

Arch 582

# Computational Lighting Design and Analysis

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## Project 1: Lighting Measurements with High Dynamic Range Photography

As highlighted in the course syllabus and throughout the lectures sessions, Computational Lighting Design is a course that draws from recent developments in lighting simulation, visualization, per-pixel data measurement and analysis techniques.

This project involves the evaluation of an existing space using HDR photography technique. You are asked to select a space and analyze the qualitative and quantitative properties of the luminous environment. Your project can either highlight good quality lighting or identify a problem. This exercise will give you an opportunity to study the quantitative measures (luminance values and variations) in combination with your experience and perception in the actual physical space.

### **(a) Capturing Process:**

Select a building that you have access to take photographs. You may use your own camera or check out a camera from the library (or instructor). Follow the multiple exposure image capturing guidelines described in class and documented in the tutorial. You should capture a variety of lighting conditions to analyze the space.

- You may capture a daylight scene in different times and/or different sky conditions.
- You may introduce operational dynamics by operating a shade fabric and/or blinds.
- You may capture different viewpoints to imitate a head/body movement of an occupant.
- You may also turn on/off or dim electric lights.

You should select a scene that is reasonably static. There are many interesting buildings in UW campus and around Puget Sound: be creative.

**(b) HDR Image Creation:**

Assemble HDR images from multiple exposure photographs using Photosphere.

**(c) Evaluation:**

You need to clearly state the set of *criteria and/or benchmarks* that you will use to evaluate the luminous environment. Since HDR photographs will allow you to study **luminance**, the criteria should include *luminance values, ranges, and distributions* (uniformity on the task or variation throughout the space). Utilize false-color luminance maps, tone mapped images, numerical values and histogram analysis to evaluate the space. What kind of information are you extracting from HDR images? What do they tell us about the luminous environment that is being analyzed? How is this technique useful as a design and/or analysis tool?

**(d) Presentation**

You are asked to give a presentation describing the outcome of HDR photography analysis of a selected scene (**January 31, 2012**). We will critique each others work, brainstorm about the capabilities and limitations of the technique. Prepare a 10-15 minute presentation with the following outline:

- I. Introduction: This section should include information about the selected building. Why did you select this particular scene for lighting analysis?
- II. Description of capturing process: This section should include the camera choice and settings.
- III. Description of the HDR image assembly process.
- IV. Description of the criteria and the lighting analysis performed based on HDR photographs.
- V. Discussions of the analysis results and evaluation of HDR photography technique, and potential applications...

Submission: The project consists 40% of your final grade. Please submit an electronic copy of your presentation (pdf or pptx) and up to 5 selected HDR images from the scenes.