8:30 – 9:00

Refreshments

1

9:00 – 9:45

Illumination Insensitive Methods of Visual Comparison

Dr. Margarita Osadchy
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NEC Labs America, Inc.
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Image comparison is a fundamental component in many computer vision tasks such as recognition, alignment and tracking. Variation in lighting is critical to image comparison, because it dramatically affects the appearance of an object in an image. Current methods approach this problem by focusing on effects created by discontinuities in matte objects, which are insensitive to lighting changes. However this approach is very limited because it treats other effects as unmodeled noise, including the effects of smooth, untextured surfaces and the effects of shiny objects that produce significant highlights. These are present in most real objects. I show that these properties can be modeled, and they provide a rich source of information. I tackle the problem presented by smooth surfaces with no edges or texture by using a whitening tool from signal processing theory to design a superior measure of image comparison. This can provide a component in a general comparison method that also integrates past approaches. Recognition of shiny objects is also very challenging, since the appearance of the highlights they produce changes drastically with the viewing conditions. I show that using a simple qualitative model of specular reflection I can judge the consistency of specularities with 3D object geometry and use this consistency to identify very challenging transparent objects such as wine glasses. Next, I integrate this knowledge about the highlights with previous methods for matte objects. This allows recognition of glossy, smooth objects, such as pottery, which are very challenging for existing methods.

2

9:45 – 10:15

Global Curvature Analysis and Segmentation of Volumetric Data Sets Using Trivariate B-spline Functions*

Octavian Soldea
Computer Science Department, Technion

This work presents a scheme to globally compute, bound, and analyze the Gaussian and mean curvature of an entire volumetric data set, using a trivariate B-spline volumetric representation. The proposed scheme is not only precise to within machine precision but also level insensitive to aliasing, compared to traditional piecewise constant volumetric data sets. Further, this scheme allows one to globally segment the images into volumetric regions with convex or concave (elliptic) iso-surfaces, planar or cylindrical (parabolic) iso-surfaces, and volumetric regions with saddle-like (hyperbolic) iso-surfaces. Being global analysis, these segmented regions are extracted simultaneously for all iso-surface level values. Results will be presented for volumetric segmentation of both the Gaussian and mean curvatures, while the introduced scheme could easily be adapted to other differential properties.

***Joint work with Gershon Elber and Ehud Rivlin.**

3

10:15 – 10:45

Gradient Video Compositing*

Iddo Drori
Computer Science Department, Tel Aviv University

We present a new framework for video compositing based on efficient cuts through similar motion and appearance followed by reconstruction of video from 3D gradients. Temporal coherence present in image sequences is utilized by cutting overlapping videos through regions in which the motion fields do not conflict and where colors are similar. The video is reconstructed by solving a Poisson equation on a 3D vector field to fuse together video regions with different color and texture. The entire process is linear in the number of pixels. We use video pairs to demonstrate the applicability and advantages of our compositing method for mixing, extending, condensing, and transitions between videos in space and time.

***Joint work with Shachar Fleishman, Daniel Cohen-Or and Yehezkel Yeshurun**

10:45 – 11:15

Coffee Break

4

11:15 – 11:45

Anatomical Image-Based Rigid Registration between Fluoroscopic X-ray and CT*

Dotan Knaan
School of Engineering and Computer Science
The Hebrew University of Jerusalem

We describe a practical, whole system approach to rigid registration between preoperative CT and intraoperative X-rays obtained with a tracked C-arm and demonstrates its efficacy experimentally. Our approach is generic, targeted to orthopaedic surgery and includes fluoroscopic X-ray calibration, image distortion correction, optical tracking, and 2D/3D image registration. For 2D/3D image registration, we use two new gradient-based and intensity-based algorithms which are fast, robust, and accurate in realistic setups. Our experiments on simulated, in-vitro, and cadaver cases show that an overall mean target registration error of 1--1.5mm (2mm worst case), which succeeds on the first try 95\% or more of the time in less than two minutes, is practically feasible.

***Joint work with L. Joskowicz, H. Livyatan, Z. Yaniv**

5

11:45 – 12:15

Feature-Space Analysis of Unstructured Meshes

Ariel Shamir
The Interdisciplinary Center

Unstructured meshes are often used in simulations and imaging applications. They provide advanced flexibility in modeling abilities but are more difficult to manipulate and analyze than regular data. This work provides a novel approach for the analysis of unstructured meshes using feature-space clustering and feature-detection. Analyzing and revealing underlying structures in data involve operators on both spatial and functional domains. Slicing concentrates more on the spatial domain, while iso-surfacing or volume-rendering concentrate more on the functional domain. Nevertheless, many times it is the combination of the two domains which provides real insight on the structure of the data. In this work a combined feature-space is defined on top of unstructured meshes in order to search for structure in the data. A point in feature-space includes the spatial coordinates of the point in the mesh domain and all chosen attributes defined on the mesh. A distance measures between points in feature-space is defined enabling the utilization of clustering using the mean shift procedure (previously used for images) on unstructured meshes. Feature space analysis is shown to be useful for feature-extraction, for data exploration and partitioning.

6

12:15 – 12:45

An Efficient Algorithm for the Computation of the Metric Average of Two Intersecting Convex Polygons, with Application to Morphing

Evgeny Lipovetsky
Dept. of Applied Mathematics
Tel Aviv University

In this work an algorithm for the computation of the metric average between two intersecting convex polygons in 2D is developed and studied. This algorithm has linear time complexity. As an application of this algorithm, a new technique for morphing between two convex polygons is developed. We produce the intermediate polygons in terms of the metric averages between the source polygon and the target polygon mapped by a rigid motion to intersect the source polygon, such that their intersection is large. The new algorithm performs morphing in a non-intuitive way. In particular the intermediate polygons are not necessarily convex.

INVITATION

ISRAEL SIGGRAPH PROFESSIONAL CHAPTER MEETING

Sponsored by
Silicon Graphics (Israel) Ltd.

8:30 – 12:30
November 21, 2003
Lev Auditorium
Shenkar Physics Building
Tel Aviv University

Chair: Anath Fischer
Technion – Israel Institute of Technology

Due to security reasons there is no entry permit to the Tel-Aviv University campus