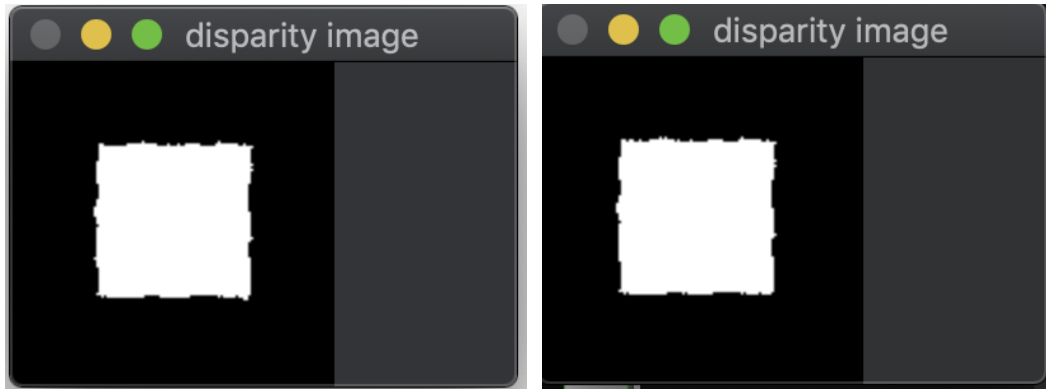


1 Question 1

Disparity images are placed before the text.



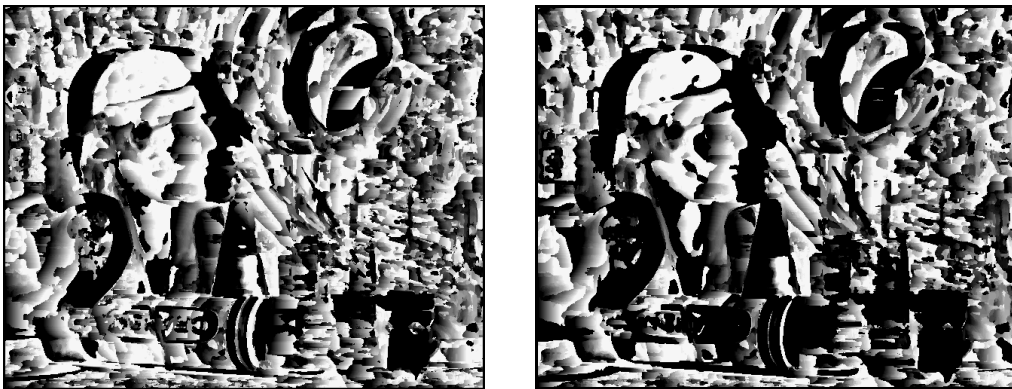
(a) Disparity images left to right

(b) Disparity images right to left

Figure 1: Market dashboard

2 question 2

2.1 disparity images from left to right for different window sizes



(a) window size 6

(b) window size 8

Figure 2: disparity images from left to right for different window sizes

As we increase the window size the sharpness of the images decreases and more smoothing happens.



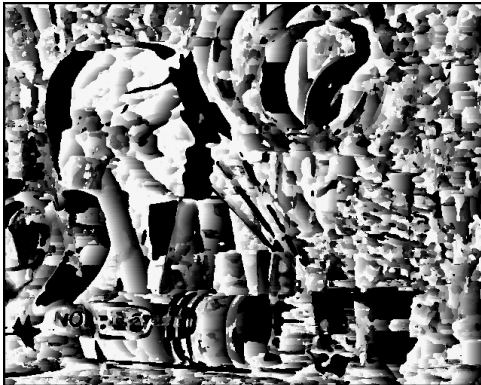
(a) window size 12



(b) window size 16

Figure 3: disparity images from left to right for different window sizes

2.2 disparity images from right to left for different window sizes



(a) window size 6



(b) window size 8

Figure 4: disparity images from right to left for different window sizes

The maximum disparity is specified as 40.



(a) window size 12



(b) window size 16

Figure 5: disparity images from right to left for different window sizes

2.3 Analysis of the results with ground truth

The Ground truth is smooth and scaled and but in my case increasing the window size is leading to blackening of the disparity image.

The disparity images is improved by running a filter on the generated images that checks for noise within the window that the disparity within the window should not increase drastically and that can be specified by window size and window range.

3 question 3

3.1 disparity images with noise from left to right for different window sizes



(a) window size 6



(b) window size 8

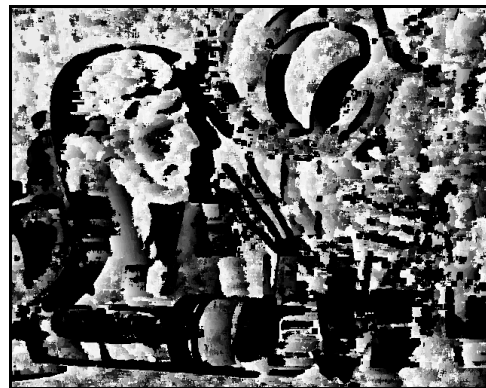
Figure 6: disparity images from left to right for different window sizes

Gaussian noise was added to the image with mean 0 and sigma of 15 and then disparity images were calculated.

3.2 disparity images from right to left for different window sizes



(a) window size 6



(b) window size 8

Figure 7: disparity images from right to left for different window sizes

The maximum disparity is specified as 40.

3.3 disparity images with 10 percent contrast

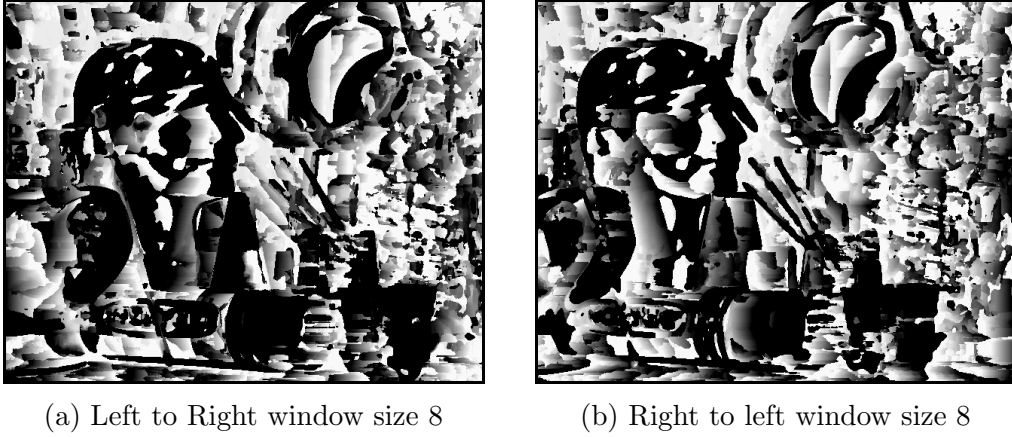


Figure 8: disparity images with contrast

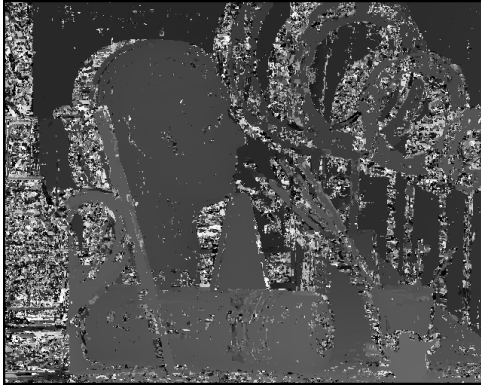
3.4 Analysis of the results with ground truth

SSD handles the case well with additive gaussian noise and produces a reasonable disparity image when the size of the window is increased. SSD can be used for detection when the input has been corrupted with noise. The SSD is not immune to the intensity variation in the images and can map to wrong values when the intensity of the two images is different.

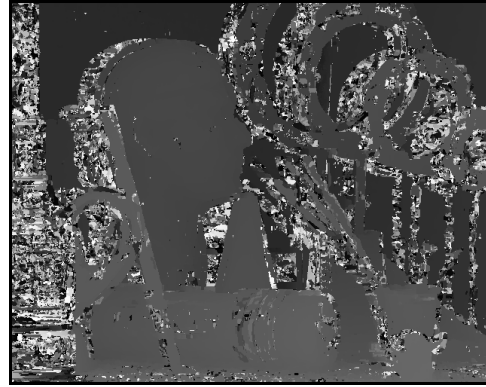
4 question 4

The template matching function of the opencv was employed to calculate the maximum of normalized cross correlation and then the index of that value was noted and then the disparity was calculated.

4.1 disparity images using template matching from left to right for different window sizes



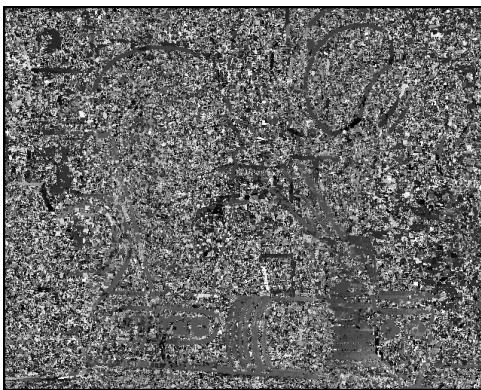
(a) window size 6



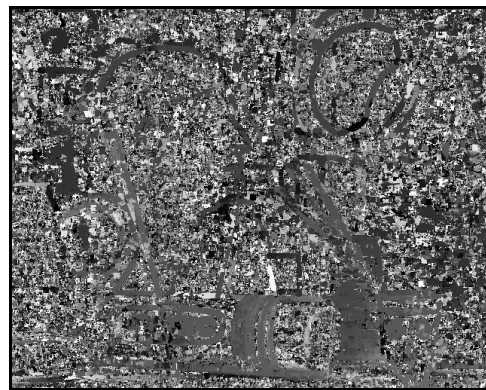
(b) window size 8

Figure 9: disparity images from left to right for different window sizes

4.2 disparity images using template matching with noise from left to right for different window sizes



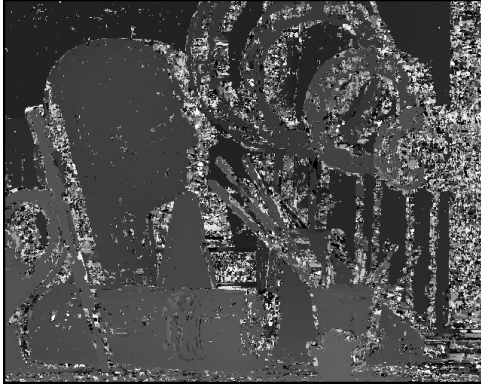
(a) window size 6



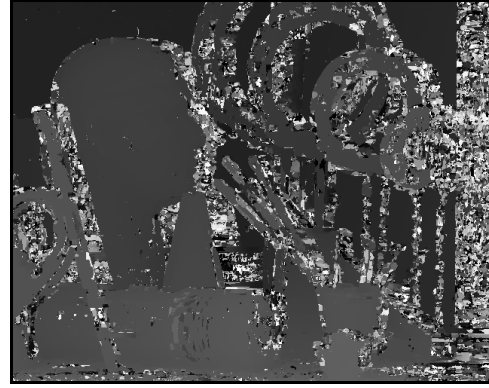
(b) window size 8

Figure 10: disparity images from left to right for different window sizes

subsectiondisparity images using template matching from right to left for different window sizes



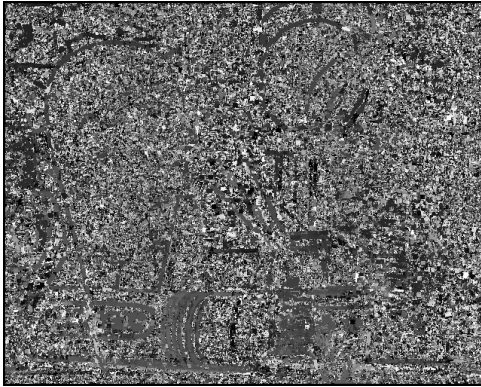
(a) window size 6



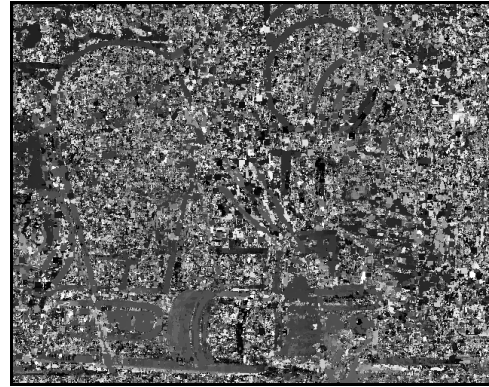
(b) window size 8

Figure 11: disparity images from left to right for different window sizes

4.3 disparity images using template matching with noise from right to left for different window sizes



(a) window size 6



(b) window size 8

Figure 12: disparity images from left to right for different window sizes

4.4 Analysis of the results with ground truth

Template matching performs better than SSD for calculating the disparity images because it is normalized which means that it is resistant to intensity changes. Because the two images can be taken by different cameras with intensity variation which can cause the template to match to a wrong point which has a higher score than the correct match.

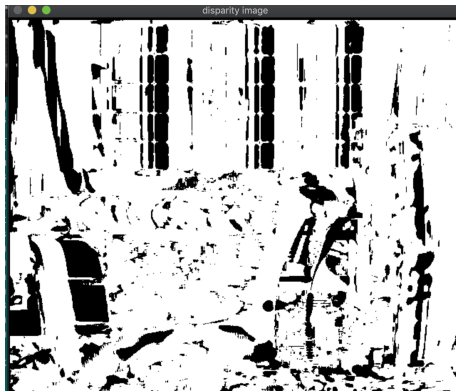
The SSD is also affected by the intensity variation.

The template matching is done by calculating the cross correlation between the template and the image patch and where the coefficient is maximum we take that value.

Increasing the contrast of the images increases the correlation score regardless of the what the template is and to solve that issue we can subtract off the mean value of the template and in this way correlation is higher when dark parts coincide with dark parts and brighter parts with brighter.

5 question 5

5.1 disparity images from left to right for different window sizes



(a) window size 6



(b) window size 8

Figure 13: disparity images from left to right for different window sizes

5.2 disparity images from right to left for different window sizes

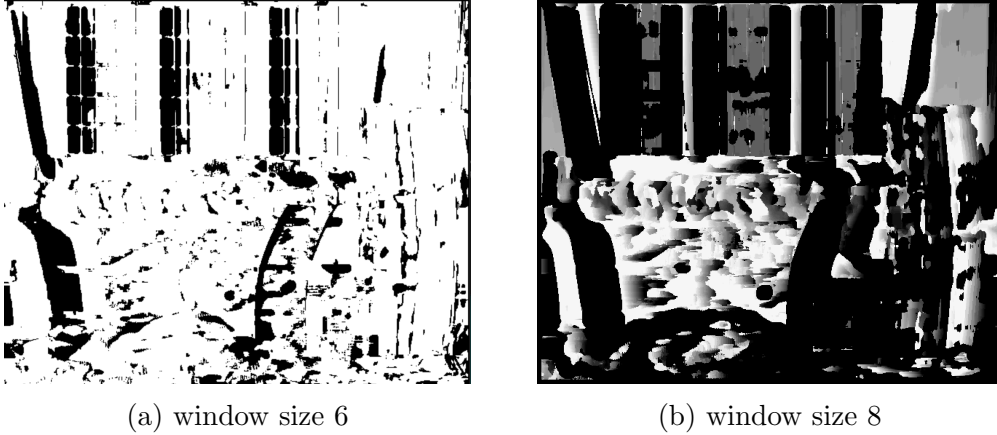


Figure 14: disparity images from right to left for different window sizes

5.3 Variation of SSD with different parameters

Window size : Varying the window size can have a lot of affect on the disparity images as it will smoothen the images. A optimum value of the window size should be picked.

Max disparity : The max disparity specified the maximum disparity or the maximum shift of the image. This can be varied to get a good images.

prefiltering : The images if pre filtered to smoothen the image before applying the SSD.

post filtering: post filtering removes the noise in the disparity image by varying the filter over the images and only allowing the values within a range inside that filter window.