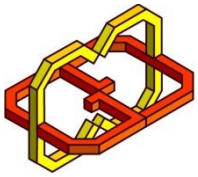

Technion-Israel Institute of Technology

Computer Science Department

Center for Graphics and Geometric Computing

CGGC Seminar

Monday, June 13th

14:00-14:30

Fady Massarwi

Computer Science Department, Technion-Israel Institute of Technology

A B-spline based Framework for Volumetric Object Modeling

With the recent development of Iso-geometric Analysis (IGA) [9] and advanced manufacturing technologies employing heterogeneous materials, such as additive manufacturing (AM) of functionally graded material, there is a growing emerging need for a full volumetric representation of 3D objects that prescribes the interior of the object in addition to its boundaries. In this work, we propose a volumetric representation (V-rep) for geometric modeling that is based on trimmed B-spline trivariates and introduce its supporting volumetric modeling framework. The framework includes various volumetric model (V-model) construction methods from basic non-singular volumetric primitives to high level constructors, as well as Boolean operations' support for V-models. A V-model is decomposed into and defined by a complex of volumetric cells (V-cells), each of which can also represent a variety of additional varying fields over it, and hence over the entire V-model. With these capabilities, the proposed framework is able of supporting volumetric IGA needs as well as represent and manage heterogeneous materials for AM. Further, this framework is also a seamless extension to existing boundary representations (B-reps) common in all contemporary geometric modeling systems, and allows a simple migration of existing B-rep data, tools and algorithms. Examples of volumetric models constructed using the proposed framework are presented.

14:30-15:00

Dr. Jinesh machchhar

Computer Science Department, Technion-Israel Institute of Technology

Incorporating Sharp Features in the General Solid Sweep Framework

This work extends a recently proposed robust computational framework for constructing the boundary representation (B-rep) of the volume swept by a given smooth solid moving along a one parameter family h of rigid motions. Our extension allows the input solid to have sharp features, and thus it is a significant and useful generalization of that work.

This naturally requires a precise description of the geometry of the surface generated by the sweep of a sharp edge supported by two intersecting smooth faces. We uncover the geometry along with the related issues like parametrization and singularities via a novel mathematical analysis.

Correct trimming of such a surface is achieved by an analysis of the interplay between the cone of normals at a sharp point and its trajectory under h. The overall topology is explained by a key lifting theorem which allows us to compute the adjacency relations amongst entities in the swept volume by relating them to corresponding adjacencies in the input solid.

Moreover, global issues related to body-check such as orientation, singularities and self-intersections are efficiently resolved.

Examples from a pilot implementation illustrate the efficiency and effectiveness of our framework.

This work is jointly done with Prof. Milind Sohoni and Prof. Bharat Adsul at IIT Bombay, India.

The lecture will be held on Monday, 13.06.2016, at 14:00, Taub 337

הזמנה זו מהווה אישור כניסה עם רכב לטכניון