Implementing the Paper
Digital Photography with Flash No-Flash Image Pairs

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Paper Name

Digital Photography with Flash No-Flash Image Pairs [1]

Paper Abstract

Abstract: Digital photography has made it possible to quickly and easily take a pair of images of low-light environments: one with flash to capture detail and one without flash to capture ambient illumination. We present a variety of applications that analyze and combine the strengths of such flash/no-flash image pairs. Our applications include denoising and detail transfer (to merge the ambient qualities of the no-flash image with the high-frequency flash detail), white-balancing (to change the color tone of the ambient image), continuous flash (to interactively adjust flash intensity), and red-eye removal (to repair artifacts in the flash image). We demonstrate how these applications can synthesize new images that are of higher quality than either of the originals.

Dataset Link

- Denoising, Detail Transfer and Artifact Detection `http://hhoppe.com/flash_data_JBF_Detail_transfer.zip`

- White-Balancing `http://hhoppe.com/proj/flash/Applications/white_balance/index.html`

- Red-Eye `http://hhoppe.com/proj/flash/Applications/red_eye/index.html`

Project Implementation Steps

- **Implement Bilateral Filtering Algorithm**

- **Implement Joint Bilateral Filtering Algorithm**

- **Denoising** : Using Flash images as the estimate for ambient images, denoise the No-Flash images using Bilateral and Joint Bilateral Filters.

- **Detail Transfer** : As the flash image contains many Additional Surface details due to more lighting conditions, it is used to transfer details to the No-Flash image.

1

- **Artifact Detection** : As the Flash Image contains a lot of shadowing artifacts, they are to be removed while details are being transferred to the No-Flash Image. The threshold for preparing the shadow mask would heuristically depend on user.

- **White Balancing** : Using the no-flash image and the difference or masking image, estimate the illumination at each pixel and add its contribution to the output.

- **Continuous Flash** : Adjusting the effect of the flash image on the no-flash image using a parameter α by converting to the YCbCr image space.

- **Red-Eye Correction** : Convert image to YCbCr and perform thresholdings to remove the estimated Red-Eye regions (introduced in Flash Images), using segmentation.

Evaluation or Validation Strategy

Since, there has not been any mention of evaluation methods for the output, we need to visually evaluate qualitatively.

References

[1] Georg Petschnigg, Richard Szeliski, Maneesh Agrawala, Michael Cohen, Hugues Hoppe, and Kentaro Toyama. Digital photography with flash and no-flash image pairs. *ACM Trans. Graph.*, 23(3):664–672, August 2004.