Reeb Graphs

Nodes in the Reeb graph correspond to critical points of the function. Each arc is mapped to a cylinder within the input.

The **Reeb graph** of a scalar function is obtained by contracting each connected component of a level set to a point
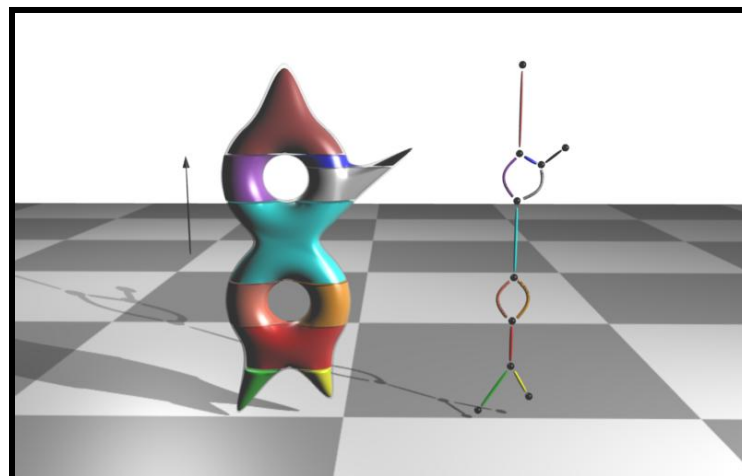
A **cylinder** is a collection of regular level set components that are topologically equivalent to each other.

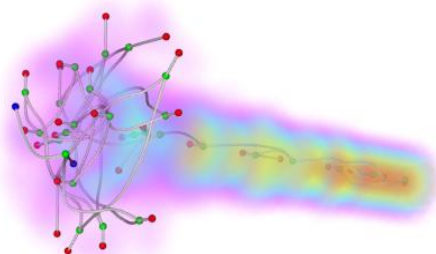**Running time** - $O(n + l + t \log t)$

n - # triangles in input mesh

t - # critical points

l – # triangles containing level sets at every critical value


An Output-Sensitive Algorithm

1. Find the critical points of the input function

2. Add arcs between appropriate critical points by tracing through each cylinder

Volume Rendered image of the Fuel dataset with the embedded Reeb graph

By assigning different colors and opacity to different cylinders, we obtain a volume rendered image that distinctly highlights the user-specified areas of the volume.
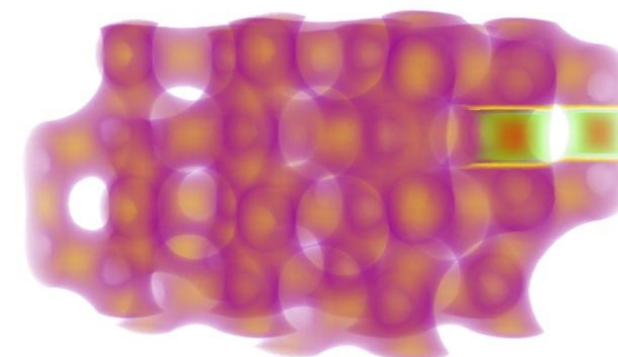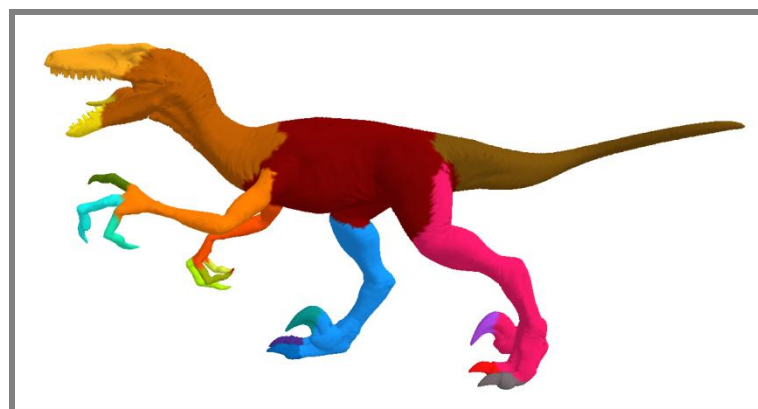
Volume rendered image of the Silicium dataset. The Reeb graph was computed for the height function, and two atoms are then highlighted by designing a different transfer function for cylinders corresponding to a loop

The set of paths that are traced through the cylinders give us an embedded layout of the Reeb graph.

The simplified Reeb graph is used for segmenting surfaces into key features

Publication

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Efficient output-sensitive construction of Reeb graphs

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