Image Analysis, Assignment 5

In this assignment you will study computer vision and finish your work on the Optical Character Recognition system. The data for the assignments is on the course homepage: http://www.ctr.maths.lu.se/course/newimagean/2014/

The assignment is due on friday of study week 7. Make sure you answer all questions and provide complete solutions to the exercises. You may hand in hand-written solutions and/or printouts in the slot marked "bildanalys" on the 3rd floor of the mathematics building and/or as a pdf by mail to fman20@maths.lth.se. Write your name and the assignment number in the subject line. For each exercise, we have tried to make it clear what should be included in the report. In addition, all the code should be submitted as m-files by mail. Make sure that your matlab scripts are well commented and can be executed directly (that is, without loading any data, setting parameters etc. Such things should be done in the script).

You will have time to work with the assignments during the computer laboratory sessions and the exercise sessions. These sessions are intended to provide an opportunity for asking questions to the lecturer on things you have problems with or just to work with the assignment. During the laboratory sessions you should work on the exercises marked "Computer Exercise". The rest of the exercises are intended to provide hints and prepare you for the computer exercises. You are expected to have solved these before you go to the lab sessions. The report should be written individually, however you are encouraged to work together (in the lab session you might have to work in pairs). Keep in mind that everyone is responsible for their own report and should be able to explain all the solutions.

1   Computer Vision

Assume that the camera matrices for two projections are

$$P_1 = \begin{pmatrix} 3 & 2 & 1 & 0 \\ 2 & 2 & 2 & 0 \\ 2 & 1 & 2 & 1 \end{pmatrix}$$

and

$$P_2 = \begin{pmatrix} 1 & 2 & 2 & 3 \\ 1 & 1 & 0 & 2 \\ 3 & 1 & 2 & 0 \end{pmatrix} \quad .$$

The so called fundamental matrix is then

$$F = \begin{pmatrix} -4 & 2 & -6 \\ 3 & 0 & 7 \\ -6 & 9 & 1 \end{pmatrix} \quad .$$

The following three points are detected in image 1:

$$a_1 = (1, 2), \quad a_2 = (3, 2), \quad a_3 = (0, 3).$$

In image 2 the following three points are detected:

$$b_1 = (1, 1), \quad b_2 = (5, 1), \quad b_3 = (-1, -3).$$

Which points can be in correspondence?

For the report: Provide your calculations, your answer and your motivation.

2 OCR final

Download two new datasets 'home2' and 'home3'. Try to discuss with the other students of the course and 'copy' the best ideas on how to segment an image and what features to use. With copying here I mean that you should try to understand their ideas on features and segmentation and use those ideas that you think are best. When it comes to features, it might be a good idea to simply add all features that you stumble across. Then try to make as good a oct system as possible and benchmark them on the five datasets 'short1', 'short2', 'home1', 'home2' and 'home3'.

The best system wins a (small) prize. If there is a tie, all will receive a prize.

For the report: Provide a description on your improvements of the system. Provide the hitrates on the five datasets. Send the final ocr system by email.