INVITATION

ISRAEL SIGGRAPH PROFESSIONAL CHAPTER MEETING

November 23, 2007
8:30 – 13:00

Arazi-Ofer Building, Room CL03
Inter-Disciplinary Center
Herzeliya

Chapter Chair: Zachi Karni

SAMSUNG TELECOM.
RESEARCH ISRAEL

Sponsored by

Samsung Telecom.
Research Israel

Innovating Telecom.

Program:

- 8:30 – 9:00
  Gathering & Refreshments
- 9:00 – 9:15
  Welcome & Announcements
- 9:15 – 9:45
  Flexible Adaptive Tessellation of Subdivision Surfaces
  Tatiana Surazhsky, Samsung
- 9:45 – 10:15
  Parameterization-free Projection for Geometry Reconstruction
  David Levin, Tel-Aviv University
- 10:15 – 10:45
  Conformal Flattening by Curvature Prescription and Metric Scaling
  Mirela Ben-Chen, Technion
- 10:45 – 11:15
  Coffee Break
- 11:15 – 11:45
  Computing the Voronoi Cells of Planes, Spheres and Cylinders in R^3
  Iddo Hanniel, Technion
- 11:45 – 12:15
  A feature-based transfer function for liver visualization: algorithm and validation study
  Moti Freiman, Hebrew University
- 12:15 – 12:45
  Seam Carving for Content-Aware Image Resizing
  Ariel Shamir, IDC

Design by Kobi Kor
www.kobikor.com

Free parking available next to the campus.
Directions at: http://www.idc.ac.il/directions

Flexible Adaptive Tessellation of Subdivision Surfaces

Tatiana Surazhsky, Samsung

Subdivision surfaces are a popular representation for the free-form shape in geometric modeling. While the subdivision process rapidly converges to a smooth shape, computing and rendering all the vertices is too expensive in the sense of the memory consumption and run time, and also superfluous. Our work was inspired by a demand for a rendering of dynamic scenes and an interactive rendering of the animated character model with reduced memory consumption and no dynamic allocations. The subdivision surface is rendered with no modifications of the control mesh, while allowing flexible tessellation on all subdivision levels as well as feature support (sharp edges and boundaries and vertex editing) for each level.

Parameterization-free Projection for Geometry Reconstruction

David Levin, Tel-Aviv University

We introduce a Locally Optimal Projection operator (LOP) for surface approximation from point-set data. The operator is parameterization free, in the sense that it does not rely on estimating a local normal, fitting a local plane, or using any other local parametric representation. Therefore, it can deal with noisy data which clutters the orientation of the points. The method performs well in cases of ambiguous orientation, e.g., if two folds of a surface lie near each other, and other cases of complex geometry in which methods based upon local plane fitting may fail. Although defined by a global minimization problem, the method is effectively local, and it provides a second order approximation to smooth surfaces. Hence allowing good surface approximation without using any explicit or implicit approximation space. Furthermore, we show that LOP is highly robust to noise and outliers and demonstrate its effectiveness by applying it to raw scanned data of complex shapes.

Joint work with Yaron Lipman, Daniel Cohen-Or and Hillel Tal-Ezer

Conformal Flattening by Curvature Prescription and Metric Scaling

Mirela Ben-Chen, Technion

We present an efficient method to conformally parameterize 3D mesh data sets to the plane. The idea behind our method is to concentrate all the 3D curvature at a small number of select mesh vertices, called cone singularities, and then cut the mesh through those singular vertices to obtain disk topology. The singular vertices are chosen automatically. As opposed to most previous methods, our flattening process involves only the solution of linear systems of Poisson equations, thus is very efficient. Our method is shown to be faster than existing methods, yet generates parameterizations having comparable quasi-conformal distortion.

Joint work with Craig Gotsman

Computing the Voronoi Cells of Planes, Spheres and Cylinders in R^3

Iddo Hanniel, Technion

We present an algorithm for computing the Voronoi cell for a set of planes, spheres and cylinders in R^3. The union of the Voronoi cells is the Voronoi diagram. The algorithm is based on a lower envelope computation of the bisector surfaces between these primitives, and the projection of the trisector curves onto planes bounding one of the objects denoted the base object. We analyze the different bisectors and trisectors that can occur in the computation. Our analysis shows that most of the bisector surfaces are quadric surfaces and five of the ten possible trisectors are conic section curves. We have implemented our algorithm using the IRIT library and the CGAL 3D lower envelope package. All presented results are from our implementation.

Joint work with Gershon Elber

A feature-based transfer function for liver visualization: algorithm and validation study

Moti Freiman, Hebrew University

This paper presents a novel method for the automatic generation of patient-specific, feature-based multi-dimensional transfer functions used in the visualization of liver blood vessels in CT datasets. The method autom atically extracts the geometrical structure of the vessels with a multi-scale eigenanalysis of the image Hessian matrix. It then uses this information to optimize the transfer functi on based on energy minimization in a variational framework. The method overcomes key drawbacks of existing volume visualization techniques, which are limited to predefined transfer functions, require lengthy manual adjustment based on CT iso-values, and often produce suboptimal results. We validate the method on eight clinical data sets with about 100 slices, obtained transfer functions for each in about 90 secs, and produced real-time visualizations. The visualizations were evaluated and compared to standard CT visualization techniques by an expert radiologist. Th e ratio between the visible parts in the CT and as provided by the proposed method was 83%. Therefore the proposed method can be a complementary tool for liver CT analysis which p rovide the 3D structure of the vessels.

Joint work with L. Joskowicz, D. Lischinski, and J. Sosna

Seam Carving for Content-Aware Image Resizing

Ariel Shamir, IDC

Effective resizing of images should not only use geometric constraints, but consider the image content as well. We present a simple image operator called seam carving that supports content-aware image resizing for both reduction and expansion. A seam is an optimal 8-connected path of pixels on a single image from top to bottom, or left to right, where optimality is defined by an image energy function. By repeatedly carving out or inserting seams in one direction we can change the aspect ratio of an image. By applying these operators in both directions we can retarget the image to a new size. The selection and order of seams protect the content of the image, as defined by the energy function. Seam carving can also be used for image content enhancement and object removal. We support various visual saliency measures for defining the energy of an image, and can also include user input to guide the process. By storing the order of seams in an image we create multi-size images, that are able to continuously change in real time to fit a given size.

Joint work with Shai Avidan