OpenBRDF – An Open System for Reflection and Transmittance Distribution Functions

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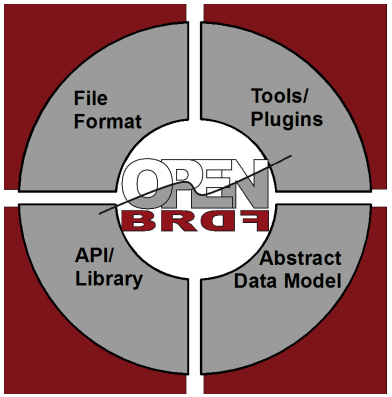
Motivation

- In computer graphics heuristic models or more advanced physically based lighting models describe the appearance of materials.
- Rather than attempting to model material many efforts have been made to develop methods to sample them ([Dan01, MPBM03b, MMS*04, HNZ*05, WLL*08]).
- Much more samples will soon be available: commodity sampling devices can be expected in the near future.
- An open system for measured surface reflectance and transmittance distribution functions is needed!



References

[Dan01] Dana K.: Brdf/btf measurement device. In *ICCV* (2001).

[HNZ*05] Havran V., Neumann A., Zotti G., Purgathofer W., Seidel H.-P.: On cross-validation and resampling of brdf data measurements. In *SCCG '05: Proceedings of the 21st spring conference on Computer graphics* (2005), ACM, pp. 161–168.

[MMS*04] Müller G., Meseth J., Sattler M., Sarlette R., Klein R.: Acquisition, synthesis and rendering of bidirectional texture functions. In *Eurographics 2004, State of the Art Reports* (2004), pp. 69–94.

[MPBM03a] Matusik W., Pfister H., Brand M., McMillan L.: A data-driven reflectance model. In *SIGGRAPH '03* (2003), ACM, pp. 759–769.

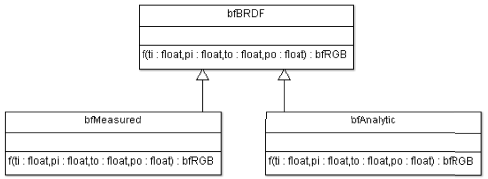
[MPBM03b] Matusik W., Pfister H., Brand M., McMillan L.: Efficient isotropic brdf measurement. In *EGRW '03: Proceedings of the 14th Eurographics workshop on Rendering* (2003), Eurographics Association, pp. 241–247.

[PH04] Pharr, Matt, Humphreys, Greg: *Physically Based Rendering*. Morgan Kaufmann, 2004.

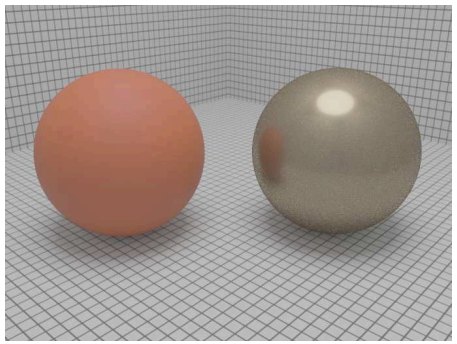
[WLL*08] Weyrich T., Lawrence J., Lensch H., Rusinkiewicz S., Zickler T.: Principles of appearance acquisition and representation. In *SIGGRAPH '08: ACM SIGGRAPH 2008 classes* (2008), pp. 1–119.

Results

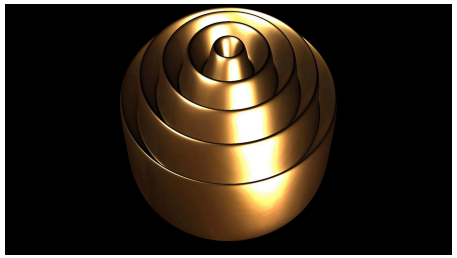
- Abstract data model and C++ toolkit
- Im- and exporters for datasets
- Approximation and conversion of datasets



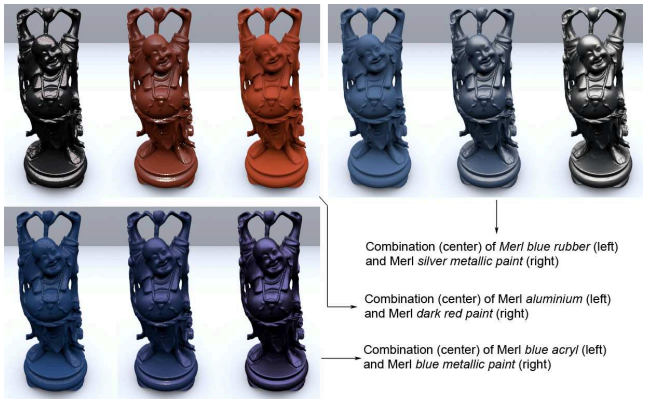
- Integration in pbrt 2.0 [PH04] using the OpenBRDF API (Left: measured diffuse light-brown, right: gold metallic paint, MERL [MPBM03a])



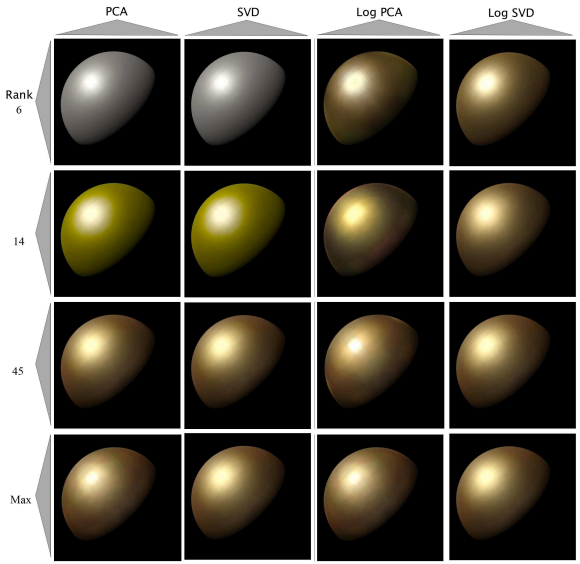
- Integration in mental ray 3.7 and Autodesk Maya 2010



- Linear dimension reduction algorithms using Principal Component Analysis and Singular Value Decomposition
- Creating new materials using linear combinations of measured materials in low-dimensional subspaces.



- A MERL gold metallic paint rendered with pbrt (Different ranks (6,14,45,100), different algorithms for dimension reduction (SVD, PCA), with and without logarithmic scale).



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