

UNIVERSITI TEKNOLOGI MARA

**APPLICATION OF CUBIC
TRIGONOMETRIC B-SPLINE AND
QUINTIC TRIGONOMETRIC
BEZIER CURVES IN THE DESIGN
OF SAFE AND EFFICIENT
ROADWAY TURNS**

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ABSTRACT

Turns on roadways are essential parts of transportation networks that have a big influence on driver comfort and vehicle safety. Serious collisions can result from poorly planned curves, particularly on fast-moving or uneven roads. Advanced mathematical approaches from Computer-Aided Geometric build (CAGD) can be utilized to build safer and smoother curves to solve these difficulties. This paper studies safe road turns utilization of QTBC and CTBS combined. The shape parameters can be changed with these techniques allowing the user to locally and/or globally control the curve and also create more accurate and flexible designs. To simulate a few numbers of curves which were part of the Jalan Hulu Yam Bharu - Batu Caves route, based on real control points, the Mathematica software was used. Making use of different values of the form parameters, the alignment, safety, and smoothness of the curve of the control polygon were evaluated. The findings show that QTBC and CTBS can demonstrate smooth and continuous curve, but the former is more flexible because of the two parameters of form. The study proves that CTBS and QTBC have significantly improved the safety and improved operational performance of roadway curves. It was found that the optimal parameters of Cubic Trigonometric B-Spline (CTBS) are 0.1 since the same technique can offer the best local control, smoothness, and fit to control polygon of the roadway scheme. Values 0.1 and -1 of 0 and -1 parameters (i.e. alpha and beta) were identified to be the most effective parameters of the Quintic Trigonometric Bezier Curve (QTBC), since the variables with these parameters generate most effective design of roadway curve in terms of their flexibility parameter and dual-shape parameter and the capability of producing smooth global transitions within a complex segment.

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