

**Universiti Teknologi MARA**

**The Construction of a Curve by Using  
Quadratic Bézier and Cubic Bézier**

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## **STUDENT'S DECLARATION**

I certify that this report and the research to which it refers are the product of my own work and that any ideas or quotation from the work of other people, published or otherwise are fully acknowledged in accordance with the standard referring practices of the discipline.



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## ABSTRACT

Bézier curve is a line with a curve shape that produces a mathematical equation, and Bézier curve is widely used in Computer Aided Geometric Design (CAGD) where CAGD can transform the equation into a curve or a surface. The construction of the curve can be carried out using the same method, but with different polynomial equations, such as the quadratic Bézier and the cubic Bézier. However, there is a problem when using different methods because the curve produces will be slightly different even though the equation is the same with different degree. That is the reason why this study is conducted to construct a curve using both methods. The main objective of this study is to determine the best construction of the curve. Sub-objectives are to construct a curve using the quadratic Bézier and the cubic Bézier, thus comparing the curves using the Mean Square Error (MSE). The data collected for this study is from a 2D image where the 2D image control points are used to construct a curve using a quadratic and a cubic Bézier. Quadratic Bézier used three control points, while cubic Bézier used four control points. The data is analysed and simulated using MATLAB so it is compared using MSE to find the least error since it is the best method to construct a curve. The results from this study found that the control points that is used for quadratic and cubic is producing the curve and the results summarize that quadratic Bézier curve is the best construction of the curve because it produce least MSE compared to the cubic Bézier curve. As the weight of control points' decrease, the curve moves away from the control points.

**Keywords:** CAD/CAGD, Bézier curve, quadratic Bézier, cubic Bézier, and MSE

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