AN INNOVATIVE OF PYRAMID-BASED FUSION FOR GENERATING THE HDR IMAGES IN COMMON DISPLAY DEVICES

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Introduction

❖ **High dynamic range (HDR) in digital image processing**

- The techniques for expanding the range of luminance level.

- A set of different exposed images, taken at the same scene, is used to generate the HDR image.

- Without the camera response and exposure value, it can be done by measuring the salient areas/pixels along the input images and merge them together.

❖ **Fuse the images with Laplacian pyramid method**

- To estimate the missing information by reconstructing extrapolated pyramid.

- To preserve the local information and keep the seamless of the boundary

$$L\{R\}_k = \sum_{m=1}^{s} G\{\dot{w}\}_k^m \, L\{I\}_k^m$$

$L\{I\}_k^m$: the Laplacian pyramid of a set of input images
$G\{\dot{w}\}_k^m$: the Gaussian pyramid of a set of weighted map
$L\{R\}_k$: the result of Laplacian pyramid along each level

Limitation

- The algorithm cannot retrieve the small local information nicely.

- Due to the effect of interpolation, some details may be overexposed and become more white
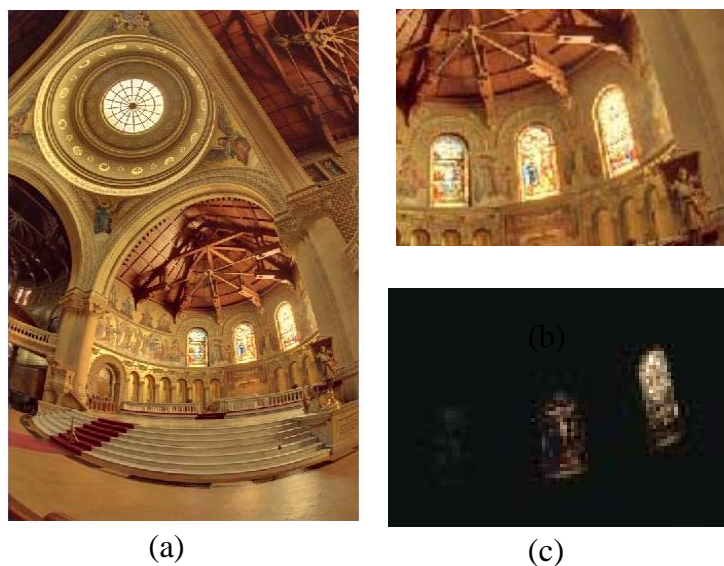

Figure 1. (a) The result of HDR image, (b) Zoom version of (a) and (c) Source of input image in zoom version.
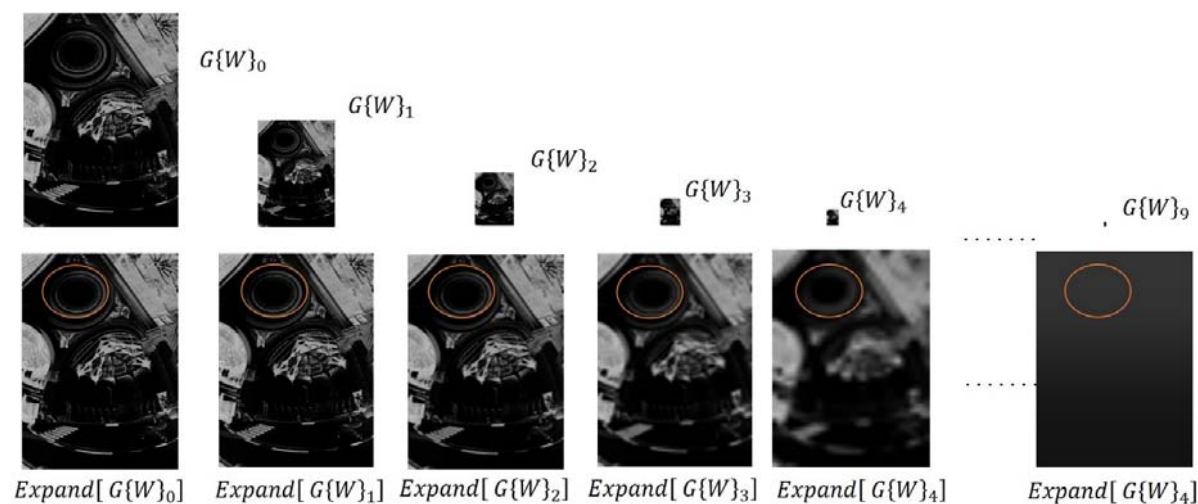

Figure 2. Multiresolution interpolation. Top row: an example of Gaussian pyramid generates from level $G\{W\}_0$ to $G\{W\}_9$. Bottom row: the extrapolation to the same size of G_0

Objective

- To solve the inherent limitation of pyramid-based fusion techniques using the dodge and burn techniques. The effect in each level of pyramid is also considered in this approach in order to retrieve the local information without constructing the seam boundary and halo effects.
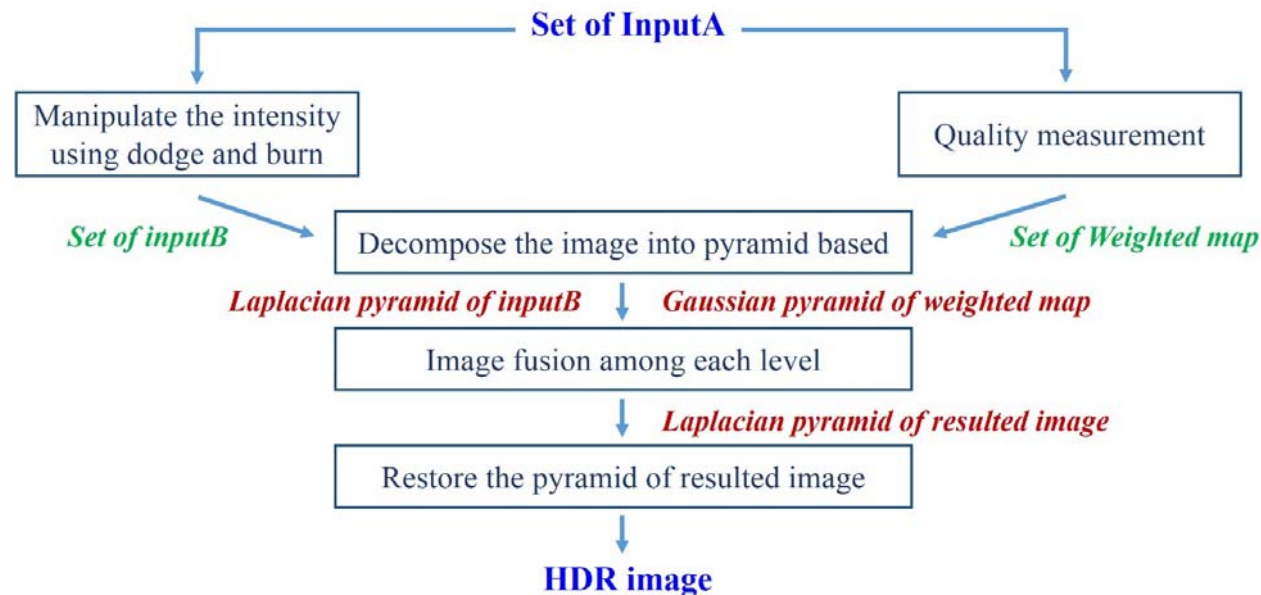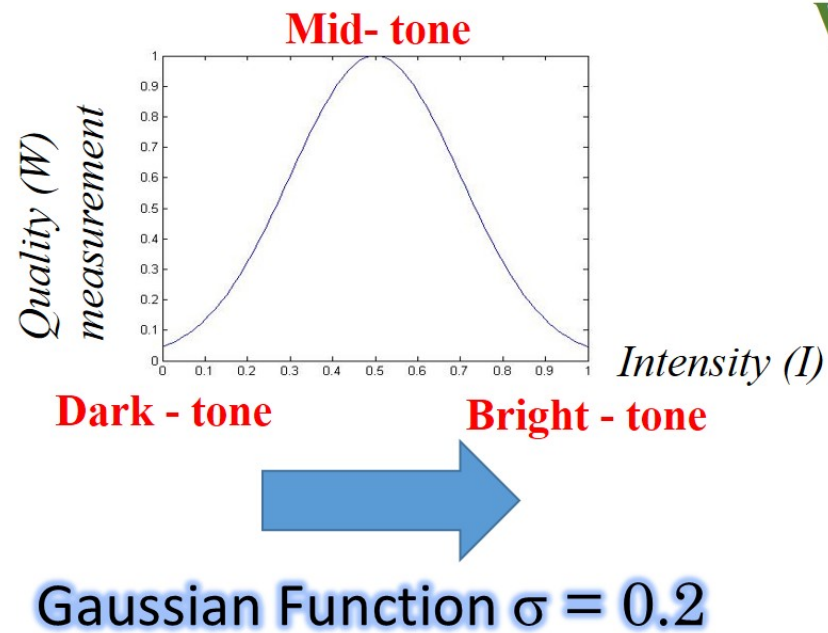
System Overview

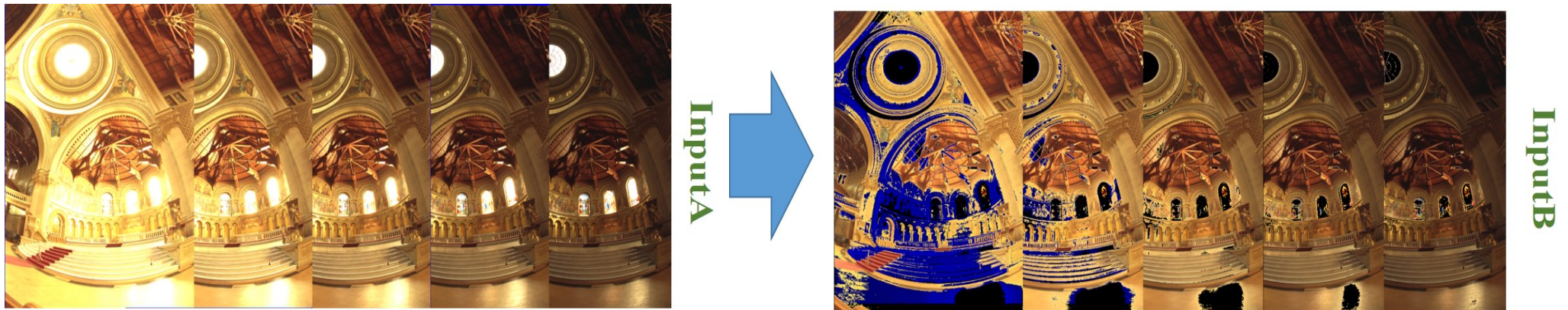**Figure 3**. An overview of the system

QUALITY MEASUREMENT

Figure 4. An example of quality measure using Gaussian function for generating weighted map image.

MANIPULATE THE INTENSITY USING DODGE AND BURN TECHNIQUE

Figure 5. An example of Manipulate the intensity using dodge and burn technique. The high intensity pixels with large dramatically changed along the sequence are burnt out.
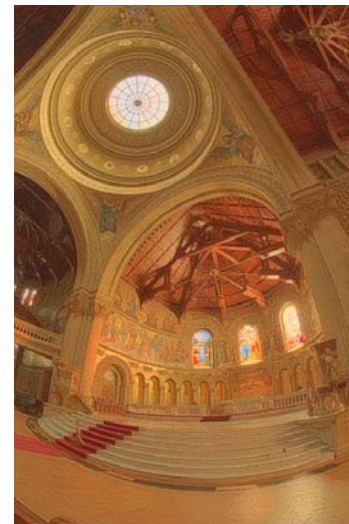
Experiment result

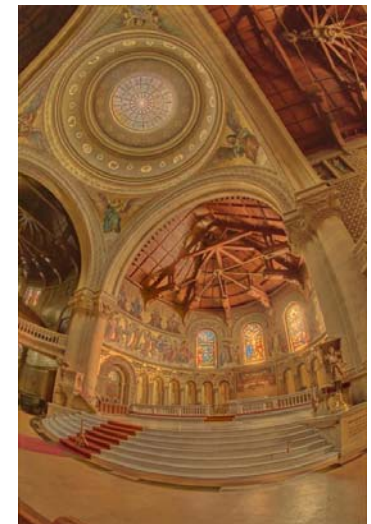

Figure 6. The result of proposed HDR image compare to other techniques. (a) - (e) The resulted HDR images from Ward et al., Tumblin and Turk et al., Fattal et al., Mertens et al., and the proposed method respectively. Image courtesy of Raanan Fattal.

Experiment result

(a) (b) (c)

(d) (e)

Figure 7. The result of proposed HDR image compare to other techniques. (a) - (e) The resulted HDR images from Ward et al., Tumblin and Turk et al., Fattal et al., Mertens et al., and the proposed method respectively. Image courtesy of Raanan Fattal.