Seminar on 3D Model Reconstruction
(600.659)

Misha Kazhdan

Seminar Subject

Given a partial representation of a shape, how do we complete it to a whole one?

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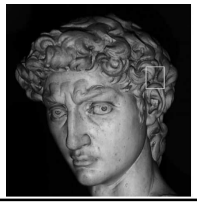
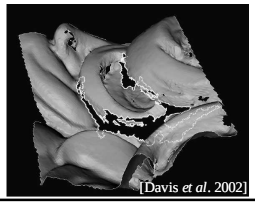
– Models with holes





[Davis *et al*. 2002]

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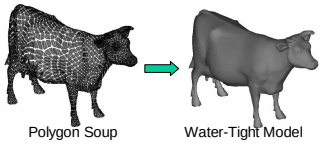
Given a partial representation of a shape, how do we complete it to a whole one?

– Models with holes

– Polygon soup



Polygon Soup Water-Tight Model

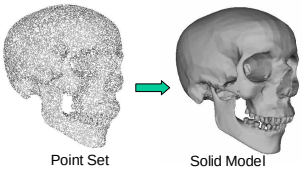
Seminar Subject

Given a partial representation of a shape, how do we complete it to a whole one?

– Models with holes

– Polygon soup

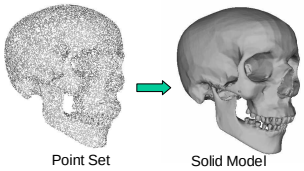
– Point sets



Point Set Solid Model

Seminar Subject

The seminar will focus on the problem of reconstructing surfaces from point sets:

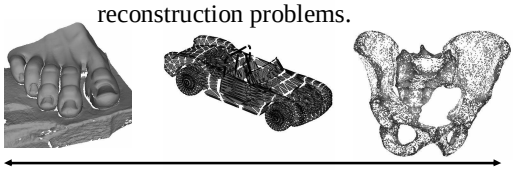


Point Set Solid Model

Seminar Subject

The seminar will focus on the problem of reconstructing surfaces from point sets:

1. This is the most general of the reconstruction problems.



Less Complex — More Complex

Seminar Subject

The seminar will focus on the problem of reconstructing surfaces from point sets:

1. This is the most general of the reconstruction problems.
2. There is plenty of material to cover in studying this sub-problem.

Bibliography

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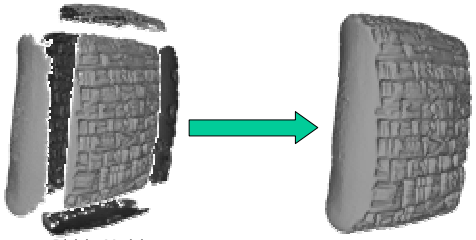
Outline

– Introduction
– Applications
– Course Description

Applications

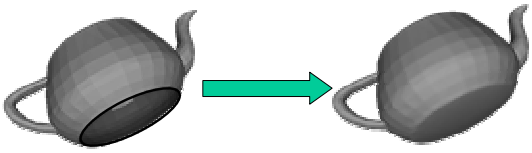
– Surface Blending



Disjoint Model "Zippered" Model

Applications

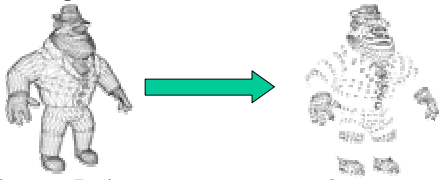
– Surface Blending
– Hole-Filling



Model with Hole Water-Tight Model

Applications

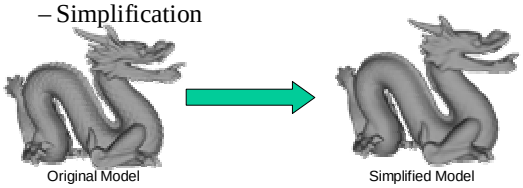
– Surface Blending
– Hole-Filling
– Compression



Geometry + Topology Representation Geometry Representation

Applications

– Surface Blending
– Hole-Filling
– Compression
– Simplification



Original Model 871,000 Triangles Simplified Model 95,000 Triangles

Outline

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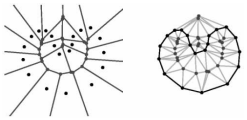
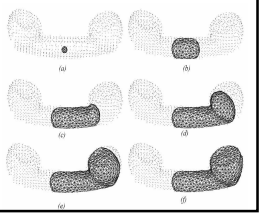
Topics I

Computational Geometry Techniques:
– Convex Hulls
– Voronoi Diagrams
– Delaunay Triangulations
– Alpha Shapes



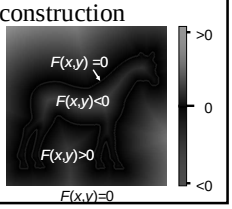
Topics II

Surface Fitting Techniques:
- Base Mesh Deformation
- Moving Least Squares



Topics III

Implicit Function Fitting Techniques:
- Growing the EDT
- Radial Basis Functions
- Fourier/Poisson based reconstruction



Requirements

Do the reading before every class
- **Be Prepared to Participate**

Regularly present to the seminar
- **In Your Own Words**

Two projects:
1. Implementation (due 10/24)
2. Research (due 12/12)