Material Qualities in the Eye of the Beholder

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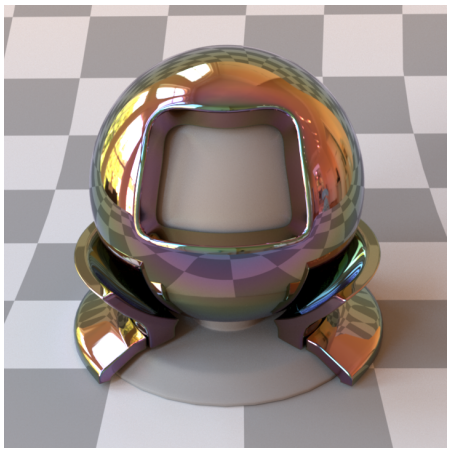

The physical description of a material is usually done through the Bidirectional Reflectance Distribution Function (BRDF), which characterizes reflectance at a point for any viewing or lighting direction. It is often assumed to be an objective characterization of a material. Yet a closer look at how BRDF models are used in Computer Graphics reveals they involve many choices: of scale, of geometric vs wave optics, of statistical assumptions, of model simplifications, etc. I argue that what motivates these choices remains subjective: what is of interest is often a combination of physical plausibility, visual adequacy, and mathematical convenience. I will present three projects where the material modeling decisions occur at different scales and entail different choices. I will start at the nano scale with a model of thin-film interference adapted to tristimulus rendering; then I will present a study of existing layered material models that work at the micro scale and the challenges posed by inverse design; finally I will introduce preliminary work on wet surfaces where meso-scale characteristics seem essential to conveil a liquid of adequate viscosity. These three projects will try to illustrate the intricate relationships between optics, graphics and vision for the specific case of material appearance.

Reference:

Belcour & Barla (2017) A Practical Extension to Microfacet Theory for the Modeling of Varying Iridescence, ACM Transactions on Graphics (proceedings of Siggraph)

Bati, Pacanowski, Barla (2019) Numerical Analysis of Layered Material Models, Research report (https://hal.inria.fr/hal-02157966)

Biography:

Pascal Barla received his PhD in Computer Science from Institut National Polytechnique de Grenoble in 2006. He later joined Inria in 2007, where he is currently a researcher and head of the Manao project team. His current research explores a variety of topics related to images: material properties, lighting design, image features, surface features, expressive shading, 2D animation, digital drawing, motion flows. He also has a profound interest in understanding how the optical structures of objects at microscopic scales and their agency at increasingly larger scales are related to visual awareness.