Report for Assignment-4 (Image Correspondence)

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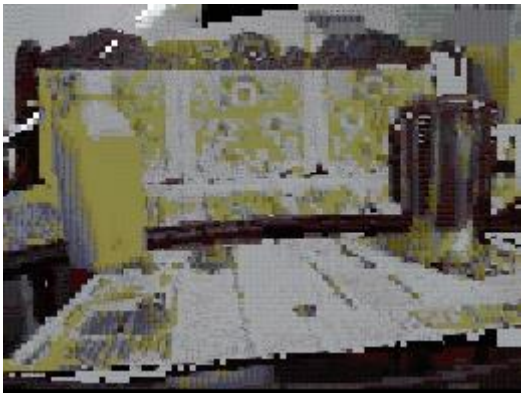
Algorithm Followed to develop the Code:

- The Code intake the images in the pair set entered by the user.
- The Fundamental Matrix is estimated using the RANSAC Algorithm (using both inbuilt and from scratch function) and displayed.
- The observation here is that although the fundamental matrices for both functions are fairly dissimilar, we can see that patch reconstruction is pretty well using from scratch function. Although, the inbuilt function is using the default parameters for param1 and param2 arguments.
- The no. of iterations here taken are limited to 10,000 but the original value to get 0.99 of probability exceeds 120*10^4 iterations. And the probability for being inliers is taken as 0.2.
- After getting the fundamental matrix the patch size for reconstruction is chosen by the user from 3 or 5, for better results. (Here all the results are obtained using 3).
- The blank canvas of size of ref image is defined and using fundamental matrix for each co-ordinate in ref image the epipolar line is obtained.
- The co-ordinates corresponding to the similar patch in reference image is obtained by fixing the co-ordinate in one axis and calculating the other using line equation.
- The similarity is checked using L2 norm (any other method like cosine similarity can also be used)
- After getting the source patch with least distance the patch is placed at the reference co-ordinate in canvas defined.

Results for the five image sets used in the Assignment:

Scene-1



Scene-2

Scene-3

Scene-4

Scene-5

Note:

- Here the Scene-1 is obtained using the 3 channelled (i.e RGB) reference and source patch and at regular size as of image.
- Due to the time constraint, the size is reduced in remaining scenes and Grayscale patches are used.
- In Scene-5, the patch size of 5 is used.
- The similarity metric of Cosine similarity is also used on one of the dataset for my understanding but not mentioned here, but the results were more of similar.

Image Sources:

- Scene-1 & 3 are provided by Rakshita Rao (M.tech Electrical, IIT Gandhinagar).
- Scene-2, 4 & 5 are provided by Karthik Gudiboina (M.tech Electrical, IIT Gandhinagar).

References:

- **For Fundamental Matrix:** Class Notes
- **For RANSAC Algorithm:** Class Notes

  >> https://engineering.purdue.edu/kak/courses-i-teach/ECE661.08/solution/hw4_s1.pdf

- **For inbuilt Fundamental Matrix Function:** Open CV Documentation

  >> https://docs.opencv.org/2.4/modules/calib3d/doc/camera_calibration_and_3d_reconstruction.html#Mat%20findFundamentalMat(InputArray%20points1,%20InputArray%20points2,%20int%20method,%20double%20param1,%20double%20param2,%20OutputArray%20mask)