UNIVERSITY OF SOUTH FLORIDA

Defense of a Master's Thesis

A Study of the Effectiveness of Topology-based Scalar Field Visualization Techniques on Comparison Tasks
by
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For the MSCS degree in Computer Science

When visualizing data, we would like to convey both the data and the uncertainty associated with it. There are many incentives to do this, ranging from hurricane path projection to geographical surveys. Important decision making tasks rely upon humans perceiving a clear picture of the data and having confidence in their decisions. Topological Data Analysis has the potential to visualize the data as features or hierarchies in ways that are familiar to human intuition, and could help convey the variation of uncertainty. In this thesis, we evaluate four techniques: Color Maps, Isocontours, Reeb Graphs, and Persistence Diagrams, that each demonstrates some level of topological representation of the data. We build and run a user study evaluating the perception of various Gaussian signals applied on 3D models using each of the visualization techniques, and measure their effectiveness. We show that for positional variation, Reeb graphs are most accurate, whereas for amplitude variation, Color Maps are most accurate. All techniques show high confidence, except for Color Maps. These results help us understand what scenarios topology-based tools are best suited for.

Thursday, September 17, 2020
12:00 PM
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THE PUBLIC IS INVITED

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