

EE368 Final Project Proposal: Improved Sectional Tone Mapping for HDR Imagery

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Abstract

High dynamic range (HDR) imaging is becoming more common in consumer entertainment. As tools for capture, content creation, encoding, and transmission evolve to support HDR formats, the variety of display capabilities is increasing. Hence, there is value in determining solutions for remapping native HDR data for display on lower quality HDR and legacy SDR displays.

Global tone mapping, wherein a single transfer curve is applied to the full HDR image, is a common procedure used today for this task. This global tone mapping operator may be static or dynamic (changing frame by frame) as described in [1], but being based on a single operator it must make a compromise between local contrast and brightness. Drawbacks identified in global tone mapping have led to proposals for more sophisticated tone mapping methods. More recently, research has sparked in the realm of local tone mapping. Here, local tone mapping refers to small area contrast enhancements similar to sharpening filters which help recover lost detail during the global tone mapping process as described in [2]. These methods may lead to image artifacts such as halos and additionally can be computationally expensive, especially as we move towards 8K 120fps video content.

An alternative approach utilizes a sectional tone mapping described in [3]. This method defines 16x9 regions which are tone mapped using a histogram equalization approach. The resulting image contrast and details appear much improved. However, we believe there is room for improvement.

We propose to improve upon the 'sectional tone mapping' approach by defining edge aware regions in place of the 16x9 blocks. We anticipate this to reduce halos and perhaps improve temporal stability. Lenzen [3] improves temporal stability by blending 75percent with a global mapping operator. While this improves stability, it also diminishes the benefit of the sectional operator. We will also consider algorithm efficiency as we would like to maintain or improve upon the current speed.

We do not intend to use an Android device for this project.

Keywords: tone mapping, global tone mapping, high dynamic range, HDR, SDR

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