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CSE 4084 – Multimedia Systems Homework II Report

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Problem 1

Firstly, corresponding frame images are being loaded and converted into correct formats. After that, target block (B_{target}) is captured by specified range in the document in the $frame_2$, which is referred as I_2.

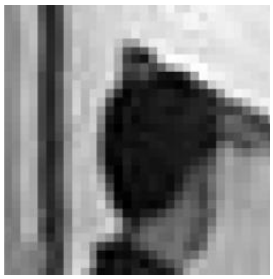

Figure1: B_{target}

Secondly, it was required to scan through $frame_1$, which is referred as I_1 via a 32x32 window. Then iteratively for every window, it was required to calculate matching criteria with mean absolute error (MAE). Here, as a logic I used a variable to check whether a less MAE value is occurred, since smallest MAE is needed. Also, if a less MAE is found its coordinates were being stored. Below, screenshots provided from MATLAB.

```
>> problem1()
MAE value= 22.99
x_pos: 65.00  y_pos: 81.00
```

Figure 2: Results obtained from problem 1 step(5)

At the Step(6) of problem 1, I applied similar application steps but this time updating B_{target} in every iteration inside the loop. Here a 64x64 search region is created and inside it a 16x16 window is being captured to check whether there is a matching criterion between the window and the B_{target}.
Unfortunately, I was not able to conclude this step to end it up because having some errors occurred which I could not solve in time. But I have provided fully commented codes.

In sense of the block-matching based methods, for the least effective case where it is applied in brute force fashion and has to search all over the image, it requires a lot of computational and time resource.
But, along with a good mathematical background considering both decreasing the region of search and window region, it may provide good results (such as seen in logarithmic search).
Also, it has an advantage of being easily applicable to merge with machine learning algorithms so that a model can learn from the parameters provided and return may be a more accurate observation by saving from the resources previously defined.

Problem 2

After noisy image is loaded and converted into proper format, in the **Step(2)** the first 3x3 median filtering is applied to the noisy image by the built-in function “medfilt2”.
Then for the **Step(3)** second-pass median filtering is applied to which image is obtained from the Step(2). Below comparison between 3 of the images are seen.

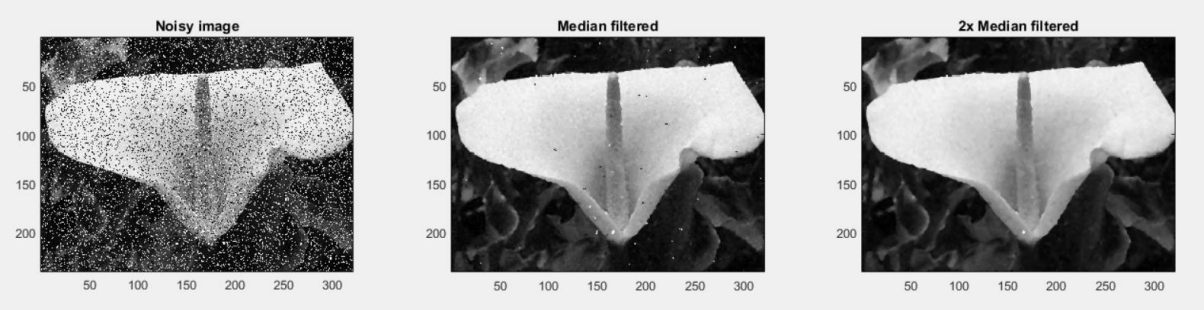

Figure 3: Displayed images for several cases

My observation from the comparisons above is that, applying a greater number of median filtering obviously removes the salt and pepper noises. But the more it is applied the more blurring effect occurs in the image.

For the steps (4), (5) and (6), PSNR values between noise-free image and three different cases (noisy image, filtered noisy image and second time filtered noisy image) are calculated. Below the screenshots provided from MATLAB.

```
>> problem2()
PSNR value of step(4)= 11.33
PSNR value of step(5)= 27.38
PSNR value of step(6)= 29.65
```

Figure 4: Results obtained from problem 2