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**CS 445 - Project 4: Image Based Lighting**

Complete the claimed points and sections below.

**Total Points Claimed** **130 / 210**

**Core**

- |                                |         |
|--------------------------------|---------|
| 1. Recovering HDR maps         |         |
| a. Data collection             | 20 / 20 |
| b. Naive HDR merging           | 10 / 10 |
| c. Weighted HDR merging        | 15 / 15 |
| d. Calibrated HDR merging      | 15 / 15 |
| e. Additional HDR questions    | 10 / 10 |
| 2. Panoramic transformations   | 10 / 10 |
| 3. Rendering synthetic objects | 30 / 30 |
| 4. Quality of results / report | 10 / 10 |

**B&W**

- |                       |         |
|-----------------------|---------|
| 5. Additional results | 10 / 20 |
|-----------------------|---------|

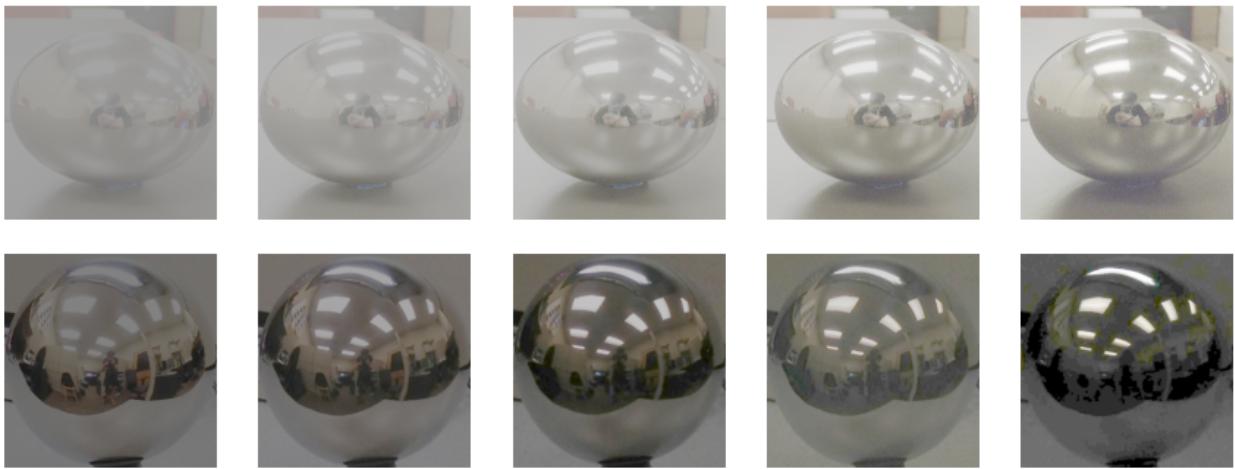
**1. Recovering HDR maps**

Include

- (a) Your LDR images (if you took your own)



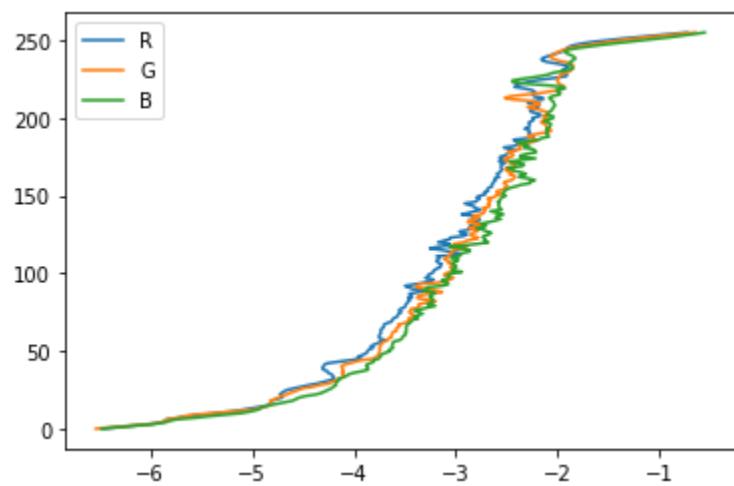
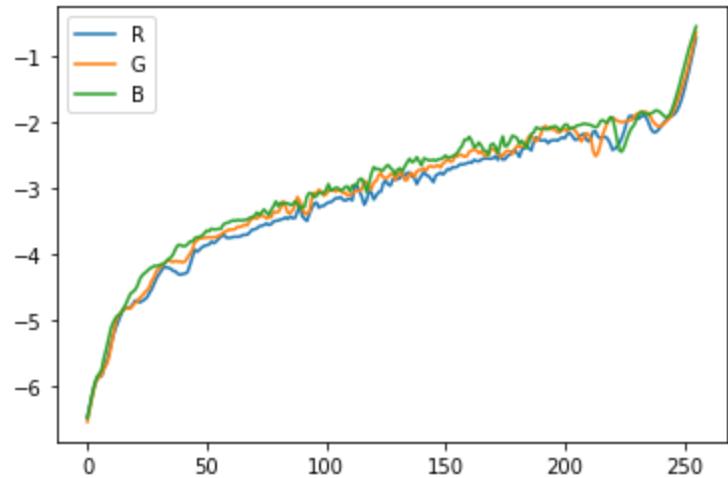
- (b) Figure of rescaled log irradiance images from the naive method(**mine and sample**)



- (d) Figure of rescaled log irradiance images from the calibration method



- (d) Plots of  $g$  vs intensity and intensity vs  $g$



- (b-d) Figure comparing the three HDR methods





- (b-d) Text output comparing the dynamic range and RMS error consistency of the three methods

naive:	log range =	6.462	avg RMS error =	0.322
weighted:	log range =	6.622	avg RMS error =	0.281
calibrated:	log range =	7.113	avg RMS error =	0.254

- (e) Answers to the questions below

*Note if you claim credit for data collection, you must use your own images for parts 1-3*

Answer these questions:

1. For a very bright scene point, will the naive method tend to over-estimate the true brightness, or under-estimate? Why?

It will underestimate the true brightness because it has a bad performance in adjusting brightness at a pixel that has extreme value. The true brightness is out of reach for our range.

2. Why does the weighting method result in a higher dynamic range than the naive method?

Because it gives more weight to pixels that are in the normal range. Pixels that are too dark or bright, it has very small weight. The weighting method allows us to obtain a wider range of pixel values than the naive method.

3. Why does the calibration method result in a higher dynamic range than the weighting method?

The calibration method can compute the radiance map using different exposure times which results in a higher dynamic range. However, the weighting method only computes the log of the sum, which is not that robust.

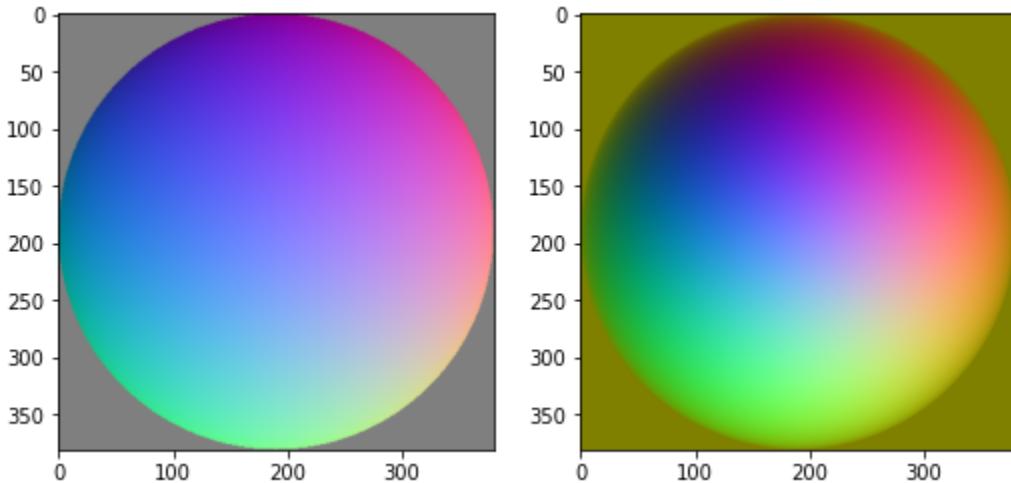
4. Why does the calibration method result in higher consistency, compared to the weighting method?

A similar idea to question 3, The calibration method can compute the radiance map using different exposure times, which has higher consistency than simply using the weighting method.

## 2. Panoramic transformations

Include:

- The images of normal vectors and reflectance vectors



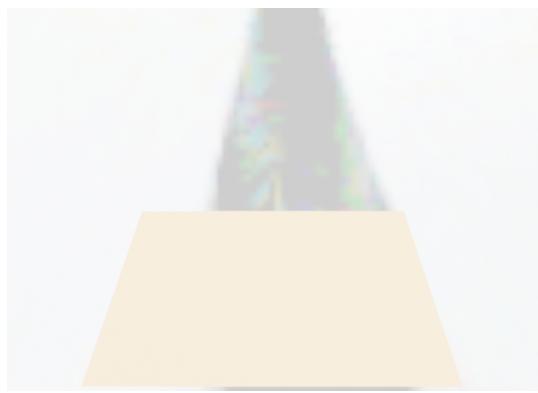
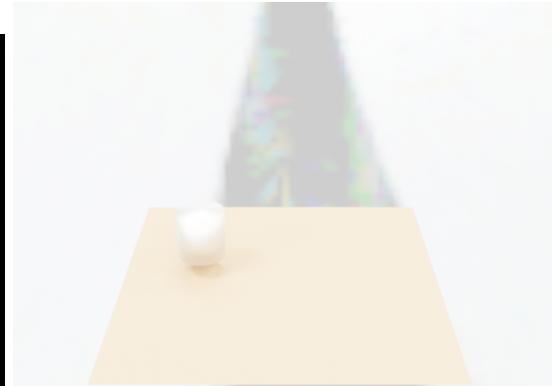
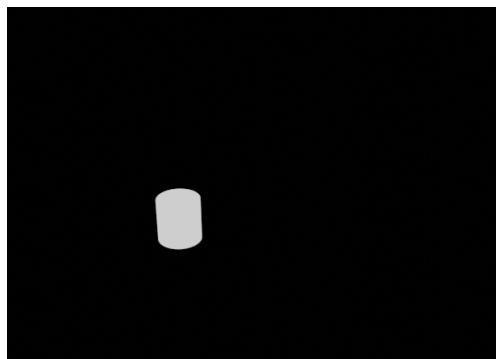
- The equirectangular image from your calibration HDR result



### 3. Rendering synthetic objects

Include:

- Component images: (1) Background image; (2) Rendered image with objects; (3) Rendered image with local geometry (e.g. support plane); (4) Rendered mask image
- Final composited result



#### **4. Quality of results/report**

Nothing extra to include (scoring: 0=poor 5=average 10=great).

#### **5. Additional results (B&W)**

Include background image and final composited result image for: (10 pts each)

- New objects, same environment map
- New environment map, same objects

