

Lab 08: Camera Calibration and Pose

Due: Oct 31, 6:00 pm



Work in Teams of Size Two

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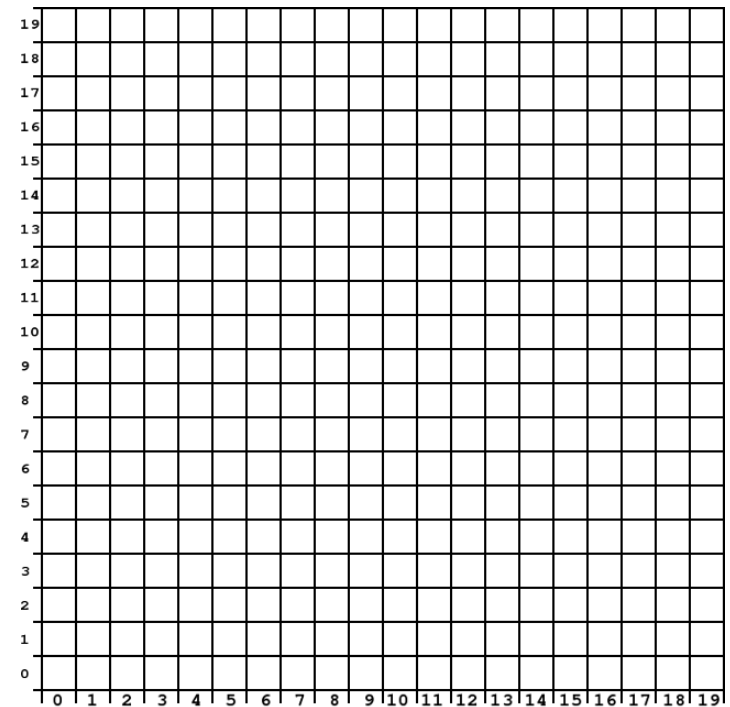
► Assignments

- David and Felix
- Nebiyou and Nancy
- Adolphe and Nchima
- Felicien and Aimbale
- John and Cesaire

Calibration and Pose

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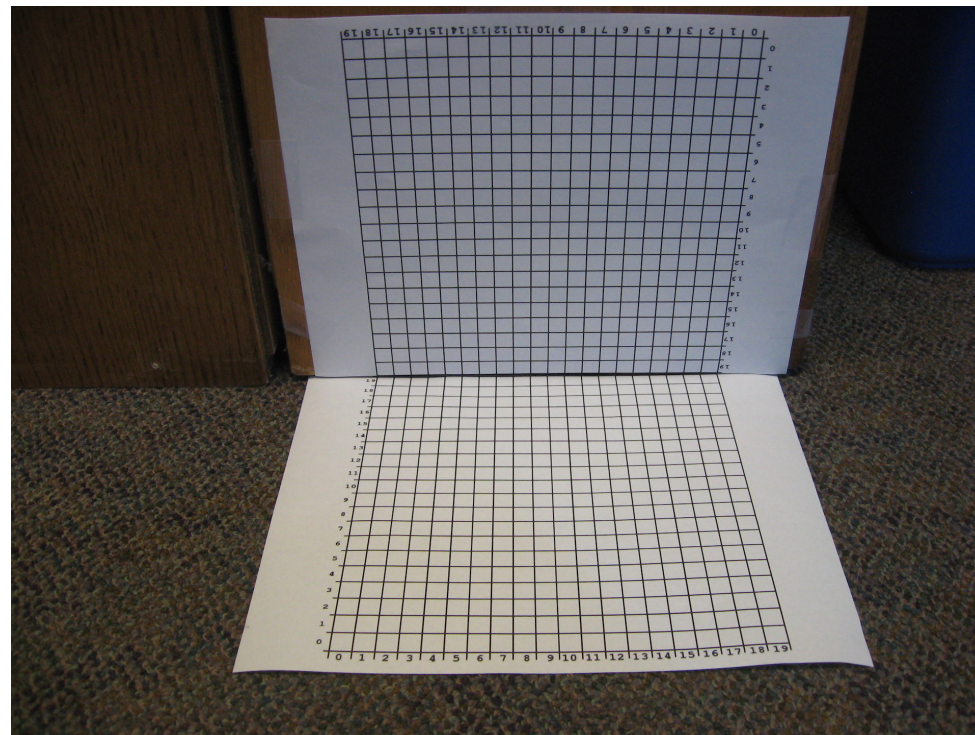
- ▶ **Position your camera calibration targets at a known location in the world**
 - In other words, define a world origin
 - Make sure you can derive the world locations of the grid crossing on your calibration target
 - ✓ You may assume that the box edges are 1 cm long each
 - Make sure your two targets are not coplanar (the calibration needs 3-D info to be robust)



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- ▶ Sample picture of calibration targets



Calibration and Pose cont.

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► Take four pictures from known world locations

- Picture 1: Camera should be level with world XY plane and point along one of the world axes as parallel as possible
- Picture 2: Camera should be level with world XY plane and point along a line parallel to one of the world axes but not directly along the world axis (this is a translation in 1 coordinate only)
- Picture 3: Camera should be level with world XY plane, its center should be on a world axis, but it should be rotated by 45 degrees
- Picture 4: Camera should be in position used for picture 2 but tilted up or down by 45 degrees.

Calibration and Pose cont.

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- ▶ **Write a script to do the camera calibration**
 - You can probably modify the scripts you wrote for perspective distortion
 - Use the pseudo-inverse function from numpy
- ▶ **Collect a total of 30 matching points for each picture**
- ▶ **Compute the camera calibration and pose using just 10 points (make sure some are in each plane) and then using all 30 points**
- ▶ **Include in your report**
 - The camera calibration matrix you computed for each of your four pictures using 10 points and 30 points
 - The composite rotation matrices you obtained
 - The translation vectors

Calibration and Pose cont.

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► Analyze your results

- Do the poses you obtained correspond with what you expected?
- Was your camera calibration matrix consistent?
 - ✓ Perhaps " f " varied due to lighting or could you control it with your camera?
- Did the numpy RQ factorization ever give a K_{33} value that was negative?
- Was there a difference between using 10 points and 30 points?