CS294-6 **Fall 2006**

Problem Set #4

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Issued: October 11 **Due: November 1 in class**

Primary Reading: Chapter 6 of MaSKS.

Problems:

1. **Exercise 6.4** (10 points)
2. **Exercise 6.6** (10 points)
3. **Programming Exercise 1: Camera calibration with known object.** (15 points)
   Download the file hw4-dataset-1.mat from the course website. The file contains 3-D coordinates X of n points in the world coordinate frame and their image (pixel) coordinates in x. Write a MATLAB function, which computes the relative displacement $(R, T) \in SE(3)$ between the world coordinate frame and the camera frame and the intrinsic camera parameter matrix $K \in SL(3)$, used to generate this data set. Hand in the result for this particular data set, as well as a copy of the MATLAB function used to compute it. The function can be called as the follows:
   `[R,T,K]=calibration2Dto3D(X,x)`
4. **Programming Exercise 2: Projective reconstruction** (15 points)
   Download the file hw4-dataset-2.mat from the course website. The file contains image coordinates of n points in two views related by a rigid-body transformation and unknown camera intrinsic parameters K. Write a function for computing the fundamental matrix F relating the two views, its associated canonical decomposition R_c, T_c, and the projective structure X_p. Hand in the printout of the MATLAB code for two functions, values of computed F, R_c, T_c, and the plot of the final projective reconstruction. The function can be called as follows:
   `[F,Rc,Tc]=points2F(x1,x2)`
   `[Xp]=points2Xp(x1,x2,Rc,Tc)`