PATTERN RECOGNITION
Computer Science COMP - 644 B
First Midterm Test - February 9, 2004

1) Neural Networks *(3 points)*

(a) Define (1) *lateral inhibition*, *(2)* the *Laplacian* of a two-dimensional function.

(b) Design a neural network that exhibits lateral inhibition. Illustrate its output for a simple input of your choice. A one-dimensional light intensity function suffices.
(c) What is the relationship between lateral inhibition and the Laplacian?

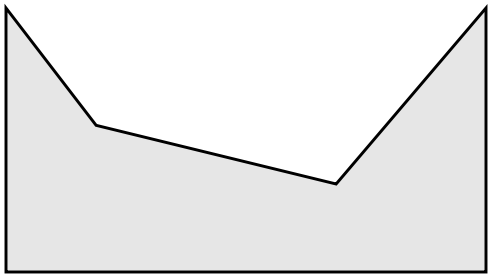
2) Midpoint Smoothing *(2 points)*

Consider the *midpoint smoothing* algorithm for polygons in the plane. Prove or disprove that every non-simple polygon in general position has a non-simple descendant. (Recall that a polygon that is *non-simple* is self-crossing. A polygon is in *general position* if no three of its vertices are collinear.)

3) Medial Axis *(2 points)*

(a) Define the *medial axis* of a simple polygon.

(b) Draw the medial axis of the polygon shown. Describe the shape of each piece and where it starts and finishes.



4) Distance Transforms *(3 points)*

(a) Let **P** be the digital pattern shown below. Find the *distance transform* D*(**P**) using the ∞-*Minkowski* metric.

(b) A *skeleton* of P using D*(**P**) is defined as the set of pixels each of which has the property that none of its 8-neighbors has a value greater than its own.
Indicate which pixels form the skeleton of **P**.

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