Image Analysis
Exercise 7
23.10.2003

1. Answer the following questions considering *academic dissertations* in Finland based on Kolesnikov's dissertation. In case you were absent, then answer the information in general.

   - Who were the official parties in the dissertation?
   - What are their roles?
   - What kind of parts the dissertation was divided into?
   - What is the main structure of the printed thesis?
   - How the thesis relates to image analysis?
   - What was the most interesting questions the opponent made during the dissertation?

6, 12	8, 12	9, 8
1, 3	5, 6	9, 6
1, 1	4, 4	6, 4

2. Generate color palette (codebook) of four colors for the above image using *median cut algorithm*. If the maximum dimensions of any two segments are equal, the secondary criterion is the second (smaller) dimensions of the segments. In all other equal situations the pixels are segmented into the upper segment.

3. Apply *GLA* for the previous color palette (codebook).

4. Download and study the software in: ftp://cs.joensuu.fi/franti/softat/vq/cluster.zip. Then do the following: (1) Open the data set data_s1.ts and move the data set into the input area (bottom part in the main window). (2) Generate random solution for the data set using the default settings. (3) Move the resulting codebook also to the input area. (4) Generate partition for the solution using *Generate optimal partition* command. (5) Try to find the optimal solution using the 6 first commands in the *Process* menu. You can choose the commands you want and repeat them as many times as necessary. Visualize your steps by the *Image* command.

5. Suppose that we have $N=10.000$ data vectors (input colors), and we want to generate $M=256$ code vectors (output colors). Estimate how many distance calculations are needed in a single step of the *Randomized Local Search* that includes (a) one random swap, (b) local repartition with vector attraction and vector rejection phases, (c) two iterations of the GLA. Which step takes most of the calculations? What is the total number of operations?