Perceptual quality of analytical BRDF models: dataset and metrics
Supplementary Material

Guillaume Lavoué[1], Nicolas Bonneel[1], Jean-Philippe Farrugia[1], and Cyril Soler[2]

[1]CNRS, Univ. Lyon, LIRIS, France
[2]INRIA, Grenoble University, France

This supplementary material is organized as follows. Section 1 illustrates example pairs presented to the subjects (related to Sec. 4.2 of the paper). Section 2 provides details about the tone mapping. Section 3 provides sample images and MOS illustrating the influence of material type and illumination on the recognition of a same material (related to Sec. 5.3 and 5.4 of the paper).

1. Example pairs presented for training

Figure 1 illustrates the sample pairs that are presented to crowd-sourcers as training examples. The objective is to familiarize them with the task and with the range of qualities.

2. Tone-mapping

For tone-mapping we use a slightly simplified version of the algorithm used in the original ILM's 'exrdisplay' viewer (See *https://openexr.com*), which pseudo-code is depicted in the Figure below:

$$\text{all channels } c \text{ in } (r, g, b)$$
$$c_{out} = c * e;$$

$$c_{out} = \log(c_{out} * f + 1)/f;$$

$$c_{out} = \text{pow}(c_{out}, 1/\gamma);$$

$$c_{out} = \text{clamp}(0, 1, c_{out});$$

For all our images, we used $1/\gamma = 0.8$, $f = 5$ and $e = 0.1$. The original implementation can be found here: *http://download.savannah.nongnu.org/releases/openexr/openexr-2.2.0.tar.gz* in file *ImageView.cpp*.

3. Effect of type and illumination of the recognition of a same material

Figures 2 and 3 illustrate how the type of material (dielectric / metal) and the illumination influence the recognition of a same material.

The left material is *very glossy* while the right one is *completely matte*.

Because of this *very large difference in gloss*, an appropriate answer here would be:
1 - Very Poor

The left material is yellow and quite*glossy* while the right one is *rathermatte*with quite*a different color.*

These are *differences in both the gloss and color,* hence an appropriate answer here could be:
2 - Poor
or
1 - Very Poor

The two materials have the same color but have a *significant difference* in appearance.
Hence, an appropriate answer could be:
3 - Moderate

The two materials are quite similar, with *slight differences in both gloss and color*. Hence, an appropriate answer could be: **4- Good**

No difference of material can be perceived. Hence, an appropriate answer could be: **5 - Excellent**

No difference of material can be perceived. Hence, an appropriate answer could be: **5 - Excellent**

Figure 1: Illustration of the 6 example pairs of images presented to the subject before beginning the rating. They intend to represent diverse ranges of material qualities, and are provided with possible correct answers and explanations.

| Reference | Hidden Reference - MOS = 4.73 | Reference | Hidden Reference - MOS = 4.13 |

Figure 2: Test (hidden reference) and reference images for *gold-metallic-paint3* (left) and *yellow-paint* (right) and corresponding mean opinion scores. Specular reflections present on the metal help the user to identify the material, resulting in a higher MOS.

| Reference | Hidden Reference - MOS = 4.63 | Reference | Hidden Reference - MOS = 4.23 |

Figure 3: Test (hidden reference) and reference images for *dark-blue-paint* with *Grace* (left) and *Uffizi* (right) illumination and corresponding mean opinion scores. Specular reflections due to the high frequencies of *Grace* help the user to identify the material, resulting in a higher MOS.