EECS 331: Introduction to Computational Photography

HW3: Flash/No Flash Photography

1. **Write an Android Program to capture a Flash/No Flash pair**

   Backbone project was not used due to Tegra Tab's white balance issue, although the code has been included with this assignment.

   The following are two sample images.

   Fig. 1: Image with flash

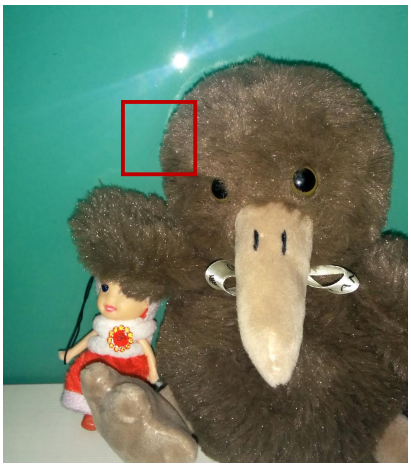
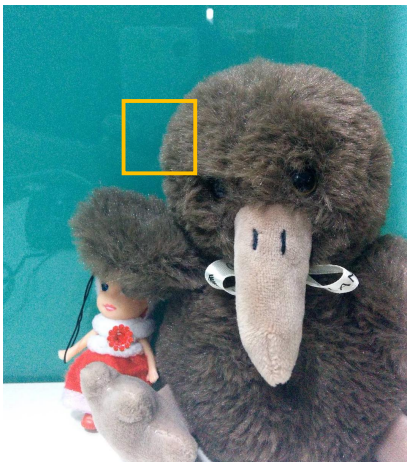


   Fig. 2: Image without flash



2. De-noising the No-flash image captured previously

MATLAB program was created to de-noise the images (HW3.m)

Process:

1. Load images to MATLAB
2. Crop them to required sizes (~1000x800)
3. Convert to double using im2double function.
4. Separate RGB color channels from the image.
5. Apply bilateralFilter() to each channel individually using optimal filter settings.
6. Concatenate them to form the de-noised image.

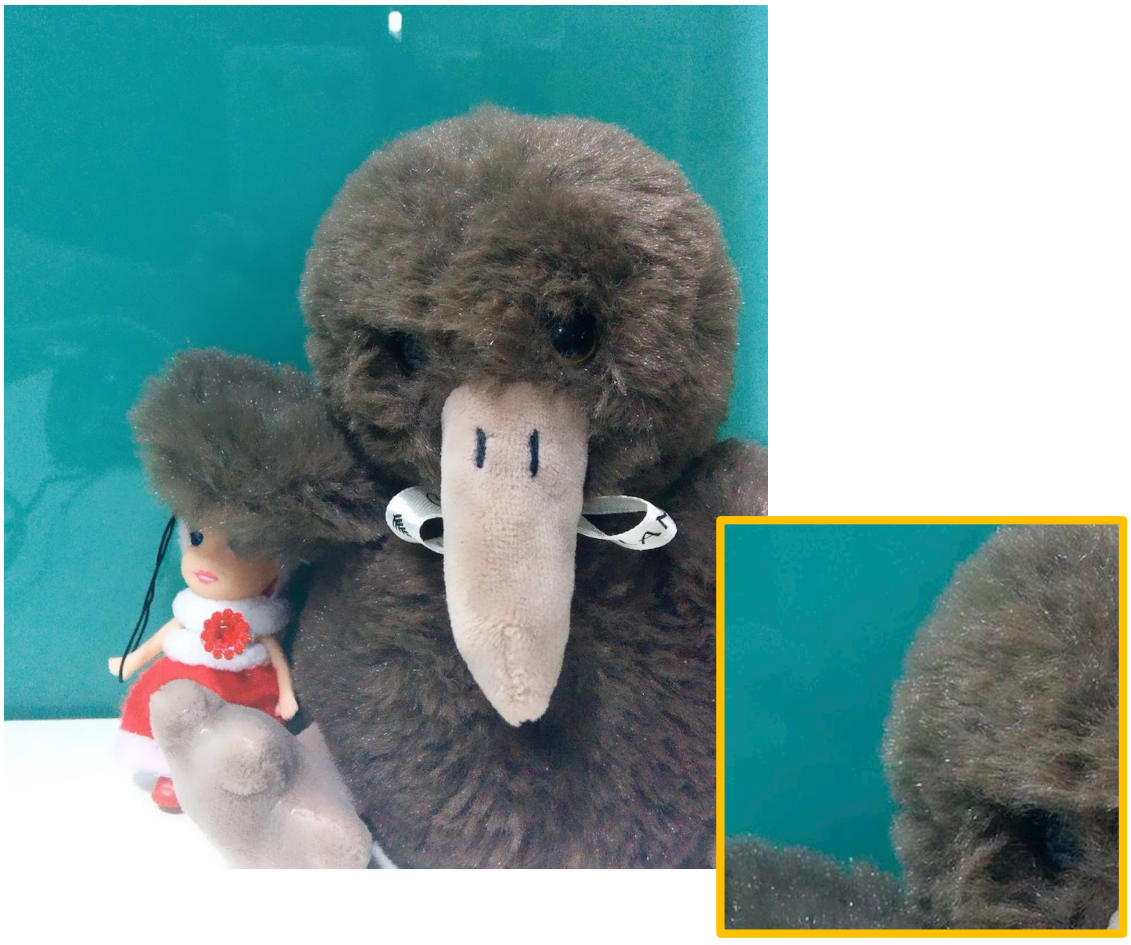
Optimal Filter Settings:

Values for σ_s and σ_R are selected by fine-tuning for best results.

$\sigma_s = 8$

$\sigma_R = 0.05$

Fig.3: De-noised No-flash image



3. Extract the details from the flash image and fuse the images together

Bilateral filter applied to image with Flash.

Optimal Filter Settings (For Flash image):
Values for σ_s and σ_R are selected by fine-tuning for best results.
$\sigma_s = 2$
$\sigma_R = 0.05$

F is flash image (say)
F_D is the de-noised flash image (say)
A_D is the de-noised no-flash image (say)
$\varepsilon = 0.02$ (given)

Fusing Image for result:
The images are fused together by using the following equation:

$$Fused = A_D * \frac{F + \varepsilon}{F_D + \varepsilon}$$

RESULT:

Fig.4: Final Fused Image

Comparison:

No-Flash image with high noise

Flash image with false colors

Fused Image with lower Noise and right colors