CS-4186
Computer Vision & Image Processing

Assignment-2
Disparity Maps

Table of Contents

Name: Avi Malhotra
Student ID: 55773896

Results

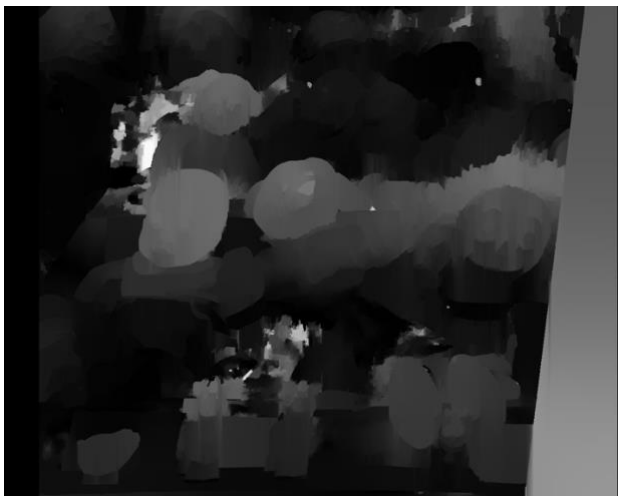
Art Stereo Pair

PSNR: 56.049
Disparity Map:

Note: The rectified images are "Art_left_rectified.jpg" and "Art_right_rectified.jpg"

Dolls Stereo Pair

PSNR: 55.777
Disparity Map:



Note: The rectified images are "Dolls_left_rectified.jpg" and "Dolls_right_rectified.jpg"

Reindeer Stereo Pair

PSNR: 55.482
Disparity Map:

Note: Rectified images are "Reindeer_left_rectified.jpg" and "Reindeer_right_rectified.jpg"

Method Novelty and Code Explanation

Initially, regardless of the alternation in the parameters of the "StereoBM" method, I was unable to get a PSNR value larger than 10. Even after using the alternative "StereoSGBM" method, I could only get a PSNR value of ~13, even though the latter method uses semi-global block-matching and forces disparity on neighboring blocks. Not to forget, the more efficient method is also more computationally expensive than the former.

Using post-processing methods, I attained a tremendous jump in my PSNR values (from 13 to 50). Specifically, I utilized the Weighted Least Squares (WLS) filter and smoothened the disparity map without sacrificing any edge-related information. Moreover, since the weights of this filter are gradient-dependent, I was able to preserve the local textures as well by experimenting with the WLS filter's sigma and lambda values. It is worth mentioning that the "ximgproc" class is equally as crucial as its subsequently chained "createDisparityWLSFilter" method as the class is an algorithm for contour fitting (a methodology that matches two closed curves using Fourier descriptions) !

Finally, the contents of the "stereo_rectification.py" file are entirely optional; they did not increase (effect of < 1) the PSNR values, which, suffice it to say, are regardless impressive. Nonetheless, I explored these stereo concepts solely out of my curiosity. I applied numerous concepts learned in class and from the previous assignment to find the fundamental matrix and do some preprocessing like drawing the epipolar lines and warping the images.