Name (netid): Your Name (Your Netid)
CS 445 - Project 4: Image Based Lighting

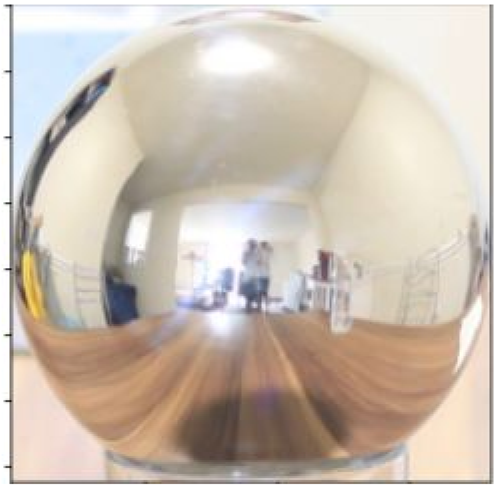
Complete the claimed points and sections below.

Total Points Claimed	**[ ] / 210**
Core	
1. Recovering HDR maps	
a. Data collection	[ ] / 20 (recorded in B&W)
b. Naive HDR merging	[ ] / 10
c. Weighted HDR merging	[ ] / 15
d. Calibrated HDR merging	[ ] / 15
e. Additional HDR questions	[ ] / 10
2. Panoramic transformations	[ ] / 10
3. Rendering synthetic objects	[ ] / 30
4. Quality of results / report	[ ] / 10
B&W	
5. Additional results	[ ] / 20
6. Other transformations	[ ] / 20
7. Photographer & Tripod removal	[ ] / 25
8. Local tone-mapping operator	[ ] / 25

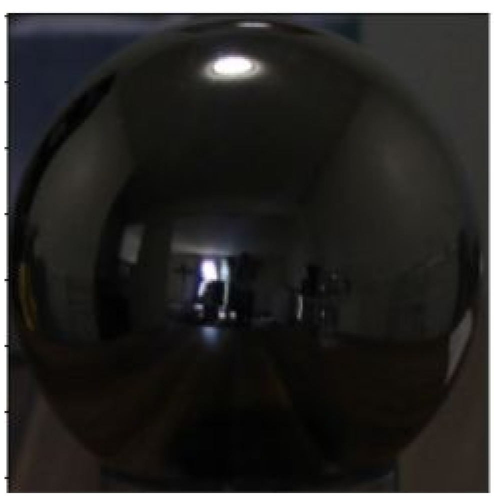
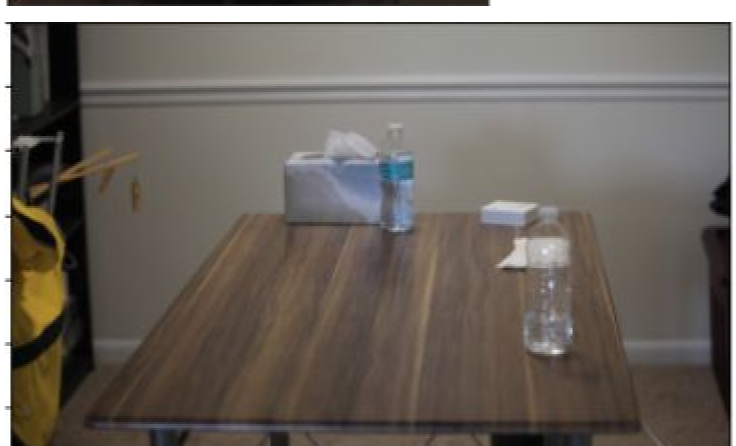
1. Recovering HDR maps

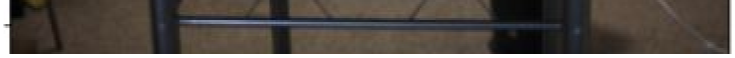
Include

- (a) Your LDR images (if you took your own)
  The following graphs correspond to shutter time:
  ['0024', '0060, '0120, '0205, '0553]
  The last picture is the background photo



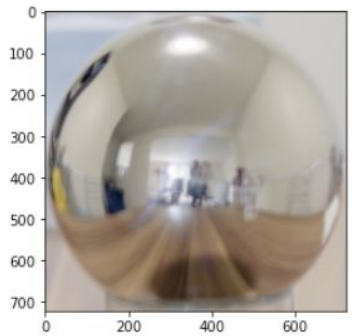


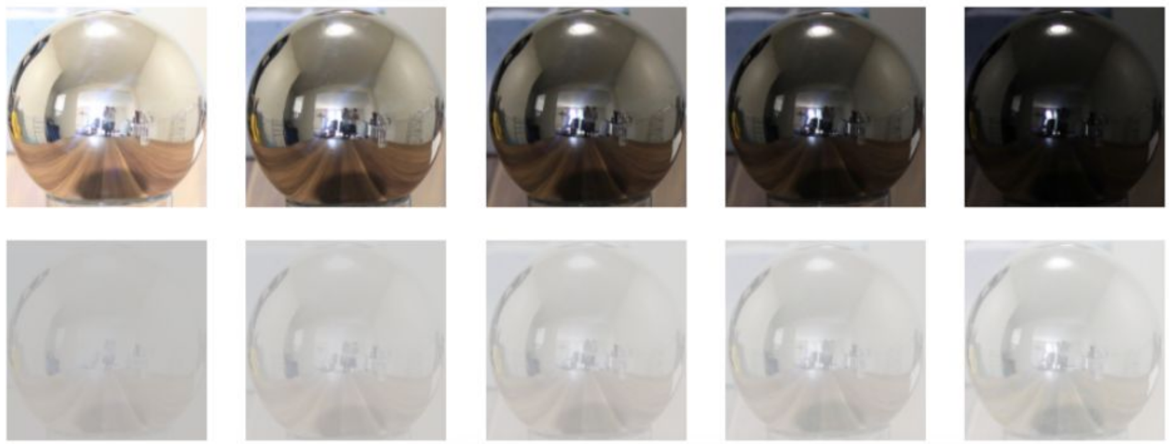





- (b) Figure of rescaled log irradiance images from naive method
  The bottom line of pictures are figures of rescaled log irradiance images from naive method

HDR Image





- (c_1)Figure of Weighted HDR merging

- (c_2) Figure of rescaled log irradiance images from calibration method
  Figure of Calibrated HDR merging

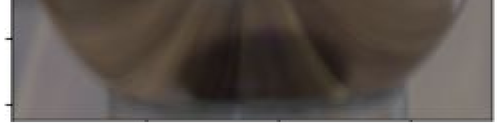
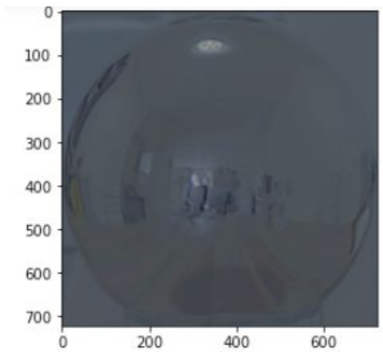
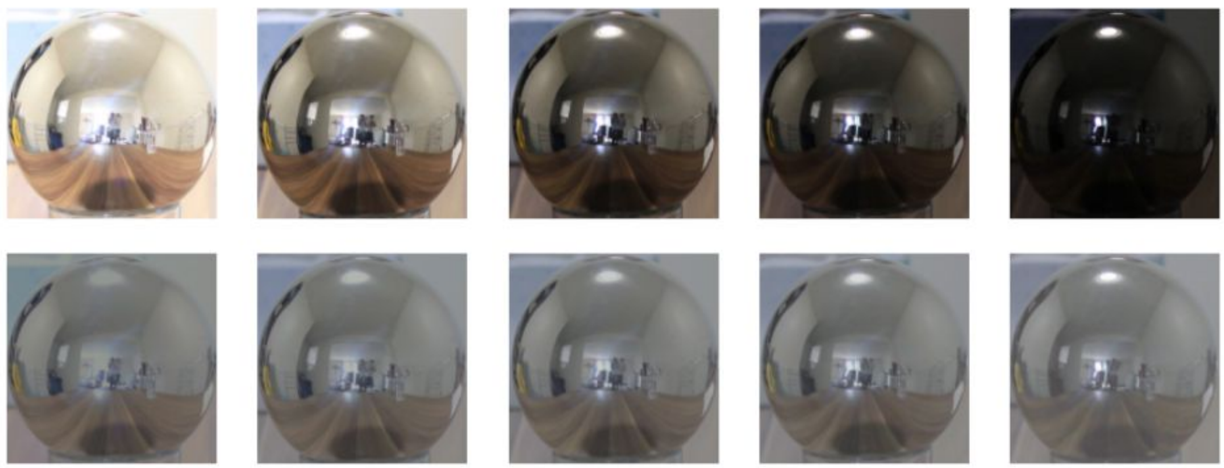
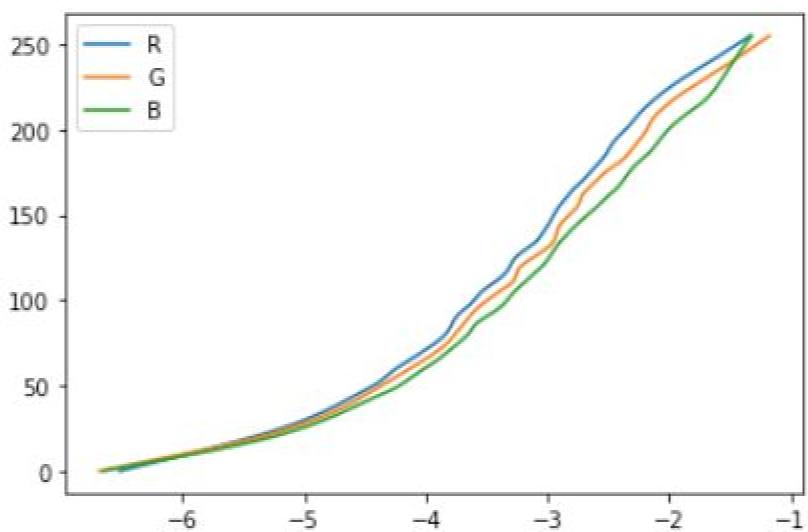


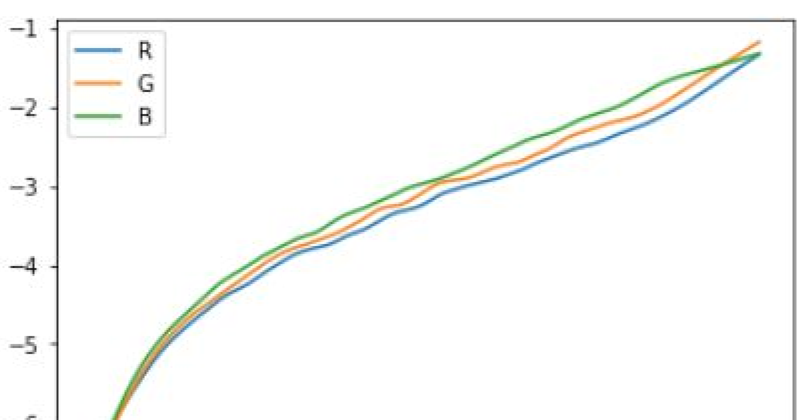
Figure of rescaled log irradiance images from calibration method





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





−6
0
50
100
150
200
250

- (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 = 2.755	avg RMS error = 4.574
weighted:	log range = 3.878	avg RMS error = 1.814
calibrated:	log range = 5.845	avg RMS error = 0.188

- (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?
   Underestimate. For instance, if we observe A: intensity of 128 over 0.1sec exposure time and B: intensity of 255 over 1 sec, then our estimated irradiance for A is 1280 and for B is 255. That value from A is more reasonable and the value from B too low. That's saying, If we just simply average all the intensities from different scenarios, then we will have a lower-than-real estimation for brightness.

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

   Weighted method assumes a linear relationship between the intensity in the picture and the intensity in the real world. Thus, it will modify the bright points and dark points in a more balanced way, and make the dynamic range larger. In one sentence, it can estimate the higher range of irridence.

3. Why does the calibration method result in a higher dynamic range than the weighting method?
   It calculated the inverse f function(g) so that we can have a map between image light intensity and the real light intensity, which enables even better and higher HDR. The relationship in the weighted method was linear. However, in real life, the relation is non-linear. So calibration considers the light intensity under different exposure times and can create an even larger range.

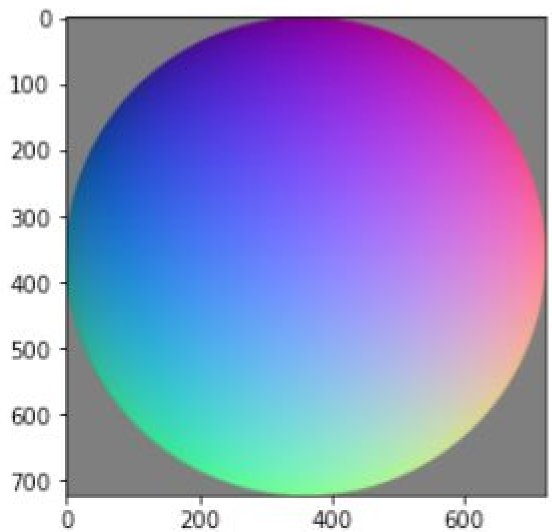
4. Why does the calibration method result in higher consistency, compared to the weighting method?

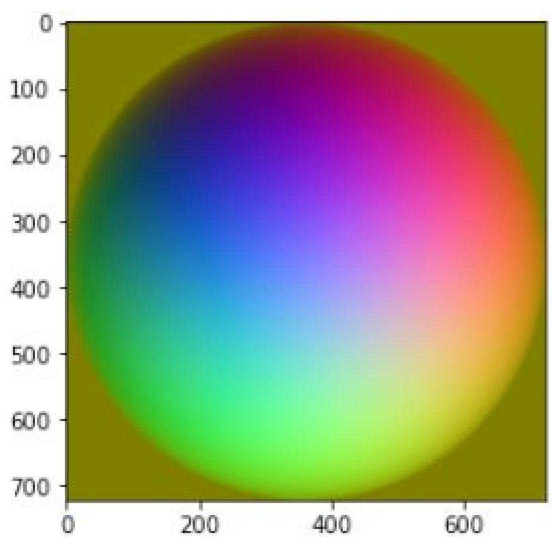
Similar to question3, calibration used the g function to secure a non-linear relationship between light intensity, exposure time and irradiance. While in weighted function, it assumes a linear relationship. The dynamic range of calibration method is larger than the range of weighting method. And there is a 1-to-1 mapping(light intensity in picture to irradiance) , which in a weighted method, the mapping is compressed over 0-255 due to assumption of linear relationship.

2. Panoramic transformations

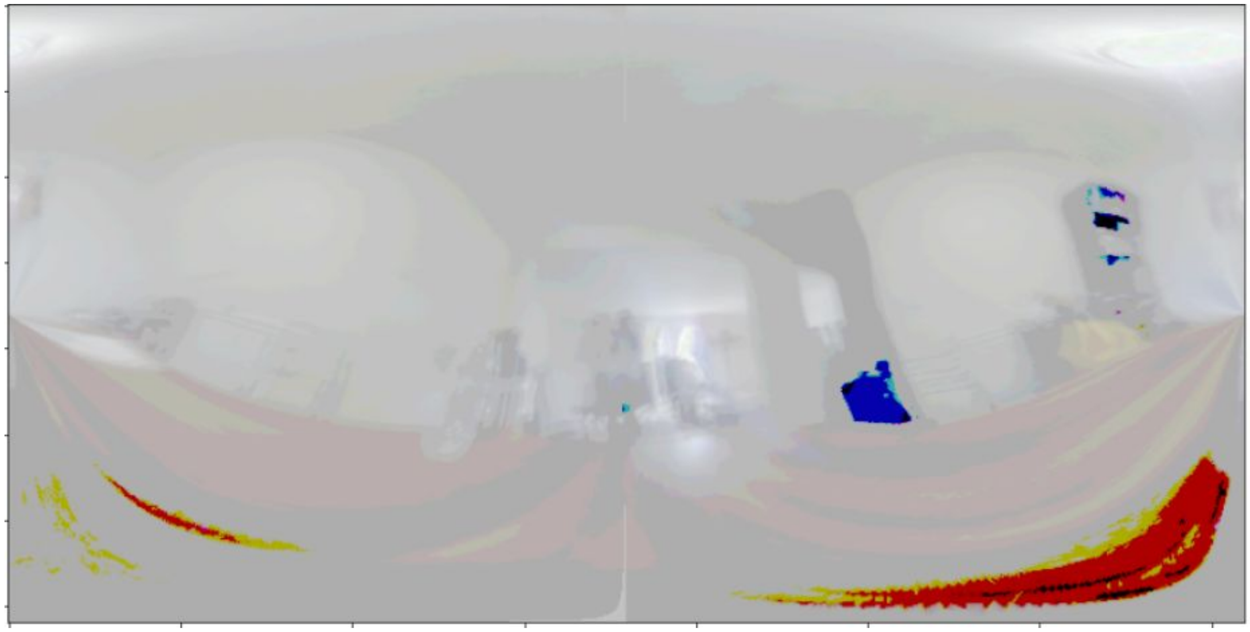
Include:

- The images of normal vectors and reflectance vectors





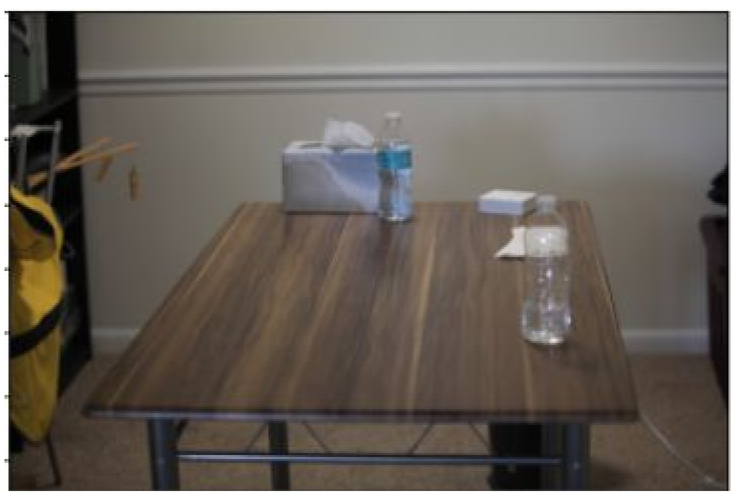
- The equirectangular image from your calibration HDR result

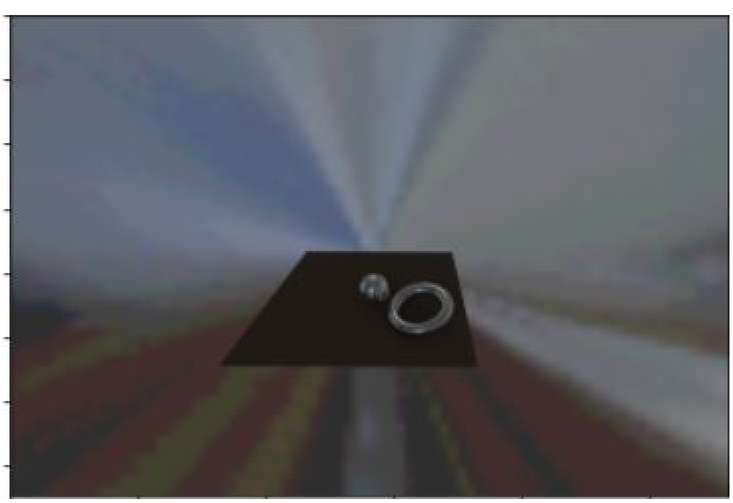


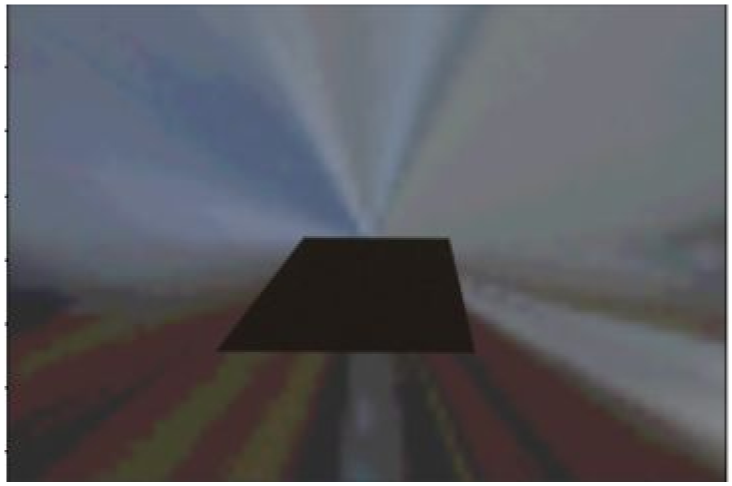
3. Rendering synthetic objects

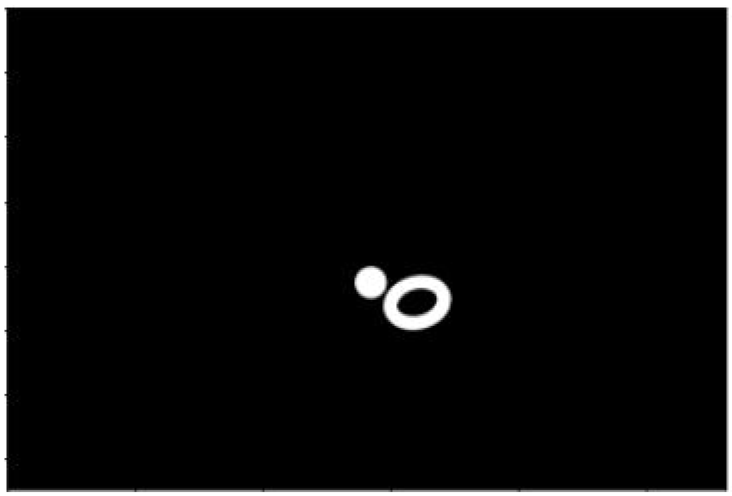
Include:

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

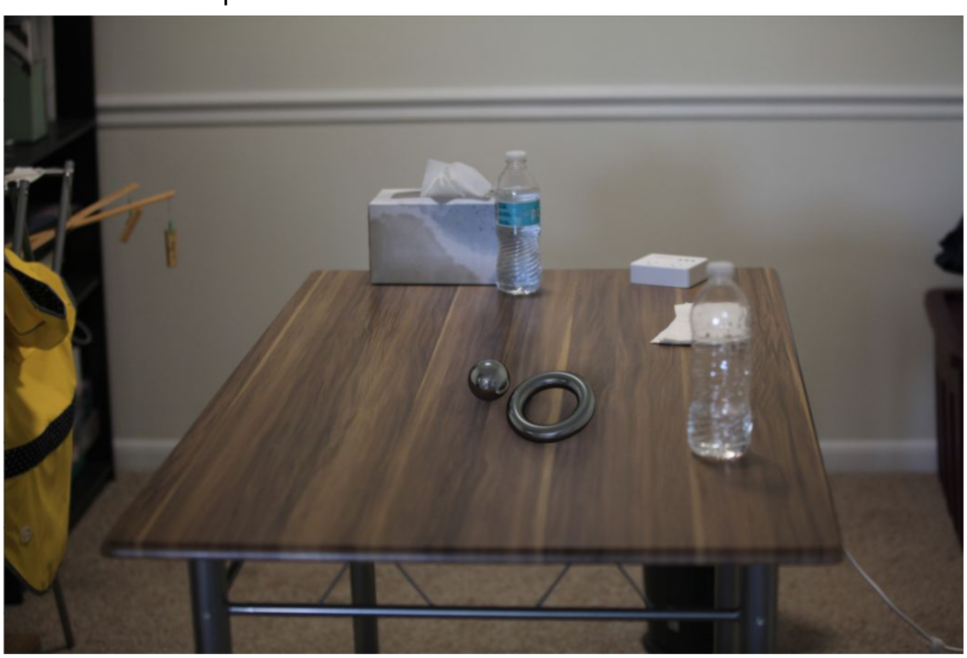








- Final composited result



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

6. Other transformations (B&W)

Include (10 pts each)
- Angular environment map
- Vertical cross environment map

7. Photographer and tripod removal (B&W)

Include:
- Original LDR images
- Equirectangular image created from your own photos without photographer
- Explain your method

8. Local tone-mapping operator (B&W)

Include:
- Displayed HDR image, computed as linearly rescaled log of HDR image
- Your HDR image display improved by tone mapping
- Explain your method

Acknowledgments / Attribution

List any sources for code or images from outside sources