Answers to questions in

Lab 3: Image Matching & 3D Reconstruction

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Program: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Instructions**: Complete the lab according to the instructions in the notes and respond to the questions stated below. Keep the answers short and focus on what is essential. Illustrate with figures only when explicitly requested.

Good luck!

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**Question 1**: To compute a homography, what are the computational steps involved? Why do you think we are interested in finding the smallest eigenvalue, but not in the other eigenvalues?

Answers:

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**Question 2**: How much image noise can you typically have before the error becomes significant? Is it preferable to use a few or many feature points when creating *A*?

Answers:

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**Question 3**: How many outliers can you typically have before the errors start to increase too much? Given what you try to optimize, how can the sensitivity to outliers be explained?

Answers:

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**Question 4**: If you have num = 100 points in total and noutliers = 50 outliers, how many iterations do you typically have to do until you find a solution with a small enough homography error?

Answers:

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**Question 5**: Why does RANSAC make the homography estimation so much more robust compared to the original implementation? Try to come up with a short, but easily understood, explanation.

Answers:

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**Question 6**: What do you observe in the results? Do you get an overlap similar to what is shown in Fig. 2? Can you somehow exploit the results even in regions for which there is no overlap?

Answers:

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**Question 7**: What are the similarities and differences between the code you wrote for estimating a fundamental matrix and a homography?

Answers:

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**Question 8**: If you have 100 generated feature matches, how many outliers can you typically have before you get significant errors in the estimated fundamental matrices? Can you see a difference with normalization versus without?

Answers:

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**Question 9**: If you have num = 100 points in total and noutliers = 50 outliers, how many iterations do you need until you find a solution with a small enough error in the estimated fundamental matrix? What is the difference compared to when you tried to find homographies?

Answers:

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**Question 10**: How large a fraction of all original feature pairs seems to be classified as inliers? Do you see any obvious mismatch being classified as inlier and thus not removed? How much do the results depend on which pair of images you tried?

Answers:

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**Question 11**: If we assume the angle between two books in books1.jpg is , is it possible to tell approximately how large the real focal length is by varying the focal length used for reconstruction?

Answers:

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**Question 12**: How sensitive is the reconstruction to the choice of images and the characteristics of the 3D scene? Can it handle scenes primarily consisting of a flat surface, such as the scenes for which we earlier used homographies?

Answers:

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**Question 13**: What do you suggest one could do to further improve the reconstructions? Could we somehow build on what has been done so far in the lab to get considerably better results?

Answers:

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