EXERCISES FOR IMAGE PROCESSING I

PROBLEM SHEET 2

Due date: 29.10.15 before 12:00h

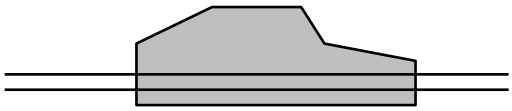
Topics: Image formation

Submission: Please send your solutions via email to seppke@informatik.uni-hamburg.de.

1 PHOTOMETRY & TV IMAGING 10 P.

a) Photometry
What conditions can cause the steps of a staircase to be invisible (homogeneous grey) in a camera image? Assume that the border area of the steps are outside the image. In your explanation, refer to the photometric laws of image formation.

b) TV Images
The images of a black-and-white (B/W) TV camera (PAL system) are digitized in the standard way (576 lines à 576 pixels, aspect ratio 3:4). The lines are recorded in interlaced mode, i.e. at first lines 1, 3, 5, ... , 575, and then lines 2, 4, 6, ... , 576. In a traffic scene, a car (length 5m) moves with 50 km/h parallel to the image plane. The camera optics depict the car with a length of 50 pixels.
What is the offset (in pixels) between the front end of the car in Line 200 and in Line 201?



2 COLOR PERCEPTION 10 P.

Achromatopsy is a form of color blindness where people can only distinguish dark and bright, but no colors. It is your task to produce a test image for achromatopic people. Generate an image with letters or numbers, which can be distinguished from the background by their colors but not by brightness. Proceed in two steps:

a) Generate a color image B1 with non-calibrated colors (i.e. arbitrary colors with different brightness values). Determine the brightness values of background and color areas.
b) Using B1 as input, generate a calibrated image B2 with equally bright background and color areas.

As solution please hand in:

- B1 and the brightness values of background and color areas
- B2 as a color image and greyvalue image
- Commented processing steps in Python