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Title :
G2 Parametric Curve and Surface Fitting Using Beta-Spline

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Advancement of the imaging technology nowadays demands sophisticated method to represent the captured image in the form of curves and surfaces. However, the challenge in curve and surface fitting techniques is the smoothness and accurateness of the result and the complexity of the techniques. Therefore, the primary goal of this research is to develop new curve and surface fitting techniques using beta-spline which has G^2 continuity, high accuracy and less number of computations. This is due to the properties of cubic beta-spline itself with G^2 conditions, and located close to the control polygon. Additionally, beta-spline can be controlled in three ways using control points, shape parameters and weights. In beta-spline curve fitting, the control points are calculated using least squares method. The data points are first segmented in corner detection process, then the curve control points are calculated based on the corner points. The developed curve fitting technique is applied on 2D font of 'ى' (ya) and'ε' (epsilon). The results are then compared with the another technique using B-spline in terms of total processing time, approximation error, and the number of computation in the algorithm. For beta-spline surface fitting, a new technique to solve branching contours has been carried out. An intermediate contour called composite contour is generated and inserted between the two adjacent image slices. Beta-spline surface is then fitted to the extracted data points from each slice. The developed surface fitting algorithm is applied on 3D Computerized Tomography (CT) image of human face and Stanford bunny. The reconstructed 3D images are compared visually with the images using the other techniques. The results show that the reconstructed images using beta-spline surface give similar result obtained using the other techniques.