Assignment A3: Camera Calibration

CS 5320/6320
Spring 2016

Assigned: 11 January 2016

Due: 10 February 2016

For this problem, handin a lab report A3.pdf (include name, date, assignment and class number in pdf) which develops and studies the camera calibration process. The assignment has two parts: Part I and Part II. Part I is to be done by all students (CS5320 and CS6320) while Part II is just for CS6320.

Part I: Develop a calibration function (header is given below) which takes a corresponding set of image points and world points and produces both the intrinsic (α, β, θ, x_0, y_0) and extrinsic (R and t) calibration parameters using the method described in the text. Each student is to demonstrate the result on a specific image-world point set; these pairs can be found in .mat files provided in Canvas. You should study the sensitivity of calibration to noise in the image locations (i.e., add Gaussian noise to the image locations).

Part II: Apply your calibration function to the image [redacted]. You will need to develop and describe a method to extract the points from the image.

You should handin the report A3.pdf as well as the source code developed in the study. The code should conform to the style requested in the class materials.

In addition, please turn in a hardcopy of the report in class before the start of class on February 10, 2016.

Write a lab report in the format (please do not deviate from this format!) described in the course materials.

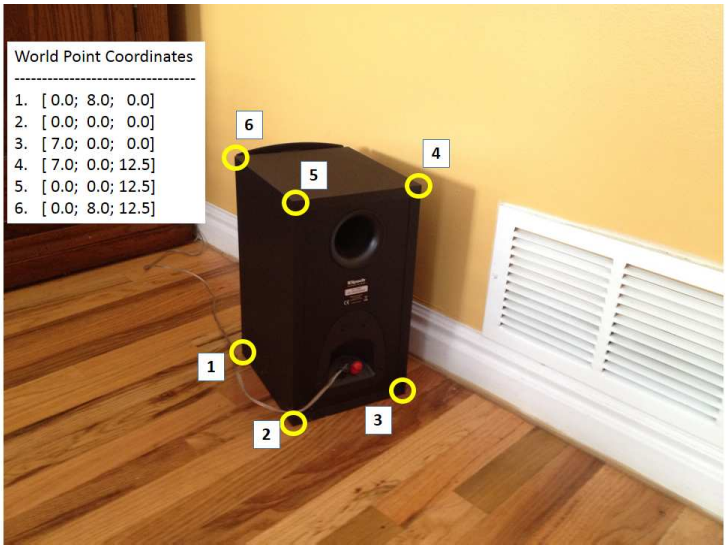

Figure 1: Calibration Image with World Point Coordinates.

```
function [alpha,beta,theta,x0,y0,R,t] = CS5320_calibrate(im,P)
% CS5320_calibrate - determine camera parameters
% On input:
%     im (3xk array): image points (homogeneous coords)
%      im(1,:): x coords;          im(2,:): y coords
%     P (4xk array): world coordinates (homogeneous coords)
%       P(1,:): x coords; P(2,:): y coords;  P(3,:): z coords
% On output:
%     alpha (float): scale parameter in x
%     beta (float): scale parameter in y
%     theta (float): camera skew angle
%     x0 (float): x coord of optical center
%     y0 (float): y coord of optical center
%     R (3x3 array): rotation matrix
%     t (3x1 vector): translation vector
% Call:
%     [alpha,beta,theta,x0,y0,R,t] = CS5320_calibrate(im,cal2);
% Author:
%     <Your Name>
%     UU
%     Spring 2016
```