



**Spring 2008 CIS Colloquium Series
Distinguished Lecture**

Towards a principled account of the mental representation of shape

Jacob Feldman

(Rutgers University, New Brunswick)

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Abstract

The mental representation of shape, a critical problem in visual perception, is still surprisingly poorly understood. For example, it is widely accepted that a critical part of shape representation is the division of a shape into component parts, but the computational rules by which the visual system accomplishes this are somewhat complicated and heterogeneous, and lack a principled theory. The subjective decomposition of a shape into parts can't be explained by any simple local rule: it respects global shape organization in a number of subtle ways that current theories cannot adequately handle. The key to the resolution of these problems is the robust identification of a shape's "skeleton" or medial axis structure—a notoriously difficult problem. In this talk I'll present a new Bayesian framework to shape (developed jointly with Manish Singh) that solves many of the standard difficulties. In the Bayesian approach, we formulate shape representation as an inverse inference problem, and attempt to estimate the shape skeleton most likely to have generated the observed shape via a process of "growth." This method gives more intuitive results than traditional medial axis methods, in that each axis in the MAP skeleton corresponds to an intuitive part of the shape, making it suitable as a basis for psychological shape representation and part decomposition. Moreover, the Bayesian approach can be extended in a variety of natural ways to solve outstanding problems in shape representation.

Elements of this work are joint with Manish Singh and Elan Barenholtz.

Bio

Jacob Feldman is Professor in the Department of Psychology and the Center for Cognitive Science at Rutgers University – New Brunswick. He received his Ph.D. in 1992 from the M.I.T. Dept. of Brain and Cognitive Sciences, and has been at Rutgers ever since. His main research interests are in visual perception, especially perceptual organization and shape; and in categorization and concept learning. In both these general areas his focus is on mathematical and computational models of human mental function.

Location: 4th Floor Conference Room (Wachman 447)

Time: 3-4pm, Wednesday, April 23, 2008

Refreshments will be served!