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THE CUSPIDAL CURVE FROM THE INTERSECTION OF BISECTOR

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ABSTRACT - Bezier curves, especially quartic Bezier curves, are used in the study to help create cuspidal curves. The goal is to design a cuspidal curve and calculate the control points of the quartic Bezier curve using the bisector of a triangle. To construct cuspidal curves, a novel technique is presented that blends quartic Bezier curves with the intersection of angle bisectors. Mathematical computations and geometric transformations are used to precisely calculate the sites of bisector crossings and create the related quartic Bezier curves. Control points on the triangle are defined using the intersection of angle bisectors, and the control points necessary to create the quartic Bezier curve are determined. By presenting a unique approach to creating cuspidal curves using quartic Bezier curves and angle bisector intersections, this paper contributes significantly to curve theory and singularity analysis. The discoveries provide to a better knowledge of the evolution and characteristics of cuspidal curves, as well as significant insights for applications in computer graphics, industrial design, and robotics.

Keywords: Cuspidal curve, quartic bezier curve, intersection of bisector, mathematical computations, geometric properties.

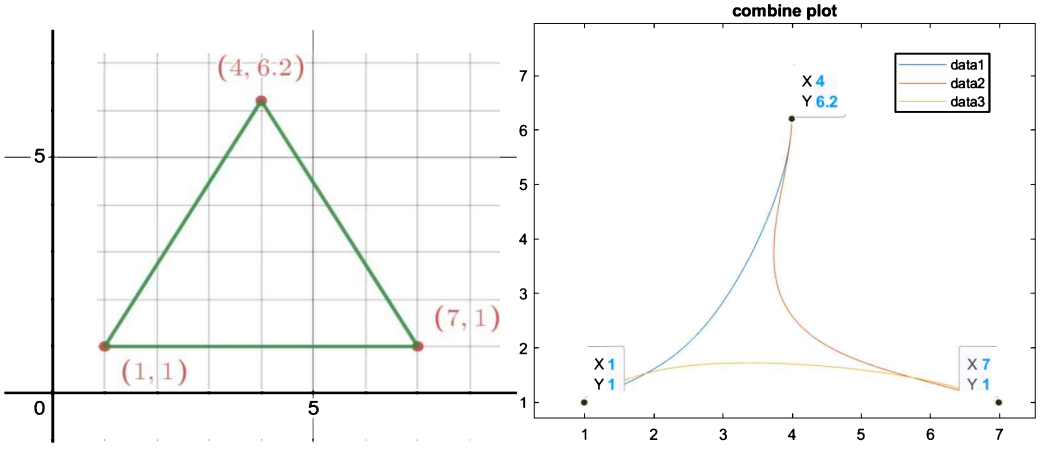
1. INTRODUCTION

The study introduces a novel approach to determining control points using the bisectors of a triangle and constructing cuspidal curves using quartic Bezier curves. Mathematical computations and geometric transformations are utilized to accurately locate bisector intersections and construct the corresponding quartic Bezier curves. The process begins with defining the control points on the triangle based on the intersection of angle bisectors, followed by determining the control points required for constructing the quartic Bezier curve.

2. METHODOLOGY

The study focuses on using intersection of angle bisector to determine the control points. The equilateral triangle is being used as the based for for angle bisector and resulted in three isosceles triangles. The triangle has been completed with five control points by using intersection of angle bisector and by using midpoint equation. The curve formed will be resulted from the five control points and when combined all three curves, a cuspidal curve is formed.

3. RESULTS AND DISCUSSION



Three curves of quartic Bezier curve formed a cuspidal curve after being combined together. The three control points (1,1), (4,6.2) and (7,1) are also the vertices oh the triangle.

4. NOVELTY OF RESEARCH

Quartic Bezier curve has been studied by Dube & Sharma (2013) with aim to construct quartic Bezier curve with shape parameters. Next, research by Besele & Catoiu (2018) about bisecting the parameter of triangle and stated that lines of bisecting area will have atleast one point that passes through those lines. Lastly, a study by Wang et al. (2011) is about cubic Bezier curve, which the authors use two curves with conditions to analyze if both curves are coincident.

5. CONCLUSION

The study gave a new viewpoint on control point identification for cuspidal curve design by introducing a novel technique for establishing control points by using the bisectors of a triangle. The study suggested a novel approach for creating cuspidal curves by combining quartic Bezier curves with the intersection of angle bisectors.

REFERENCES

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