

Lab Course Kinect Programming for Computer Vision

Assignment 3: Camera Calibration

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1. Extend your skeleton Kinect application to read and display raw infrared (IR) images from the kinect. Hint: Extracting the IR image is analogous to the depth image, except you will need an IRGenerator and a corresponding entry in your XML file. Note that you cannot obtain RGB and IR images at the same time. When adding an IRGenerator to the XML file, you have to remove the generator for the RGB image.
2. Extend your skeleton Kinect application to store images (IR and RGB) as bitmap files. Hint: you can use libraries found on the web for saving your images, e.g. EasyBMP¹ that is very easy to include in your project.
3. Familiarize yourself with the Matlab Camera Calibration Toolbox². Read the introduction and the examples (especially example 1 for single camera calibration and example 5 for stereo calibration). Finally, download the toolbox to your computer (if you have a Matlab license) or to one of the student lab computers.
4. Perform a stereo calibration on your Kinect between the RGB and the IR cameras. Follow the examples on the Matlab Toolbox website. The main steps are as follows:
 - a. Print a calibration pattern (e.g. the one included with the Matlab Toolbox) in a suitable format, glue it on a piece of rigid cardboard.
 - b. Capture a series of images of the calibration pattern in different orientations. Make sure you have one RGB and one IR image for every orientation of the calibration pattern.
 - c. Calibrate the RGB camera using the Matlab Toolbox for single camera calibration and the RGB images you captured.
 - d. Calibrate the IR camera using the Matlab Toolbox for single camera calibration and the IR images you captured.
 - e. Run the stereo calibration from the Matlab Toolbox on the results of the single camera calibrations and your captured images.
 - f. Store the intrinsic and extrinsic parameters retrieved by the Toolbox.

In the following assignment 4, you will be asked to implement a 3D point-cloud visualization for your depth data where each 3D point is assigned the color from the corresponding pixel in the RGB image. For this assignment, you will need the intrinsic and extrinsic parameters that you obtain from stereo calibration.

¹ <http://easybmp.sourceforge.net/>

² http://www.vision.caltech.edu/bouguetj/calib_doc/