CAP5416: Assignment #4, Due Date: Dec. 2, 2016

Make sure that you writing is legible, or else, type your answers using your favourite text formatter.

1. If points $\mathbf{x}$ in the left camera and $\mathbf{x}'$ in the right camera correspond to each other in a stereo camera system, what is the equation of the epipolar line in the right camera for any point $\mathbf{x}$ in the left camera in terms of the Fundamental matrix F? Also, show that $\mathbf{x}$ and $\mathbf{x}'$ are corresponding points *if and only if* the condition $\mathbf{x}'F\mathbf{x} = 0$ is satisfied. How many degrees of freedom does the F matrix (which is a (3,3) matrix) have?

2. Problem 10-11 on page 238 of the text book by BKP Horn.

3. Problem 11-10 (a) of the text book by BKP Horn.

4. Problem 11-12 (a) and (b) of the text book by BKP Horn.

5. In optical flow, if you assume the flow to be a constant over a patch, with the constraint that pixels far from the center of the patch are weighted less than those closer to it, derive a closed form expression for this weighted flow. Explicitly set up the linear system for the weighted flow i.e., show the entries of the matrix in the linear system and the right hand side vector in the linear system. Assume the patch size to be (n, n) and the weight matrix to be W.