive points.
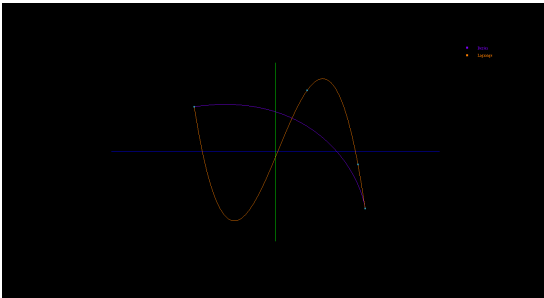
III. RESULTS
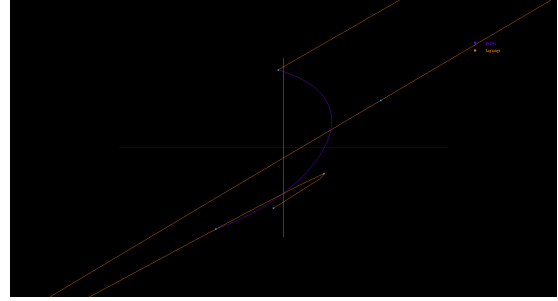

Figure 1 : Curves with 4 points

Figure 1 : Curves with 5 points and with rotation

IV. CONCLUSION

1) The curves can be re-rendered after insertion of very point.
2) Even after rotation, translation and zoom the points the curves can be rendered with introduction of a new point in the new coordinate system but there will be small errors while rendering curves after rotation as the centroid calculated in the previous and the new coordinate system are not the same and so small errors occurs while rotating the curves about its centroid.