

Assignment 2: Computational Photography

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1 HDR Imaging

Note: As I used OpenCV GuassianBlur() for implementing the gaussian filter, the range of my σ_s is [0,1] and not [1,64]



Ambient Image



Flash Image

1.1 Bilateral Filtering

- $\sigma_r : 0.3$
- $\sigma_s : 0.5$



Output of Bilateral Filtering on input Image



Difference between bilateral filtering and input image

By applying the bilateral filtering, the noise in the Ambient image is reduced. We can see that in the difference image only the edges are highlighted. Some noise still remains around the edges.

1.2 Joint Filtering

- $\sigma_r : 0.2$
- $\sigma_s : 0.5$



Output of Joint Filtering on input Image



Difference between joint filtering and bilateral filtering

By applying the joint filtering, the noise around the edges is removed as compared to the bilateral filtering. We can see that in the difference images the pixels bordering the edges are highlighted.

1.3 Detail Transfer

- $\sigma_r : 0.35$
- $\sigma_s : 0.5$



Output of Detail Transfer on input Image



Difference between detail transfer and joint filtering

Detail transfer helps add details to the image. The difference image shows that the difference between detail transfer and joint filtering is at areas that are over illuminated. The detail transfer image adds more details to such high exposure areas.

1.4 Shadow and Specularity Masking

- $\sigma_r : 0.3$
- $\sigma_s : 0.5$



Output of Shadow and Specularity Masking on detail transferred image



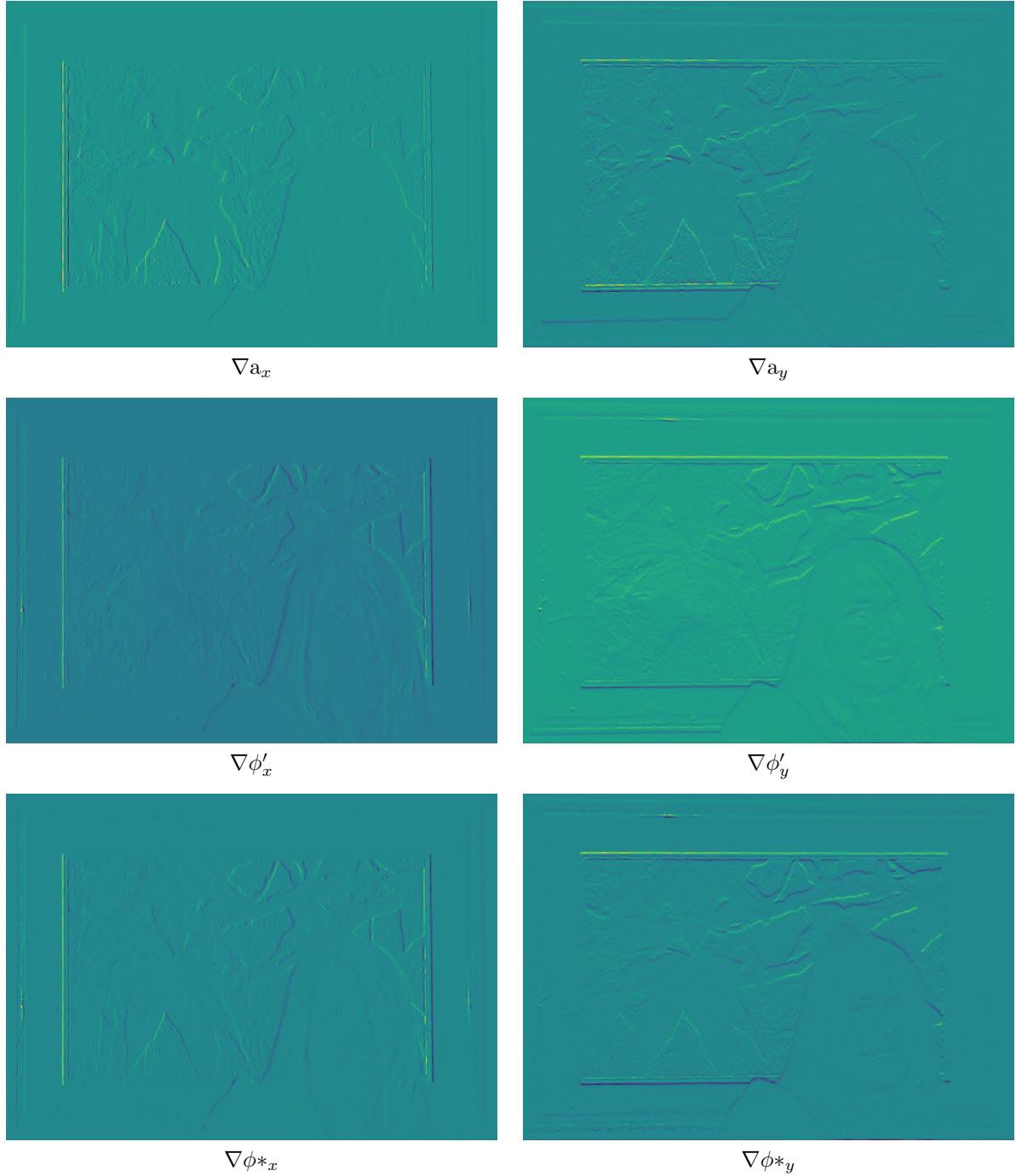
Difference between Shadow and Specularity Masked image and the detail transfer image

The difference image shows the regions in the detail transfer image that have shadows and specularities that have been taken care of by the mask we created to mask out the shadows and specularities. This final image is the most appealing one of the four as it contains the right amount of detail, minimum noise and shadows.

2 Gradient-domain processing

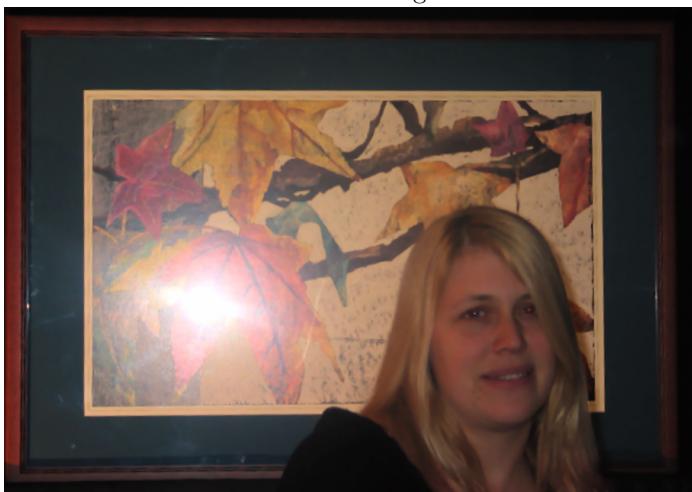
- $\tau = 0.6$
- $\sigma = 10$

Gradient Field Visualisation

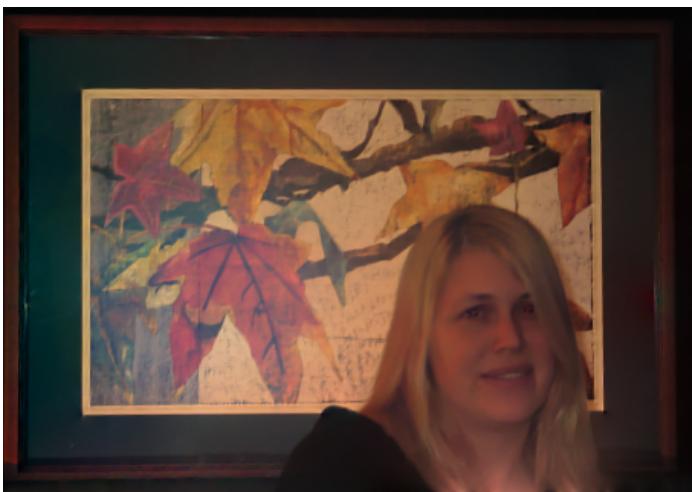




Ambient Image



Flash Image



Output Image

3 Custom Flash/No-Flash Pair

3.1 Denoising based on Bilateral Filtering

- $r = 0.3$

- $\sigma_s = 0.5$



Ambient Image



Flash Image



Detail Transfer Output Image

3.2 Gradient Domain Fusion

- $\tau = 0.6$
- $\sigma = 10$



Ambient Image



Flash Image



Output Image