$\boxed{4}$

11:30–12:00

Image-Based Rendering for Non-Diffuse Synthetic Scenes*

Dani Lischinski
The Hebrew University

Most current image-based rendering methods operate under the assumption that all of the visible surfaces in the scene are opaque ideal diffuse (Lambertian) reflectors. This talk is concerned with image-based rendering of non-diffuse synthetic scenes. We introduce a new family of image-based scene representations and describe corresponding image-based rendering algorithms that are capable of handling general synthetic scenes containing not only diffuse reflectors, but also specular and glossy objects. Our image-based representation is based on Layered Depth Images. It represents simultaneously and separately both view-independent scene information and view-dependent appearance information. The view-dependent information may be either extracted directly from our data-structures, or evaluated procedurally using an image-based analogue of ray tracing. We describe image-based rendering algorithms that recombine the two components together in a manner that produces a good approximation to the correct image from any viewing position. In addition to extending image-based rendering to non-diffuse synthetic scenes, our work has an important methodological contribution: it places image-based rendering, light-field rendering, and volume graphics in a common framework of discrete raster-based scene representations.

*** Joint work with Ari Rappoport**

$\boxed{5}$

12:00–12:30

Curve and Surface Fitting and Design by Optimal Control Methods

Michal Alhanaty and Michel Bercovier
The Hebrew University

Optimal control theory is introduced in this work as a uniform formal frame for stating and solving a variety of problems in CAD. It provides a new approach to handling, analyzing and building curves and surfaces. As a result, new classes of curves and surfaces are defined and known problems are analyzed from a new viewpoint. Applying the presented method on the classical problems of knot selection of cubic splines and parameter correction leads to new algorithms. By using the optimal control framework new classes of curves and surfaces can be defined. Two such classes are introduced here: the class of smoothed m-splines generalizing the classical m-splines, and the class of smoothed approximating splines as a new family of splines.
The work describes the numerical solution method deriving from this framework. The optimal control formulation, contrary to general optimization theory, simplifies the explicit computation of gradients. The solution uses these gradients and handles the inequality constraints appearing in the problems by means of the projected gradient method. It turns out to be simple, stable, and efficient for the above applications.

INVITATION

ISRAEL SIGGRAPH

PROFESSIONAL CHAPTER MEETING

Sponsored by

Silicon Graphics (Israel) Ltd.

July 2, 1999
8:30–12:30
Ulam Dach
(near Ulam Lev, Shrieber Bldg.)
Tel-Aviv University

Chair: Leo Joskowicz
The Hebrew University

This invitation is an entry permit for your car at gate 4 of the Tel-Aviv University campus.

8:30–9:00

Refreshments

$\boxed{1}$

9:00–9:30

Self-Customized BSP Trees: A Case-Study*

Sigal Ar
Technion

We define a self-customized data structure as one that automatically adjusts itself to client usage. This involves two concurrent activities: (i) a learning mechanism infers a probabilistic distribution from a log of client requests; (ii) a reconfiguration process optimizes the data structure with respect to the inferred distribution. The two processes must be seamlessly integrated so as to make self-customizing transparent and latency-free. A self-customized data structure is optimized for average-case performance: its distinctive feature is to avoid a priori assumptions about the distribution of client requests. In this paper we report encouraging results obtained while experimenting with this concept in the context of self-customized BSP trees.

*** Joint work with Bernard Chazelle and Ayellet Tal.**

$\boxed{2}$

9:30–10:15

On Rational Bisector and Alpha-Sectors*

Gershon Elber
Technion

Given two varieties in Rn, their bisector is defined as the set of points which are equidistant from the two varieties. Bisector curves and surfaces and medial surfaces have many important applications in engineering. However, their construction is non-trivial except for some special cases. It is therefore crucial to identify and isolate the cases that can be handled with ease. We will consider and present several such special cases: (1) The bisector curve of a point and a rational curve, in R2; (2) The bisector surface of a point and a rational surface, in R3. (3) The bisector surface of two rational curves, in R3. (4) The bisector surface in R3 of several CSG primitives such as a cone and a sphere, or a plane and a cone.

All the above cases will be constructively shown to form rational bisectors. In addition, we introduce and examine a new shape formulation we denote the alpha-sector. The alpha-sector extends the notion of the bisector to arbitrary distance ratios between the two varieties. We show that a close formulation, we denote the pseudo-alpha-sector, is indeed rational and can be useful to a whole variety of applications, including metamorphosis.

*** Joint with M-S. Kim, SNU South Korea and G. Barequet, Technion.**

10:15–11:00

Coffee Break

$\boxed{3}$

11:00–11:30

Context-based Space Filling Curves

Revital Dafner
Tel-Aviv University

A context-based scanning technique for images is presented and used for image compression. An image is scanned along a context-based space filling curve that is computed so as to exploit inherent coherence in the image. The resulting one-dimensional representation of the image has improved autocorrelation compared with universal scans such as the Peano-Hilbert space filling curve. The increased autocorrelation is advantageous for many algorithms such as image compression, which is discussed. An efficient algorithm for computing context-based space filling curves is presented and the resulting sequence of pixels is then compressed.

*** Joint with Daniel Cohen-Or and Yossi Matias, Tel-Aviv University**