15462 Assignment 3

Lingxi Zhang (lingxiz)

October 24, 2022

1 Bilateral Filtering

parameters : radius $r = 9$, $\sigma_s = 1, \sigma_r = 0.1$ for all 4 types of bilateral, except for standard it is $\sigma_s = 4$

1.1 standard bilateral

advantage: easy to implement, less overblur than gaussian
disadvantage: estimate of high frequency information is poor

1.2 join

advantage: better estimation of high frequency information
disadvantage: can fail in flash shadows and specularities as it may underblur at the edge of these regions

1.3 detail transfer

advantage: it can transfer detail from the flash image as well
disadvantage: still poor detail estimate in shadows and specular regions

1.4 mask merge

advantage: can control the right amount of detail transferred with smoothing by choosing parameter σ_r, σ_s
disadvantage: may lead to excessive smoothing and leads to halo artifacts

Figure 1: From top to bottom and left to right: standard bilateral, join, detail, merge

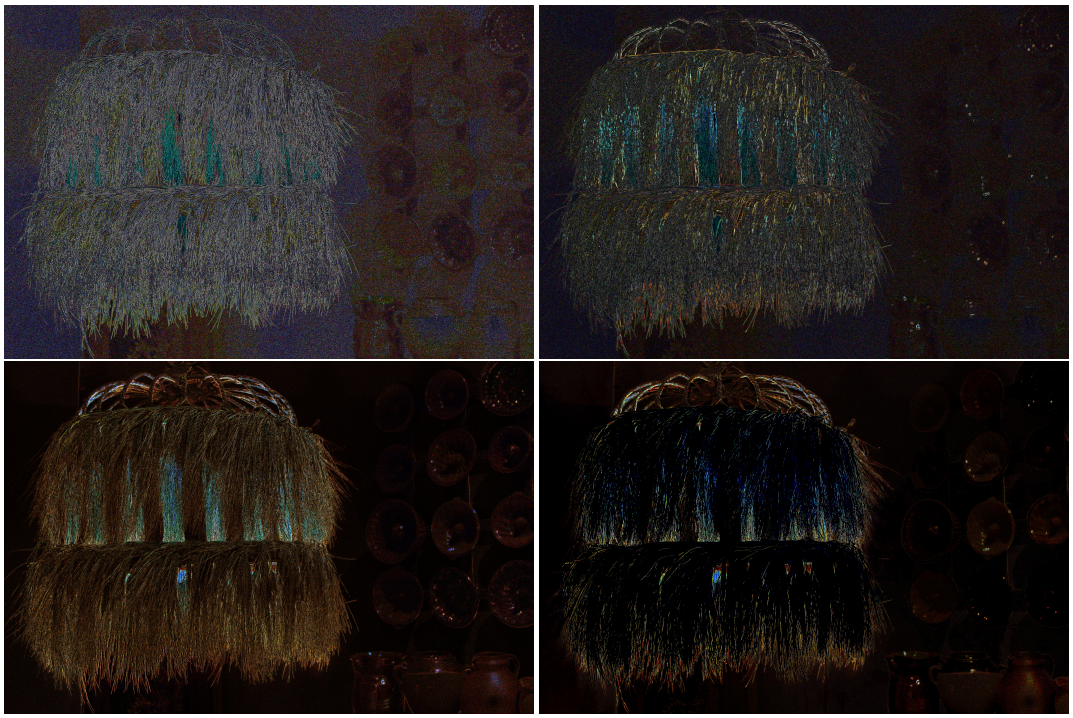

Figure 2: Diff pictures(10x):From top to bottom and left to right: standard - ambient, join - standard, detail - join, merge - detail

2 Gradient-Domain Processing

$$\sigma = 20, \tau_s = 0.9$$

This set of parameters deliver the best result.

Final Choices after Comparison:
Initial Boundary Conditions: ambient
Initial Init Conditions: Zero image
Pictures are included in the following pages

3 Own Flash Pairs

Figure 3: From top to bottom: ∇a, $\nabla \Phi'$, $\nabla \Phi^*$, From left to right: x, y

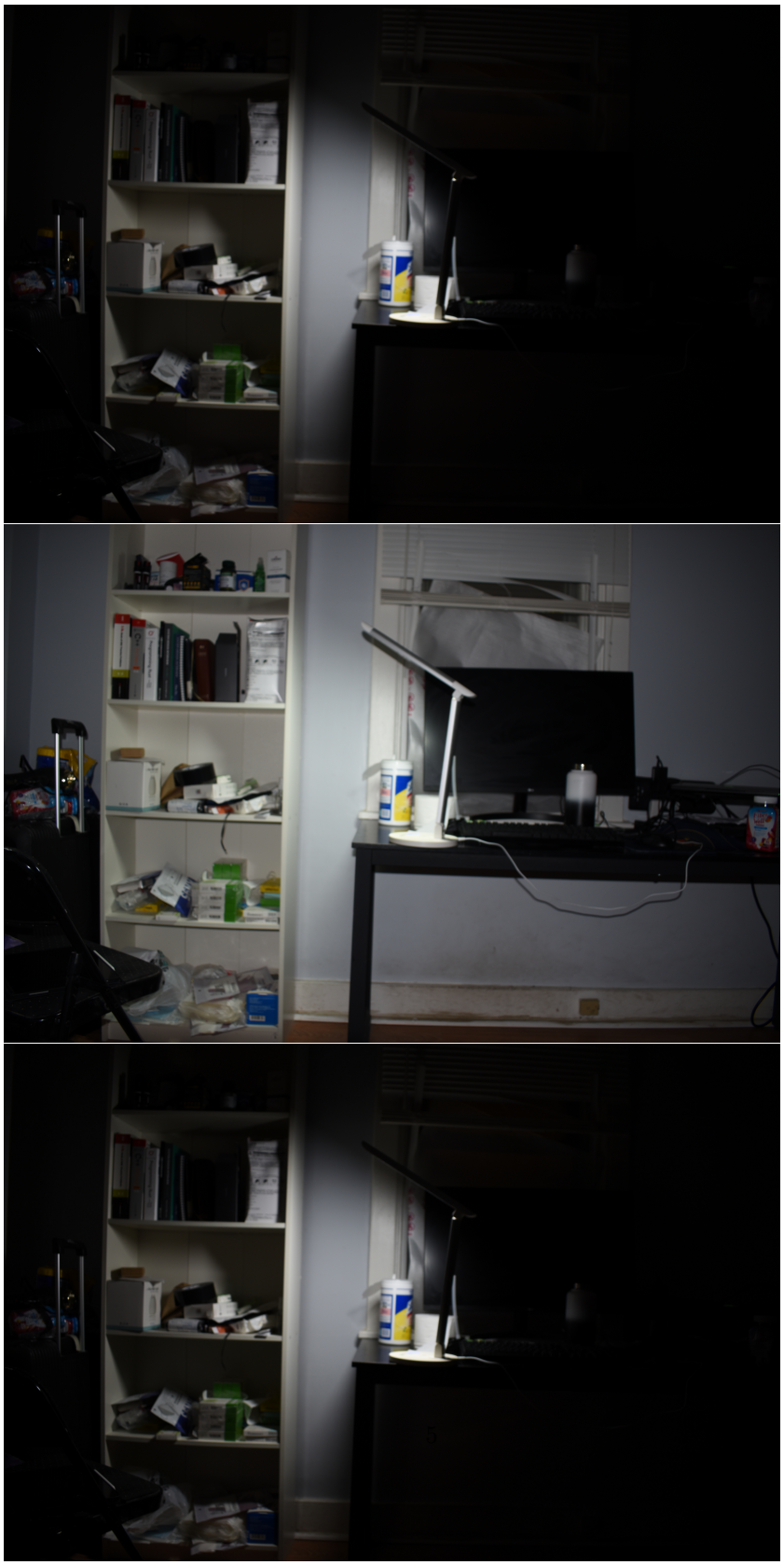

Figure 4: Bilateral Filtering: From top to bottom: ambient, flash, bilaterally fused

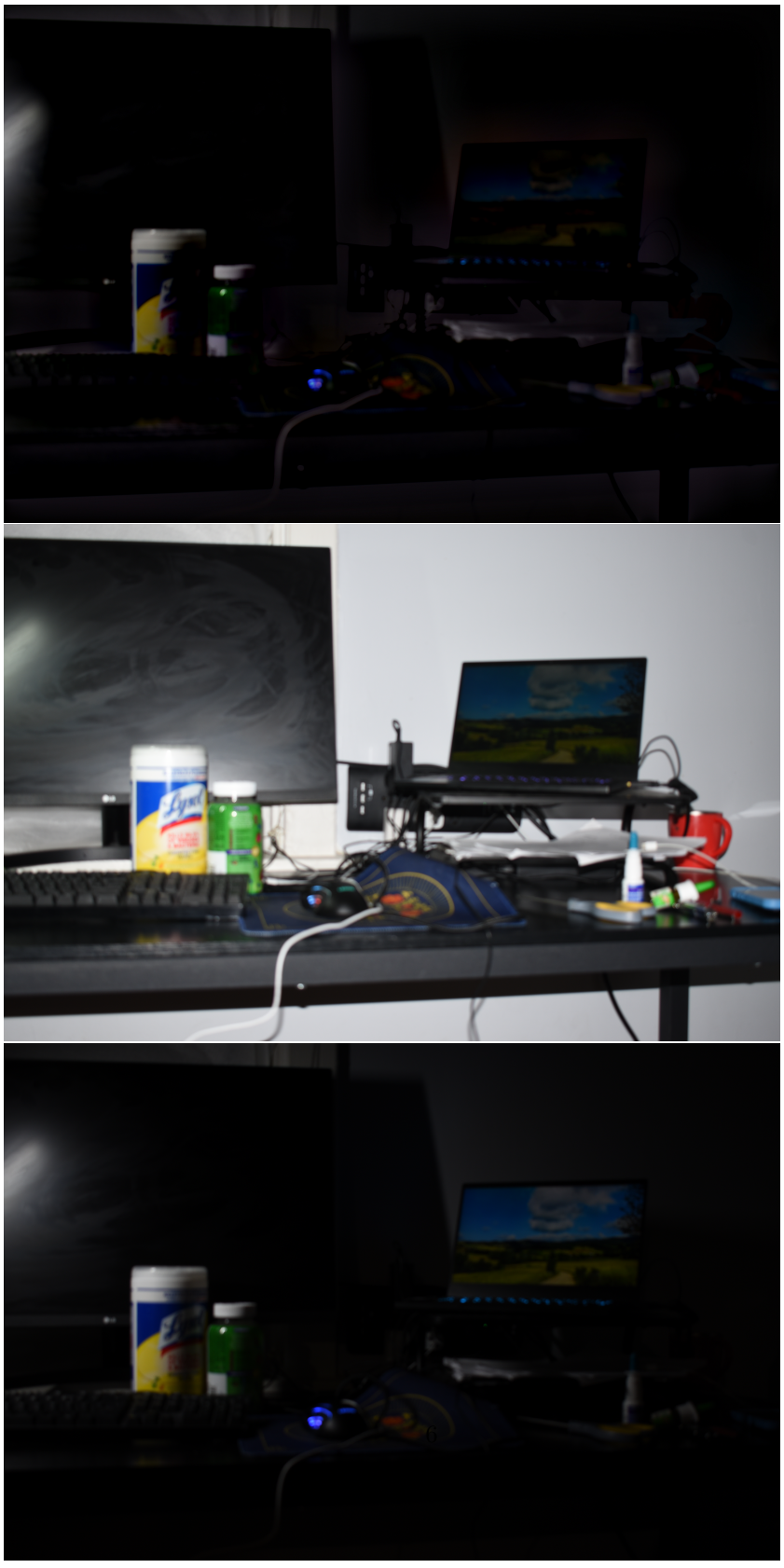

Figure 5: Gradient Descent: From top to bottom: ambient, flash, fused