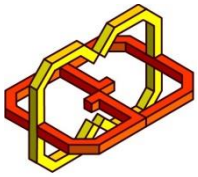

Technion-Israel Institute of Technology

Computer Science Department

Center for Graphics and Geometric Computing

CGGC Seminar – M.Sc. Talk

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Topology-Controlled Reconstruction from Partial Planar Cross-Sections

The problem of three-dimensional reconstruction from planar cross-sections arises in many fields, such as biomedical image analysis, and geographical information systems. The problem has been studied extensively in the past~40 years.

Each cross-section of the input contains multiple contours, where each contour divides the plane into different material types.

The reconstructed three-dimensional object is a valid volume (surrounded by a closed surface) that interpolates the input slices.

Some existing works utilize prior information about the reconstructed object, such as its topology, which can be described by the number of connected components and the genus of each component, for recovering the original shape of the reconstructed object. These works assume that the input cross-sections are complete and do not contain missing information. In most real-life cases, this assumption does not hold, and the input cross-sections might contain noisy or unknown areas.

Other existing works handle such inputs; however, these methods do not have topological guarantees for the reconstructed object.

In this work, we provide, to our best knowledge, the first algorithm that provides topology control for three-dimensional reconstruction from partial planar cross-sections.

The input to our algorithm is an arbitrarily-oriented set of 2-dimensional cross-sections that might contain missing information, which we refer to as “unknown" regions, in addition to user-specified topology constraints on the reconstructed object.

During the reconstruction process, we explore a set of distinct topologies for relabeling the “unknown" regions. We define a scoring function for calculating the likelihood of each topology.

We choose one set of topologies, so that the reconstructed object satisfies the global topology constraints and the score function is maximized.

The lecture will be held on Thursday, 21.07.2022, at 13:00, Taub 301

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