FEATURE EXTRACTION & DATA CUBE VISUALIZATION THROUGH TOPOLOGICAL DATA ANALYSIS

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INTRODUCTION TO THE TEAM

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Mo’ Data Mo’ Problem
Mo’ DATA Mo’ PROBLEM
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TOPOLOGICAL DATA ANALYSIS AND VISUALIZATION (TDAV)

study of approaches to EXTRACT structure from NOISY or COMPLEX data and REPRESENT that data in an actionable form
Persistent Homology

a method for computing topological features of a space at different spatial resolutions
How Does This Relate to Radio Astronomy?

TDAV represents a diverse toolbox capable of addressing analysis needs in many contexts.

Our development study addresses these needs specifically via the Contour Tree.
Topological Skeleton: Contour Tree
CONTOUR TREES
CONTOUR TREES
CONTOUR TREES
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CONTOUR TREES
CONTOUR TREES
CONTOUR TREES
CONTOUR TREES
A CLOSER LOOK AT THE CONTOUR TREE

Scalar Value of Event
A CLOSER LOOK AT THE CONTOUR TREE

Birth of the Feature

Scalar Value of Event
A CLOSER LOOK AT THE CONTOUR TREE

Death of the Feature

Birth of the Feature

Scalar Value of Event
A CLOSER LOOK AT THE CONTOUR TREE

Persistence of the Feature

Scalar Value of Event
FEATURE REMOVAL
FEATURE REMOVAL
FEATURE REMOVAL
SCALARFIELD SIMPLIFICATION
SCALARFIELD SIMPLIFICATION
SCALARFIELD SIMPLIFICATION
SCALARFIELD SIMPLIFICATION
RESULTS

Simple Spinning Disk
from Anil Seth
Phys. & Astro.
University of Utah
VARYING
PERSISTENT
SIMPLIFICATION
Stepping through slices
Moment 0 Analysis

original

simplified
SUMMARY

Early results convincing
Open questions remain
Scalar field simplification choice
  Scalability of software
  Related visualization needs
Additional uses of the contour trees
Scientific impact of simplification
Other TDAV data structures
SOFTWARE

Software will be publicly released before the end of the year

We invite interested users to contact us for early access
QUESTIONS?

CONTACT

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PROJECT WEBSITE

http://alma-tda.cspaul.com