ECE6360

Computer Vision and Image Reconstruction

Project2

R11469014

Tsung-Sheng Huang

Overview

In this project, we are going to calculate the disparity of two images. We keep one of the image fixed (IL) and shift the other one (IR). Calculate the difference for each shifts by using SSD, SAD and NCC. And the output is the index of the minimum difference value.

Results and Comment

Figure 1 to Figure 3 are the result of the disparity maps using SSD, SAD and NCC respectively.

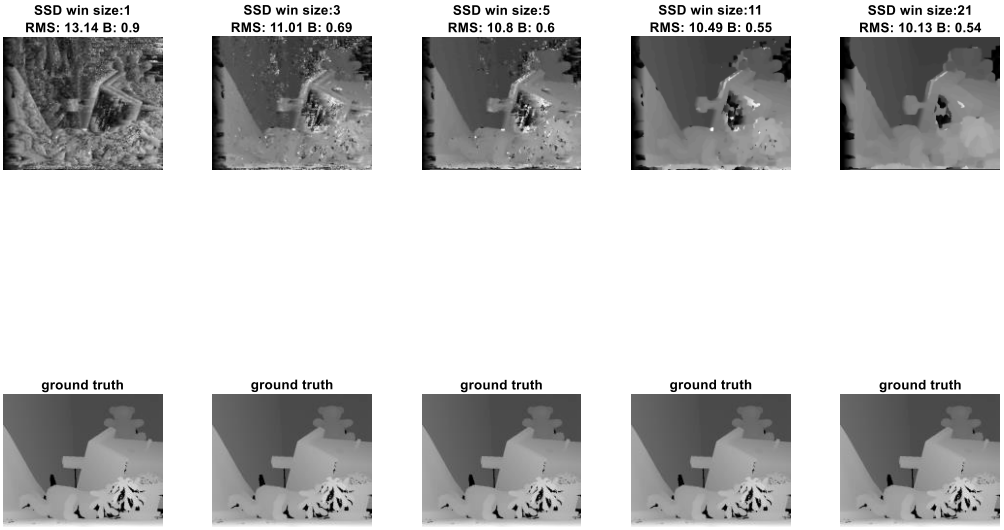

Figure 1: Disparity map using SSD with different window sizes

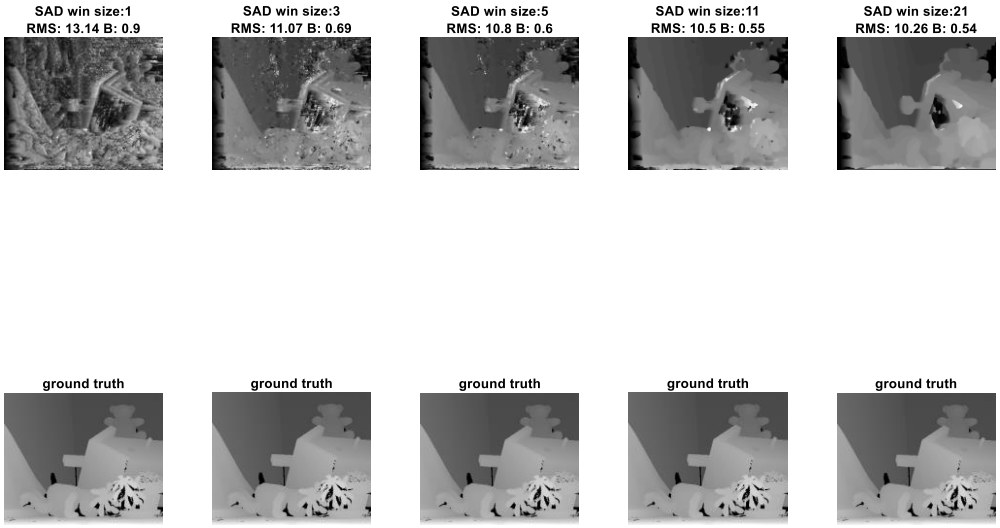

Figure 2: Disparity map using SAD with different window sizes

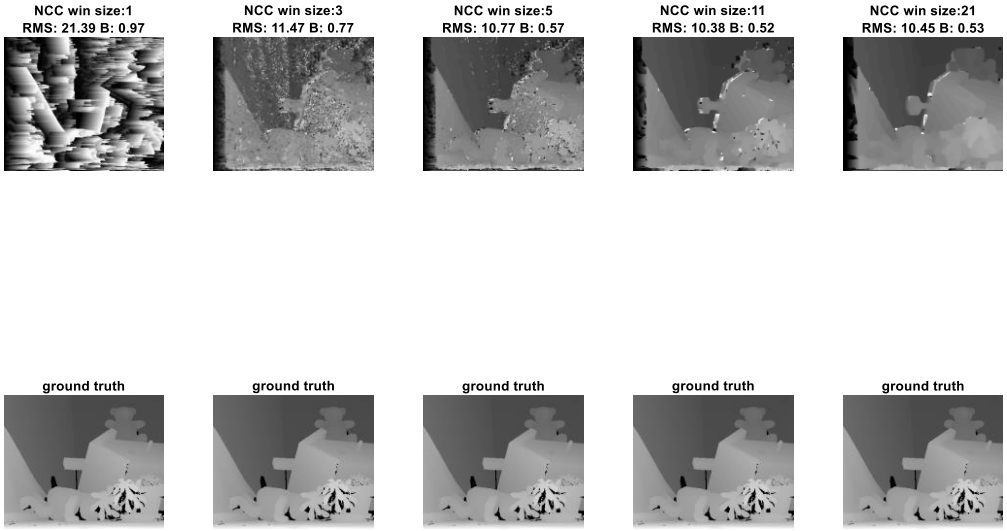

Figure 3: Disparity map using NCC with different window sizes

Images above are from Teddy dataset. We can observe that when we increased the window size, the disparity map will become smoother and have lesser noise in it. Also, we can observe that the part of disparity map will be darker than the part of objects. For example, the wall (background) and the house (objects). Moreover, we can see that the part of the shadow will be black, which means it's the unknown disparity.

For validation part, we can see that for SSD and SAD, the error rate decreases as the window size increases, but for NCC, when window size is equal to 11, it will give us the best error rate. Also, we can see that the black part which is located at the left side of the bear disappear when we the window size equates to 21.

Comparison with built-in function

For this part, we select Teddy dataset, Cones dataset and Art dataset. Figure 4 to 6 show the comparison between built-in function (SAD) and my own function using three methods (maxDisp=64, window size= 15).

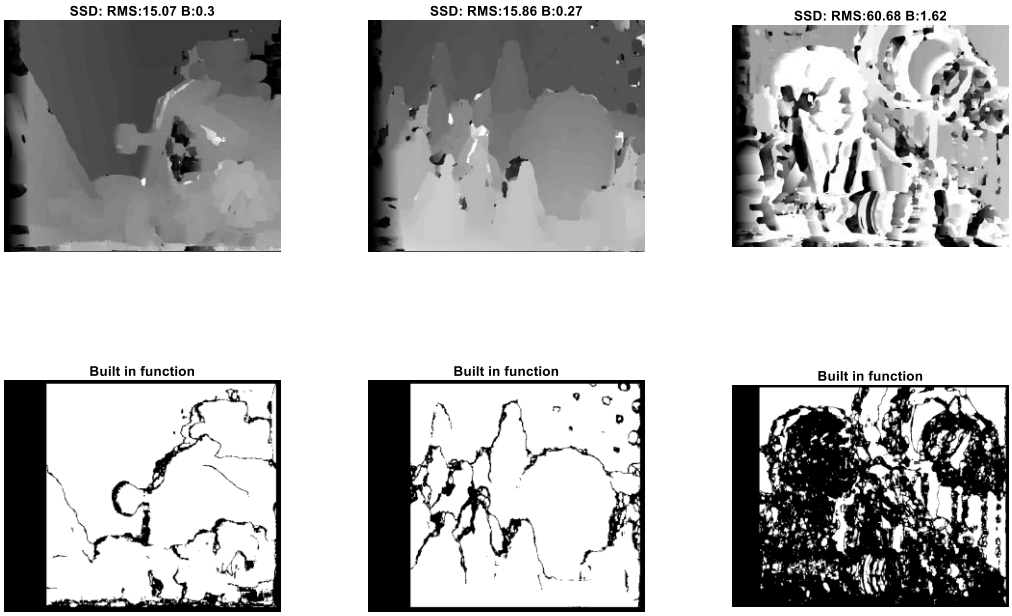

Figure 4 Comparison between SSD implementation and built-in function

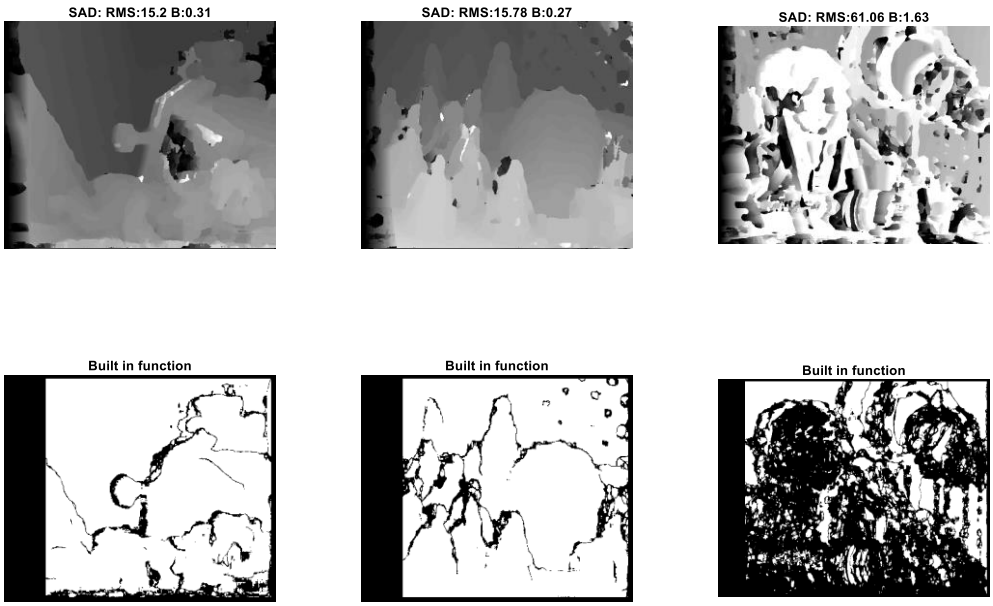

Figure 4 Comparison between SAD implementation and built-in function

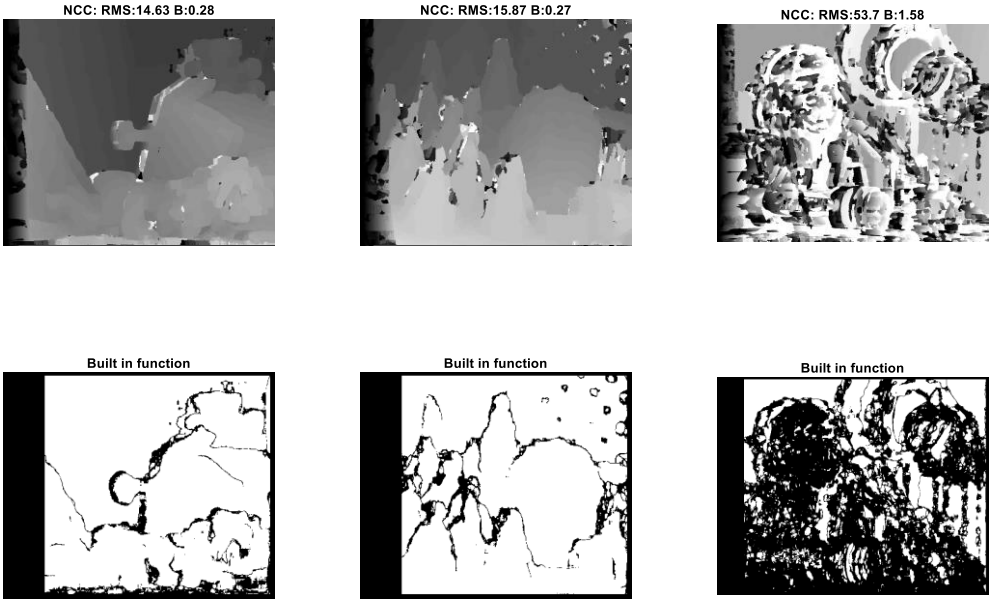

Figure 6 Comparison between NCC implementation and built-in function

From the images above, Art dataset is the most complicated one, which you can see the error rate is the highest, so we can conclude that the more complicated our images are, the higher error rate we will get. Moreover, when we're using the same dataset, NCC gives us the smallest error rate. For example, when we're using the Art dataset, NCC gives us 53.7, however, SSD and SAD give us 60.86 and 61.06 respectively.