CSE473/573 Summer 2018 - Programming Assignment 2

Due Date: 11th July 2018

June 20, 2018

1 Stereo Vision

You are given with image dataset which has three views of the same scene and ground truth disparities of two views. In this project you will implement disparity estimation from rectified images using basic block matching and dynamic programming. You will also implement View Synthesis which is an interesting application of Stereo Vision.

Figure 1: disp1.png and disp5.png are the ground truth disparities of view1 and view5 images

Use the basic block matching technique from class lectures to estimate disparity between view1 and view 5 of the image data. You will generate two disparity maps, one for view1 and the other for view5

1.1 Disparity estimation using block matching - 20%

Try different block sizes (3x3 and 9x9) and generate disparity maps. Report the estimated disparity map and the calculated MSE (Mean Squared Error) with respect to the given ground truth disparity maps

1.2 Consistency check - Bonus - 10%

Eliminate the noisy disparity estimates using consistency checking – Due to occlusion, we have missing regions in the stereo image pair. This will result in random matches, since a correct match does not exist. After obtaining disparity maps for both the images, use back-projection to do a consistency check. Mark the inconsistent pixel with the value Zero disparity and estimate the MSE error with ground truth. Below is a sample image of disparity map estimated using block matching, without consistency check.
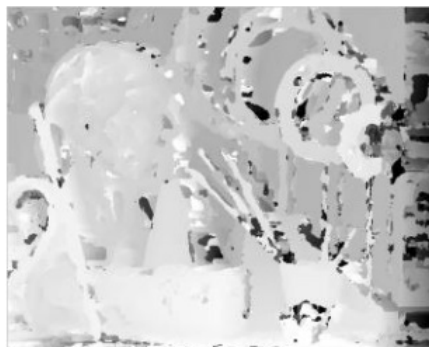
1.3 Disparity estimation using Dynamic Programming - 20%

Estimate disparity using Dynamic Programming by following the pseudocode from section 2.1
http://www.cs.umd.edu/~djacobs/CMSC426/Slides/stereo_algo.pdf

1.4 View Synthesis- 20%

View3 is what you would see if you place a camera exactly at the midpoint of the baseline of cameras that captured view1 and view5. Your task is to generate view3 by using view1 and view5 images and their respective ground truth disparity maps. The synthesized view will have holes which can be marked as Zero. Below is the snapshot of the expected result

2 Image Segmentation

Perform mean-shift segmentation on the image above. We use the simplest way to perform mean-shift as suggested by the reference textbook (Section 5.3.2) - Start a separate mean-shift mode estimate y at every input point x_i and to iterate for a fixed number of steps or until the mean-shift magnitude is below a threshold. - 30%