Lab – CCD camera

This lab is about using image sensor chips of the type: charged-coupled device (CCD). The lab intends to have two exercises running in parallel, therefore two groups will be formed with a maximum of 4 students within each group.

Exercise 1: Pixel size, magnification and resolution

In this exercise the goal is to identify magnification, resolution and pixel size of a given vision system.

The CCD camera is equipped with a lens with fixed aperture (Rodenstock, Macro-CCD-lens x0.5). With a CCD camera an image is recorded of an object with a given size (use a standard ruler). The program named Malcolm Jr is used to digitize the analogue video signal from the color type SONY XC-333P camera.

How many pixels on the saved image corresponds to 1 mm in the image plane both vertically and horizontally?

According to the measurement what is the approximate element size of the CCD-chip?

Exercise 2: Colour images

In the RGB model, each colour appears in its primary spectral components of red, green and blue. The goal is to generate a RGB-image from three different black and white images taken with three different interference filters. The filters are blue (400 nm), green (500 nm) and red (640 nm). Analyze the images in Matlab to find the right composition between the color components.

In what way is the calibration affected by the illumination source (spectra)?

To grab images use the Measurement & Automation Explorer program. The images can be saved in .tif format and then used in Matlab. There is an example program for reading and displaying images in Matlab, createRGB.m. Another important function in Matlab is impixel which returns the red, green, and blue color values of specified image pixels.

Lab-rapport

Write a short lab report 1-2 A4 pages per group that describes the experiments and presents the results with your own reflections and comments.

Email the report to jens.lundstrom@hh.se