3D Modeling: Digital Geometry Processing

Adaptive semi-regular meshes, curvature approximation, and mesh denoising

Examples of digital surface processing applications.

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**BRIEF DESCRIPTION OF TECHNOLOGY DEMONSTRATION**
We demonstrate a complete set of tools for analyzing, editing, or manipulating 3D meshes. This includes fast denoising techniques like implicit fairing, accurate discrete differential-geometry operators on irregular meshes, or remeshing techniques to provide the user with semi-regular meshes with good aspect ratio triangles. The overall goal of this research is to go from DSP (for signals such as music, images, video) to DGP, for 3D objects now.

**UNIQUE OR DISTINGUISHING CHARACTERISTICS RELATIVE TO STATE-OF-THE-ART**
Being able to handle arbitrary meshes as easily as a image, with guaranteed error bounds.
**APPLICATIONS**

Mesh editing, automatic denoising of scanned meshes, irregular mesh handling, shape analysis, compression, etc.

**RECENT HIGHLIGHTS, LEVEL OF DEVELOPMENT, UPCOMING MILESTONES**

We recently proposed a realtime remeshing engine for arbitrary surfaces. We are now working on optimal surface approximation. We are also working on linking our approach to theoretical foundations well-known in differential geometry.

**UNDERLYING TECHNOLOGIES**

- Implicit fairing, for fast, yet robust denoising.
- Curvatures approximations over arbitrary meshes.
- Smooth parameterization for any 2-manifold
- Realtime remeshing

**LIST OF PUBLICATIONS, REFERENCES, URLs**

- Pierre Alliez, David Cohen-Steiner, Olivier Devillers, Bruno Lévy, Mathieu Desbrun, *Anisotropic Polygonal Remeshing*, SIGGRAPH '03.
- Thouis R. Jones, Frédol Durand, Mathieu Desbrun, *Non-iterative, Feature-Preserving Mesh Smoothing*, SIGGRAPH '03

Check out: [http://www-grail.usc.edu/](http://www-grail.usc.edu/)

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