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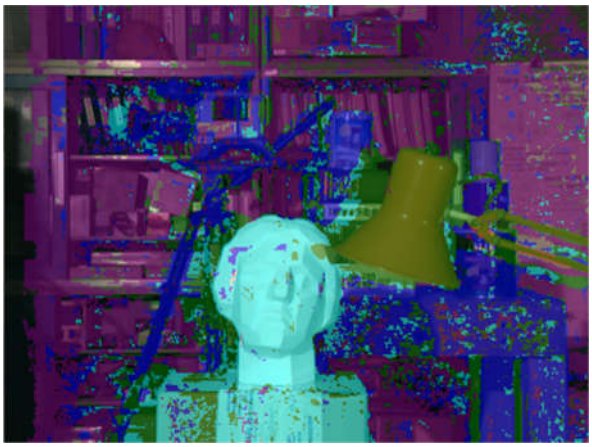
Image Analysis 4487
Professor Boykov

Window-Based Stereo

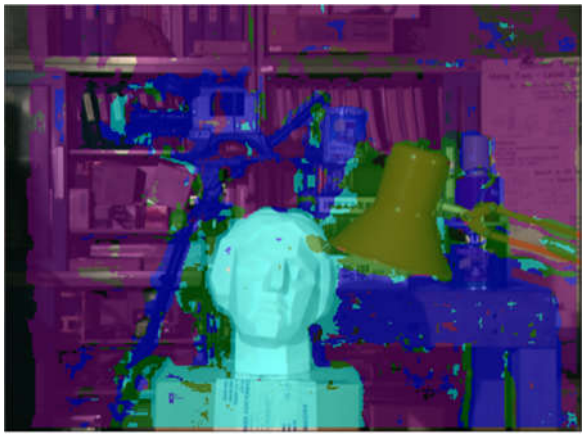
When implementing window-based stereo, the most important variable to consider is the window size. A larger window will generally do a better job of segmenting the areas, it is blurry around objects boundaries. In contrast, a smaller window will do a better job of detecting boundaries but will struggle with textured areas. We compare the tsubaka sample image with differing window sizes. Note that a window size of *x* means the window is in fact 2*x* + 1 pixels, since the window extends for *x* pixels in each direction (plus the middle pixel). All the images are taken with l = 4.

Window size of 0

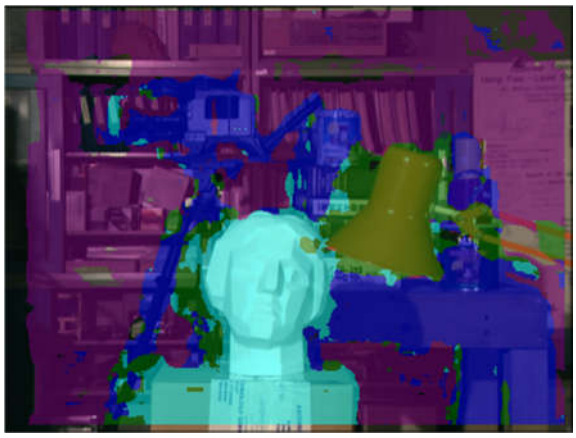


Window size of 1

The difference is immediately clear. We see much more noise in the left image, and the segmentation is much easier to read on the right.



Window size of 3



Window size of 5

These images are much more similar to one another, and both are acceptable segmentations, but the w = 3 case still shows unwanted noise in some of the background objects. In the w=5 scenario, we see much less noise, and the blurriness isn't terribly apparent since the image is large enough that a 5 pixel blur isn't significant.

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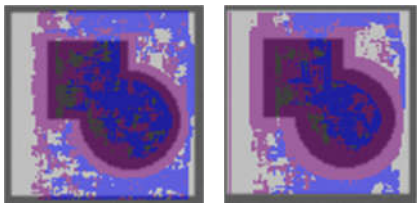
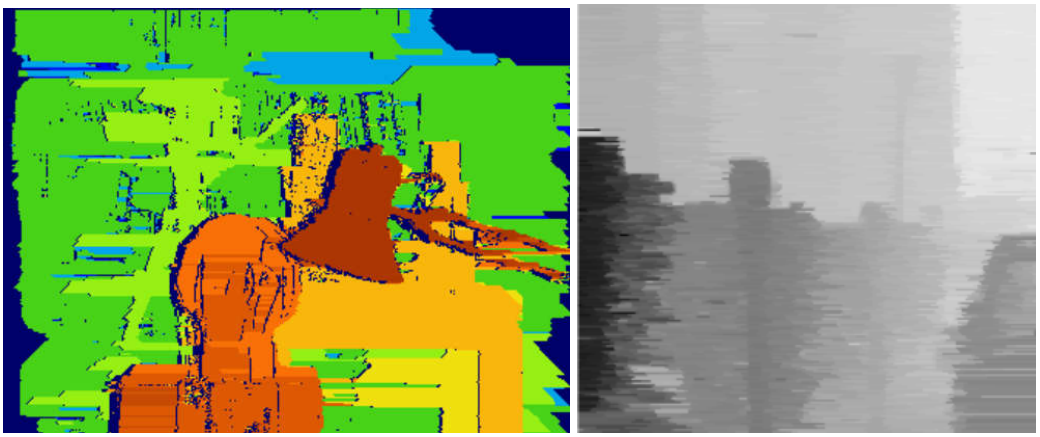


w=3 w=5

In the art image, we can clearly see the effect of the larger window. The larger areas around the edges of the object shows the blurring effect when compared to the smaller window.

Scanline Stereo

I was unfortunately not able to get my scanline to work properly, so the code will do nothing since most of it is commented out. However, we can still analyze some sample images.



These examples demonstrate the biggest problem with the scanline approach: since each line is matched only within itself, streaking artifacts will occur in the output image. It does a good job matching each line, but the streaks make this method not preferable since each scan line is completely unaware of the others. It is, however, considerably better at segmenting objects than the window method.

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Global Stereo

In the global scenario, using minimum-cut energy optimization, the results are hard to interpret. We see a “ghost” of each object to its left. Since nothing is really properly segmented, I think it is safe to assume that there is a mistake in my implementation of this method. It’s hard to determine what might be wrong exactly, but the result should be nicely segmented, like the example below. We see that it is very similar to the scanline method, but manages to take into account all of the scan lines in the picture at once, rather than optimizing each line individually. This eliminates the problematic streaks.