An Improved Multiple Scattering Reflectance Model Based on Specular V-Cavity

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Abstract : Microfacet-based reflection models are widely used to model light reflections for rough surfaces. Microfacet models have become the standard surface material building block for describing specular components with varying roughness; and yet, while they possess many desirable properties as well as produce convincing results, their design ignores important sources of scattering, which can cause a significant loss of energy. Specifically, they only simulate the single scattering on the microfacets and ignore the subsequent interactions. As the roughness increases, the interaction will become more and more important. So a multiple-scattering microfacet model based on specular V-cavity is presented for this important open problem. However, it spends much unnecessary rendering time because of setting the same number of scatterings for different roughness surfaces. In this paper, we design a geometric attenuation term G to compute the BRDF (Bidirectional reflection distribution function) of multiple scattering of rough surfaces. Moreover, we consider determining the number of scattering by deterministic heuristics for different roughness surfaces. As a result, our model produces a similar appearance of the objects with the state of the art model with significantly improved rendering efficiency. Finally, we derive a multiple scattering BRDF based on the original microfacet framework.