Applications of Flash / No-Flash Image Pairs in Mobile Phone Photography

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Motivation
Rapid advances in semiconductor technology significantly improve mobile phone imaging sensor capability and hardware processing resources, however image quality is still limited under low lighting environment.

This project utilizes the integrated flash to capture the flash and no-flash image pair and reconstruct the original image through denoising and white balancing. Additional processing techniques will also be explored that could help users to manipulate images for intended effects.[4]

Technique
Denoising and Image Reconstruction
- Joint bilateral filter, utilize edge-stopping function from the Flash image.
- Combine detail layer from Flash image

White Balancing
- Estimate the albedo by taking mean value from each pixel from the entire image.

Dynamic Edge Preservation Filtering for Special Effects
- Create mask layer with per pixel intensity gradient which weight the filter parameters for each pixel.

Experimental Results
Final image retained high frequency information as expected but the misalignment between the image pair can cause an misalignment between the detail layer and the base image layer.

White Balancing
White balance can be tuned, such a lookup table for light sources for most pleasing image.

Related Work
The denoising and white balancing techniques were a re-implementation guided by Petschnigg et al. [1] and where the original work used a more powerful digital camera.