

## Assignment 2 (100 points)

### Homography and Camera Calibration

**Due 4/19 (Thu) 9:30AM**

For the following two problems, describe every step of your solution in detail and implement the algorithm to obtain the solution. If your solution has errors, discuss the reasons.

1. **(Geometry: 30 points)** Solve the following two subproblems.
  - A. Prove that  $(\mathbf{a} \times \mathbf{b}) \times (\mathbf{a} \times \mathbf{c}) = \alpha \cdot \mathbf{a}$ , where  $\alpha$  is a constant. *Hint:* A geometrical interpretation makes this problem very easy!
  - B. Prove that a 3D point  $\mathbf{x}$  can be defined by the intersection of a 3D plane and a 3D line.
2. **(Homography: 70 points)** Compute the homography matrix for the ground plane of the two images, view1.png and view2.png. Find correspondence points on the ground plane between the two views using corners manually, and improve the locations of the corners by local search with “corneriness” measure. After computing the homography matrix, stitch the two images (ground plane part only) and show the result from the top view. Describe what methods you used to reduce the error to compute the homography matrix.



view1.png



view2.png

**Submission:** Submit your source code and result to class afs submission directory using ftp. You may hand in your report in hard or soft copy.