Numerical comparison of sampling strategies for BRDF data manifolds

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Abstract:
The bidirectional reflectance distribution function (BRDF) is one of the fundamental concepts in such diverse fields as multidimensional reflectometry, computer graphics and computer vision. BRDF manifolds form an infinite-dimensional space, but typically the available measurements are very scarce. Therefore, an efficient learning strategy is crucial when performing the measurements.

In this paper, we perform simulation studies within a mathematical framework that allows to establish more efficient BRDF sampling and measurement strategies in the sense of statistical design of experiments and generalized proactive learning. Our simulation studies suggest that the default BRDF measurement strategy is suboptimal for a wide class of loss functions.

Keywords and phrases: Design of experiments, active learning, BRDF, diffuse reflection, specular reflection, computer graphics, computer vision, metrology, data analysis, statistics of manifolds, distance on the space of BRDFs.

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