Practice questions - camera calibration, homographies, stereo, etc.

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1. When performing camera calibration, we set up a system of equations $A\mathbf{p} = 0$ in the parameters $\mathbf{p}$ that define the camera projection matrix. We then tried to minimize $\|A\mathbf{p}\|$ subject to $\|\mathbf{p}\| = 1$.

   (a) Why do we constrain $\|\mathbf{p}\| = 1$?

   (b) How many entries does $\mathbf{p}$ have?

   (c) What is the minimum number of equations we need?

   (d) What is the minimum number of 3D-2D correspondences we need?

2. What do the epipolar lines look like for rectified cameras (cameras with viewing directions parallel to each other that differ only by a translation along X)?

3. Can you define a notion of disparity when the cameras with parallel viewing directions differ by a translation not along X, but in an arbitrary direction in the XY plane? What do the epipolar lines look like in this case?

4. Consider using RANSAC to fit lines to points. What happens when there is more than one good fit (dotted lines in the figure)? How can you change RANSAC so that it can output multiple lines?