Hamilton Institute

A Computational Theory of Contour Completion
in Visual Cortex

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Abstract

Illusory contour displays (e.g., the Kanizsa Triangle) dramatically illustrate the human visual system's ability to complete the boundaries of partially occluded surfaces. A recent neural model of illusory contour formation is based on a distribution of natural shapes traced by particles moving with constant speed in directions given by Brownian motions.

The input to that model consists of pairs of position and direction constraints and the output consists of the distribution of contours joining all such pairs. In general, these contours will not be closed and their distribution will not be scale-invariant. In this talk, I show how to compute a scale-invariant distribution of closed contours given position constraints alone.

Like computations in primary visual cortex (and unlike all previous models of contour completion), our computation is also Euclidean invariant, i.e., rotation and translation of the input yields an identical rotation and translation of the output. This invariance is achieved in a biologically plausible manner by representing the input, output, and intermediate states of the computation in a finite basis of shiftable-twistable functions.

Joint work with Karvel Thornber (NEC Research Institute) and John Zweck (Univ. of Maryland).

Venue: Seminar Room, Hamilton Institute, Rye Hall,
NUI Maynooth

Time: 3.00 - 4.00pm (followed by tea/coffee)

Travel directions are available at www.hamilton.ie

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