The Bi-Directional Reflectance Distribution Function (BRDF) – Measurement and Analysis Techniques

BRADLEY BALLING, MICHAEL MARCINIAK, Air Force Institute of Technology — The Bi-Directional Reflectance Distribution Function (BRDF) either defines or represents how light reflects off a surface; it is a subset of the larger family of Bi-Directional Scatter Distribution Functions which include transmission distribution, as well. This work seeks to define and explore the BRDF through the use of both analytic and measurement techniques. Both representative and more physically based BRDF models are fit to data collected from a variety of samples using a Schmitt Industries’ Complete Angle Scatter Instrument. In particular, a measurement methodology and statistical analysis of a calibrated diffuse reflectance standard supplied by the National Institute of Standards and Technology (NIST) will be presented to demonstrate the repeatability of the measurement technique and just how much directional dependence a real-world “perfectly diffuse” reflector actually has. Analysis shows that the more physically based BRDFs do represent measured data more accurately, and hold the potential to be predictive, rather than merely a representation of previously measured surfaces.

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Date submitted: 01 Oct 2008