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THE DEPARTMENT OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE, CS DIVISION

Presents the Summer 2012 EECS Seminar Series

Dr. Sven Dickinson

University of Toronto

"The Role of Intermediate Shape Priors in Perceptual Grouping and Image Abstraction"

Thursday, August 2, 2012 • 2:00 p.m. • HEC 103

Abstract

Perceptual grouping played a prominent role in support of early object recognition systems, which typically took an input image and a database of shape models and identified which of the models was visible in the image. When the database was large, local features were not sufficiently distinctive to prune down the space of models to a manageable number that could be verified. However, when causally related shape features were grouped, using intermediate-level shape priors, e.g., cotermination, symmetry, and compactness, they formed effective shape indices and allowed databases to grow in size. In recent years, the recognition (categorization) community has focused on the object detection problem, in which the input image is searched for a specific target object. Since indexing is not required to select the target model, perceptual grouping is not required to construct a discriminative shape index; the existence of a much stronger object-level shape prior precludes the need for a weaker intermediate-level shape prior. As a result, perceptual grouping activity at our major conferences has diminished. However, there are clear signs that the recognition community is moving from appearance back to shape, and from detection back to unexpected object recognition. Shape-based perceptual grouping will play a critical role in facilitating this transition. But while causally related features must be grouped, they also need to be abstracted before they can be matched to categorical models. In this talk, I will describe our recent progress on the use of intermediate shape priors in segmenting, grouping, and abstracting shape features. Specifically, I will describe the use of symmetry and non-accidental attachment to detect and group symmetric parts, the use of closure to separate figure from background, and the use of a vocabulary of simple shape models to group and abstract image contours.

Biography

Sven Dickinson received the B.A.Sc. degree in Systems Design Engineering from the University of Waterloo, in 1983, and the M.S. and Ph.D. degrees in Computer Science from the University of Maryland, in 1988 and 1991, respectively. He is currently Professor and Chair of the Department of Computer Science at the University of Toronto, where he has also served as Acting Chair (2008-2009), Vice Chair (2003-2006), and Associate Professor (2000-2007). >From 1995-2000, he was an Assistant Professor of Computer Science at Rutgers University, where he also held a joint appointment in the Rutgers Center for Cognitive Science (RuCCS) and membership in the Center for Discrete Mathematics and Theoretical Computer Science (DIMACS). From 1994-1995, he was a Research Assistant Professor in the Rutgers Center for Cognitive Science, and from 1991-1994, a Research Associate at the Artificial Intelligence Laboratory, University of Toronto. He has held affiliations with the MIT Media Laboratory (Visiting Scientist, 1992-1994), the University of Toronto (Visiting Assistant Professor, 1994-1997), and the Computer Vision Laboratory of the Center for Automation Research at the University of Maryland (Assistant Research Scientist, 1993-1994, Visiting Assistant Professor, 1994-1997). Prior to his academic career, he worked in the computer vision industry, designing image processing systems for Grinnell Systems Inc., San Jose, CA, 1983-1984, and optical character recognition systems for DEST, Inc., Milpitas, CA, 1984-1985.

Dr. Dickinson's research interests revolve around the problem of object recognition, in general, and generic object recognition, in particular. He has explored a multitude of generic shape representations, and their common representation as hierarchical graphs has led to his interest in inexact graph indexing and matching. His interest in shape representation and matching has also led to his research in perceptual grouping, object tracking, vision-based navigation, content-based image retrieval, variable structured object representation and matching, category learning, and the use of language to guide perceptual grouping, object recognition, and motion analysis. One of the focal points of his research is the problem of image abstraction, which he believes is critical in bridging the representational gap between images and categorical shape models. He has published over 100 papers on these topics in refereed journals, conferences, and edited collections.