Recovering A High Dynamic Range Image and the Camera's Response Function Simultaneously

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Abstract

In this exercise, we were instructed to use the algorithm proposed by [RBS99] to take a set of images of the same scene with different exposure times and use them to recover an high dynamic range image of the scene, as well as the response curve of the used camera. As well as doing this, I have implemented a way to write the recovered image to a File in the OpenEXR format, and to display a tonemapped version of the recovered image, using the algorithm from [DMAC03].

1 Introduction

For this exercise, I first implemented the algorithm proposed in [RBS99], which can be used to take a set of spatially aligned input images of a scene, with different exposure times, and, simultaneously, iteratively recover the response curve of the camera and the luminance of the original scene. This will be discussed in section 2.

Additionally, I implemented a way for the recovered image to be saved in OpenEXR format. This will be discussed in section 3.

I also implemented the tonemapping algorithm found in section [DMAC03], which makes it possible to see the entire dynamic range of a scene mapped to a regular screen. This is discussed in section 4.

Finally, in section 5, I will explain how to compile, run and use the program.

2 Recovering An HDR Image and the Response Function

3 Writing the HDR Image to an OpenEXR File

4 Using Tonemapping to Display the Entire Dynamic Range

5 Documentation for the Program

References

[RBS99] M. A. Robertson, S. Borman, and R. L. Stevenson. Dynamic Range Improvement Through Multiple Exposures. In *Proceedings of ICIP*, 1999.

[DMAC03] F. Drago, K. Myszkowski, T. Annen, and N. Chiba. Adaptive Logarithmic Mapping For Displaying High Contrast Scenes. In *Eurographics* 22(3), 2003.

[Wik16] Wikipedia. CIE 1931 color space. `https://en.wikipedia.org/wiki/CIE_XYZ#Construction_of_the_CIE_XYZ_color_space_from_the_Wright.E2.80.93Guild_data` (accessed April 30, 2016).