T-61.5010 INFORMATION VISUALIZATION

EXAMINATION

T1, 7 May 2007 at 9–12

To pass the course you must also pass the exercise work. Results of this examination are valid for one year after the examination date.

This examination has two pages. To get full points you must complete all of the problems 1–3 and *two* of the three essays (problems 4–6).

You can answer in Finnish, Swedish or English. Please write clearly and leave a wide left or right margin. You do not need a calculator.

Instructions for the essays: Write in full sentences and structure your answer to paragraphs. The essay should be written in a manner understandable to your learned colleague who has asked you to tell her about the topic of the essay.

The results will be posted to the (blue binder at the) notice board on 7 June 2007, at latest, and also emailed to an address of form `12345X@students.hut.fi`, where `12345X` is your student number.

You can keep this paper.

1. *Concepts.* Explain the following concepts briefly:

    (a) superacuity

    (b) crispening

    (c) gestalt laws

    (d) cost-knowledge characteristic function

    (e) semiotics of graphics

2. *Depth cues.* What are depth cues? List at least six and briefly explain them.

3. *Dimension reduction methods.* Consider the problem of projecting the two dimensional data set shown in Figure 1 into one dimension.

    (a) Sketch out the projection resulting from multidimensional scaling (MDS). Write down the MDS cost or error function (stress).
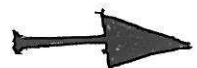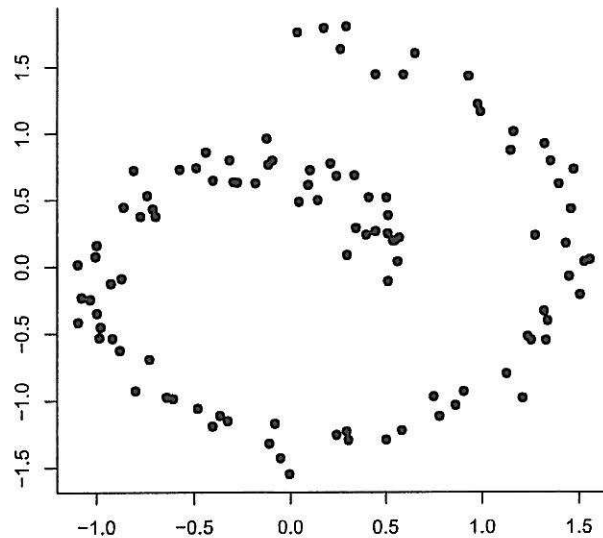
Figure 1: Two dimensional data set for Problem 3.

(b) Sketch out the projection resulting from isometric mapping of data manifolds (ISOMAP). What is the working principle of ISOMAP, and how does it differ from MDS?

(c) Analyze the properties, including trustworthiness and continuity, of the above two projections.

Instructions for Problem 3: You do not have to actually compute the projections, unless you want to — just sketch out and describe what the projections would in your opinion look like. Indicate the corresponding points or items in the original data set and its projection.

Choose *two* of the problems 4–6 (only the first two answers read by the examiner will be graded):

4. *Essay.* Pre-attentive features in design and use of glyphs.

5. *Essay.* Tufte's theory of data graphics.

6. *Essay.* How to lay out a node-link diagram: principles and algorithms.