

T-61.5010 Information Visualization Examination

May 22nd, 2013

To pass the course you must also pass the term project (assignment). Results of this examination are valid for one year after the examination date. To get full points you must complete all of the problems 1-5. All of the problems have an equal weight. There are 50 points in this exam in total.

Answer in English. Please write clearly. Leave two squares from the right-hand side as a margin, in addition to the white area already there. No extra material (calculator, lecture notes etc.) is allowed. Please write your answers preferably using a ballpoint pen, not a pencil.

PLEASE ANSWER EACH QUESTION ON A DIFFERENT SHEET!

The results will be posted to the course Noppa home page. No other announcement will be made.

There are 5 (five) pages in this examination. You can keep this paper

1 Multiple choice questions

The following questions each have different proposed answers. Only one of them is correct. **You have to give your answer along with your confidence ("High" or "Low") for each answer.** Grading for each of these multiple choice questions is then:

- +2 if answer is right and confidence is high
- +1 if answer is right and confidence is low
- 0 if answer is missing
- -1 if answer is wrong and confidence is low
- -2 if answer is wrong and confidence is high

Write on your answer sheet the correct answer (A, B, C, D,), along with the confidence you have (High, Low) for that questions; e.g. "A, Low" is a proper way of answering a question. **Missing confidence for a question will be treated as "Low". Total score for this question is between 0 and 10 (TOTAL SCORE OF THE EXAM IS UP TO 50).**

Question 1.

In the context of pre-attentive processing,

- A) size and gray scale are integral features which are perceived independent of each other
- B) size and gray scale are integral features which are perceived holistically
- C) size and gray scale are separable features which are perceived independent of each other
- D) width and height are separable features which are perceived holistically
- E) width and height are separable features which are perceived independent of each other
- F) width and height are integral features which are perceived independent of each other

Question 2.

To improve the data-ink ratio of data graphic, one could:

- A) Add data to the plot;
- B) Remove data from the plot;
- C) Erase redundant data-ink;
- D) Increase the amount of non-data-ink;
- E) Perform all of the above.

*Ink for data
graphic / Ink*

LF = $\frac{\text{effect on graphic}}{\text{effect on data}}$

Question 3.

Narrative graphics of space and time:

- A) Display sequences of data-maps as they evolve in time;
- B) Enhance the explanatory power of time-series displays by adding spatial dimensions;
- C) Replace latitude-longitude coordinates of data-maps with more abstract time measures;
- ~~D) Review the graphical practice and excellence of the last two centuries;~~
- ~~E) Enhance the story-telling power of a display by equalising both the spatial and the temporal Lie-factor.~~

Question 4.

Structure-based Object Recognition theories:

- A) Propose that we recognise an object by matching the visual image with a snapshot stored in memory;
- B) Propose that we recognise an object by analysing its primitive forms and the relationships between them;
- C) Propose that we recognise an object from a hierarchical graph where the root is the canonical silhouette and the leaves are the geons;
- D) Propose that we recognise an object by distinguishing different textures in a rapid serial visual presentation (RSVP);
- E) None of the above is correct.

Question 5.

Consider applying PCA (Principal Component Analysis) to the data in this figure (Figure 1, on the next page). Which of the four lines are the first and second Principal Components?

- A) The first principal component is line a; the second principal component cannot be computed for this data
- B) The first principal component is line c; the second principal component cannot be computed for this data
- C) The first principal component is line a and the second is line c
- D) The first principal component is line c and the second is line a
- E) The first principal component is line b and second is line d
- F) The first principal component is line d and second is line b

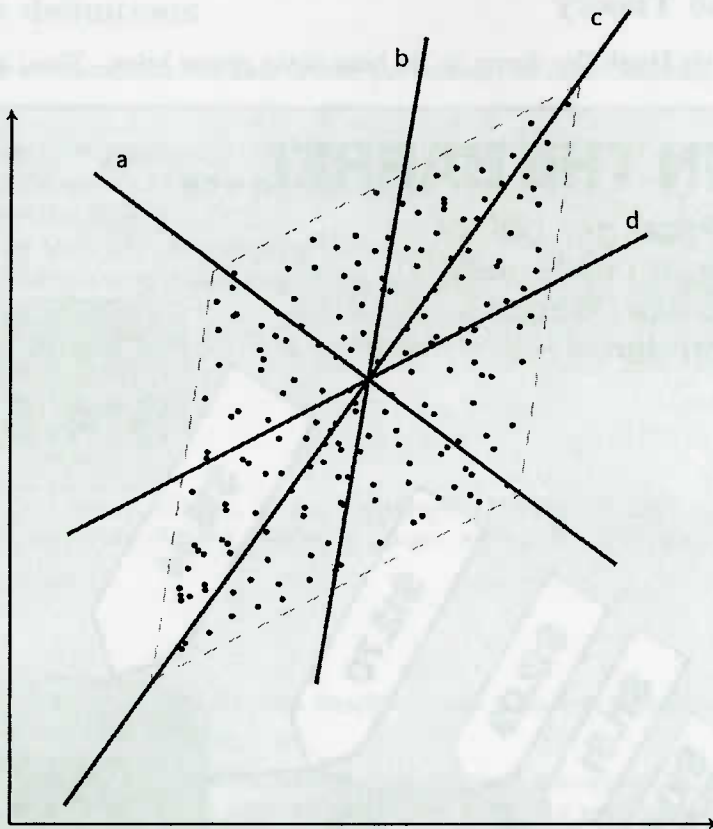
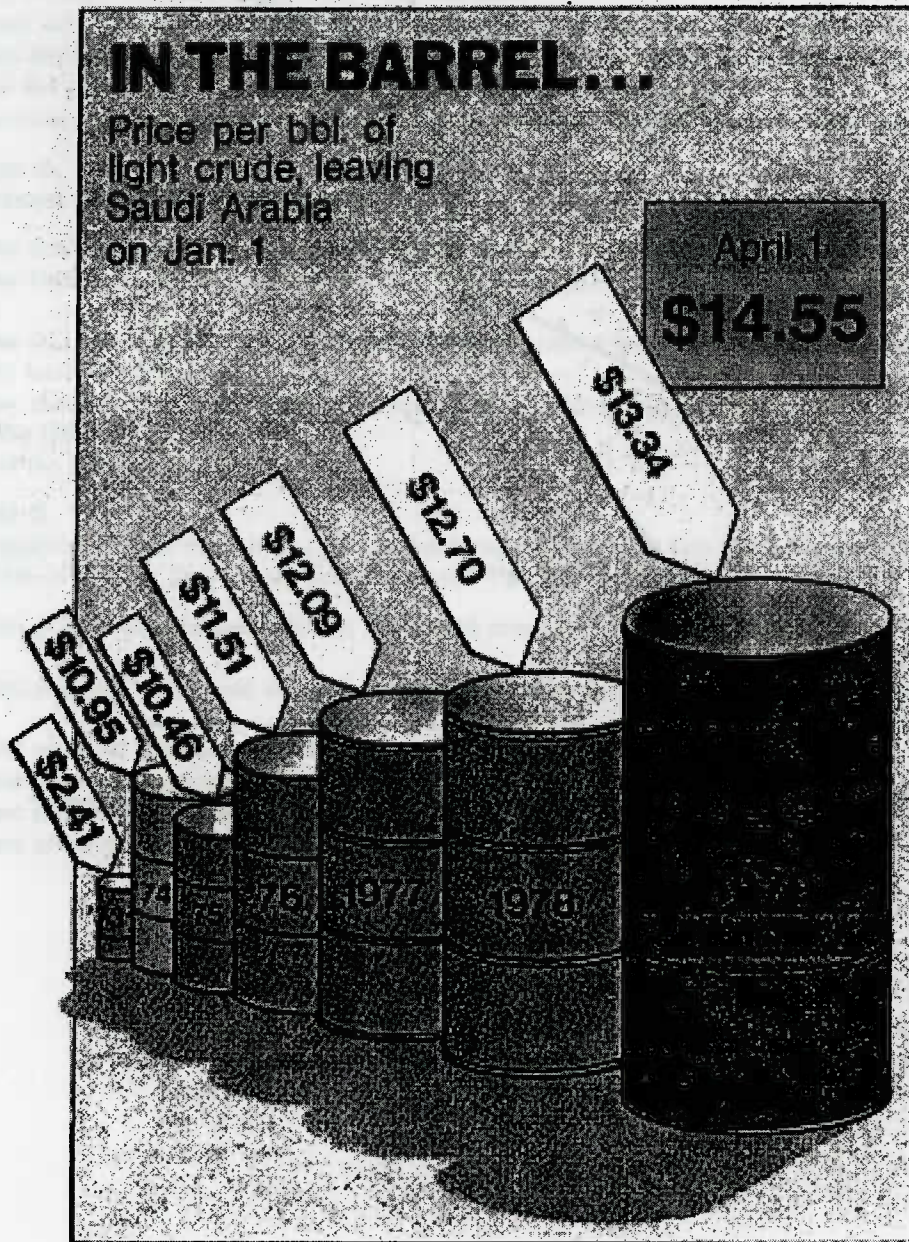


Figure 1: Which of the four lines are the first and second Principal Components?

2 Depth Cue Theory

Discuss and explain the Depth Cue theory, on the basis of the picture below - Time, April 9, 1979, 57



3 Concept definitions

Define and explain in a maximum of 3 lines (3 lines per concept) all of the following concepts:

- Data-ink
- Canonical view (within the context of object recognition)
- Geon (within the context of object recognition)
- Multidimensional scaling
- Self-Organizing Maps (for dimensionality reduction)

Instructions for the concept definitions: Write in full sentences. The “maximum 3 lines” should be interpreted as “can be fitted on 3 lines in a readable-size handwriting”. Concept definitions should give a precise meaning of a term where available, or mention the most important aspects of a broad concept if a precise definition is not available.

4 Essay 1

According to the visual attention theory, what are the ways or choices that allow information to pop-up (active from the low-level point of view). Maximum 2 pages, explain all the technical terms that are used in your essay.

5 Essay 2

The first principle in Tufte’s Theory of Data Graphics states “above all, show the data” Discuss its meaning in terms of Graphical Integrity.

Instructions for the essays: Write in full sentences and structure your answer in paragraphs. The limit of 2 pages should be interpreted as “2 pages written on every line in a readable-size handwriting” The essay should be written in a manner understandable to your fellow student (who would have the necessary prerequisite information to take this course, but has not taken it) who has asked you to tell him/her about the topic of the essay. **NOTE: Both essays are compulsory!**