

EE368: Project Proposal - High Dynamic Range Imaging with the Android Platform

Johan Mathe johmathe@google.com - Tim M Wong tim.m.wong@kla-tencor.com

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1 Description of the project

The goal of the project is to bring High Dynamic Range imaging technology on the Android¹ platform. It will allow the user to take multiple pictures of a scene and to produce a proper HDR image, possibly tone mapped.

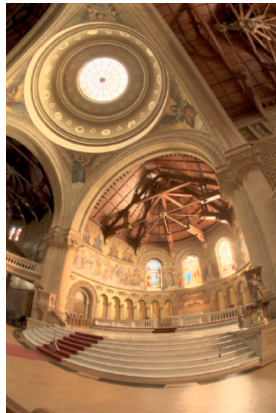


Figure 1: Example of an HDR Image

The workflow will be the following:

¹<http://www.android.com>

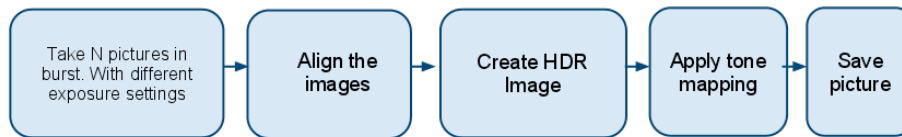


Figure 2: Proposed workflow

Steps 1 and 5 are quite trivial on the android phone.

1.1 Image alignment

In order to accomplish step 2 (image alignment), we will have to evaluate the performance of image alignment algorithms. Some algorithms are very expensive in terms of computation. We need to make the user experience as good as possible, and find the good tradeoff between algorithm performance and processing time.

1.2 High Dynamic Range imaging - Tone mapping

For step 3, creating the HDR image per se, we can also use some of the literature work showing that it is possible to create HDR images for a known or an unknown camera response function². Step 4 will allow us to see the results of our HDR image. Tone mapping is essential to adapt an HDR image to the Human Visual System. Tone mapping algorithms flourish all over the literature. We will implement a basic tone mapping algorithm first, and once again evaluate the performances in order to make the user experience as good as possible.

We know that the HDR/tone mapping operations on high resolution images (5M pixels for the last android phones) can be very CPU expensive. We will have to take special care of this problematic, and if the time is too long, maybe think about a client-server approach for our application.

This project will touch two different areas of digital image processing:

- Image transformation for the pictures alignment
- Color transformations/HDR imaging

2 References

- Simultaneous Homographic and Comparametric Alignment of Multiple Exposure-Adjusted Pictures of the Same Scene. Frank M Candocia. IEEE Transactions on Image Processing, Vol12 No 12 December 2003

²See reference 2

- Dynamic Range Improvement Through Multiple Exposures. Mark A. Robertson, Sean Borman, and Robert L. Stevenson. IEEE
- IMAGE CHARACTERISTIC ORIENTED TONE MAPPING FOR HIGH DYNAMIC RANGE IMAGES Chun Hung LIU, Oscar C. AU, P. H. W. WONG, M. C. KUNG
- Image Registration for Multi-exposure High Dynamic Range Image Acquisition
- High Dynamic Range Imaging Pipeline: Perception-Motivated Representation of Visual Content

3 Work distribution

- Images alignment algorithms:
 - Tim Wong
- HDR/Tone mapping algorithms:
 - Johan Mathe
- Java developpment:
 - Tim Wong
 - Johan Mathe
- Reports/poster presentation
 - Tim Wong
 - Johan Mathe

4 Need of an Android phone

- Johan Mathe: will use his own android phone (nexus one).
- Tim M Wong: borrowed a droid phone.