

## Sheet R01 - Radiometry and Tonemapping

Solutions for the theoretical part via e-mail<sup>1</sup> or in written form by Mon, 26.06.2017, **2 p.m.** Points for the practical part will only be accredited after demonstration (whole group presence required) and discussion in the exercise on Tue, 27.06.2017 in the VR-Lab pool.

### Assignment 1) Tone mapping

(3Pts)

The subfolder "*tonemapping*" inside the framework archive contains a file *Buddha.mat* with a high dynamic range image  $I: \mathbb{N}^2 \times \{1, 2, 3\} \rightarrow \mathbb{R}$ ,  $(x, y, \lambda) \mapsto g$  and Matlab/Python scripts *tonemapping*. $\{m, py\}$ , one of which has to be completed in order to be able to display the data on a low-gamut device such as a computer screen. Implement the following tone mapping strategies:

- **Linear scaling:** Apply a linear scaling  $g \mapsto \lambda \cdot g$  to the image. Try out heuristic approaches like the one presented in slides 32 / 33 of the lecture or and experiment with other appropriate scaling factors to obtain satisfying results.
- **Gamma correction:** Apply a gamma correction  $g \mapsto g^\gamma$  to the image.  
You can also try a combination of scaling and gamma correction to achieve more pleasing results.
- **Histogram adjustment:** Apply the histogram adjustment method by Ward 97. Only consider the naïve method discussed on slide 40 of the lecture and assume  $\log(L_{dmin}) = 0$  and  $\log(L_{dmax}) = 1$ .

### Theoretical assignment

### Assignment 2) Radiance and Irradiance

(3Pts)

Consider the simple scene in Figure 1. Given the radiance of the sun  $L_s = 20.045 \frac{MW}{m^2 sr}$  and the direction  $v$  having an angle of  $45^\circ$  to the table, calculate the irradiance at the table and the total radiant power incident on the table plate. For this, assume that the radiance is constant over the whole surface of the sun. Note: you may have to look up some physical dimensions.

**Good luck !**

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<sup>1</sup>Please send emails to *all* tutors and with subject: '[atcg] submission'.

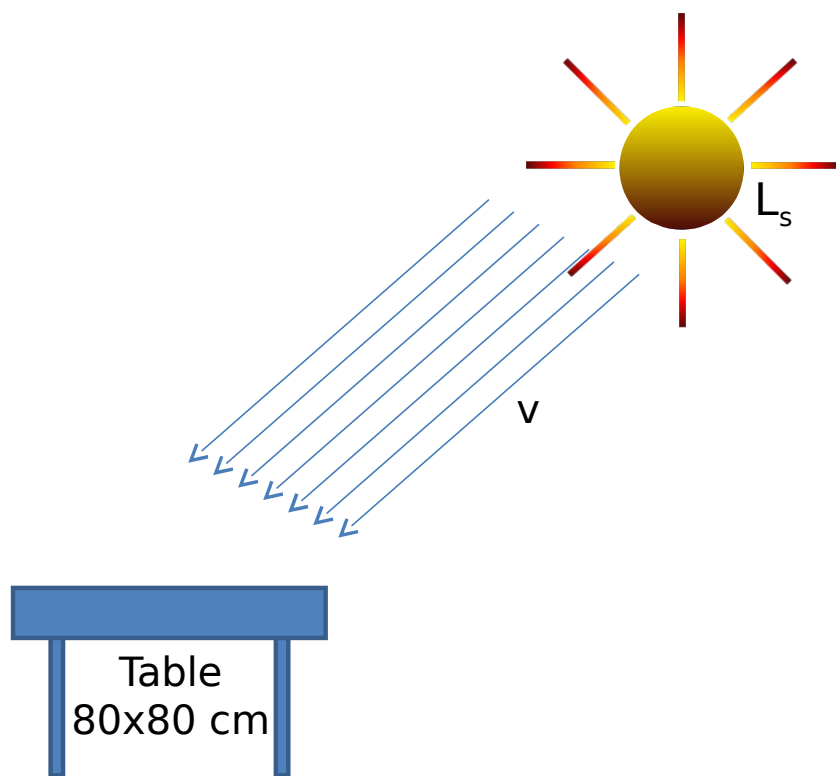


Figure 1: Toy example for radiometric quantities