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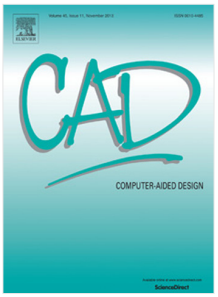

FasTFit: A fast T-spline fitting algorithm

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FasTFit: A Fast T-spline Fitting Algorithm

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Abstract

T-spline has been recently developed to represent objects of arbitrary shapes using a smaller number of control points than the conventional NURBS or B-spline representations in computer aided design, computer graphics, and reverse engineering. However, existing methods for fitting a T-spline over a point cloud are slow. By shifting away from the conventional iterative fit-and-refine paradigm, we present a novel split-connect-fit algorithm to more efficiently perform the T-spline fitting. Through adaptively dividing a point cloud into a set of B-spline patches, we first discover a proper topology of T-spline control points, i.e., the T-mesh. We then connect these B-spline patches into a single T-spline surface with different continuity options between neighboring patches according to the data. The T-spline control points are initialized from their correspondences in the B-spline patches, which are refined by using a conjugate gradient method. In experiments using several types of large-sized point clouds, we demonstrate that our algorithm is at least an order of magnitude faster than state-of-the-art algorithms while provides comparable or better results in terms of quality and conciseness.

Keywords: T-spline, point clouds, surface fitting, Bézier patch

1. Introduction

In recent years 3D point clouds of objects or environments can be readily acquired by various sensors such as consumer-grade depth cameras (most no-

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