

HCI/ComS 575X: Computational Perception
Homework 4

Out: Wed Apr 1, 2009 (April Fools' day)

Due: Wed Apr 15, 2009 (Tax day)

Submission format: post code and videos on your section of the class wiki page.

Part 1: Track a hockey puck

In this problem the task is to use a Kalman filter or a Particle filter to track a hockey puck in the presence of sensor noise and occlusions (the choice of filter is up to you and your grade will not depend on your choice). Your program should modify an input video as follows (see Fig. 1): 1) Draw a circle to represent the center position of the puck as it was measured by your program; 2) Draw a circle to represent the filter predicted position of the puck.

Solve this problem by modifying videos with OpenCV or image sequences with Matlab. Two test videos were posted on the wiki. One has an occlusion (see Fig. 1) and one does not. Your program should work with both. See the posted sample video for an example.



Figure 1: Two screenshots taken from a sample output video. The white circles denote measured positions. The black circles denote Kalman filter predicted positions. In one of the test videos the puck is occluded as it passes under a black bar.

Part 2: Theory

In class we derived the Kalman filter equations for the 1D case. This problem asks you to derive the Kalman filter equations in their general form using matrix notation.

That is it. Good luck!