

WEIZHEN HUANG¹, MATTHIAS B. HULLIN¹, JOHANNES HANIKA²

¹UNIVERSITY OF BONN, GERMANY ²KARLSRUHE INSTITUTE OF TECHNOLOGY, GERMANY

PROBLEM

Traditional hair scattering model [1] assumes that the bidirectional curve scattering distribution function (BCSDF) is separable in the longitudinal and azimuthal directions, which does not correspond to the measurement [2].

There has been an attempt to address the nonseparability of the BCSDF [3]; however, it is only an approximation of the underlying rough cylinder assumption and is only available for circular cross sections.

RELATED WORK

To our knowledge, [3] is the only previous work that proposed a non-separable model for circular hair fibers.

Recent works on rendering elliptical hair fibers [2,4] are based on separable BCSDF proposed by Marschner et al. [1].

OUR APPROACH

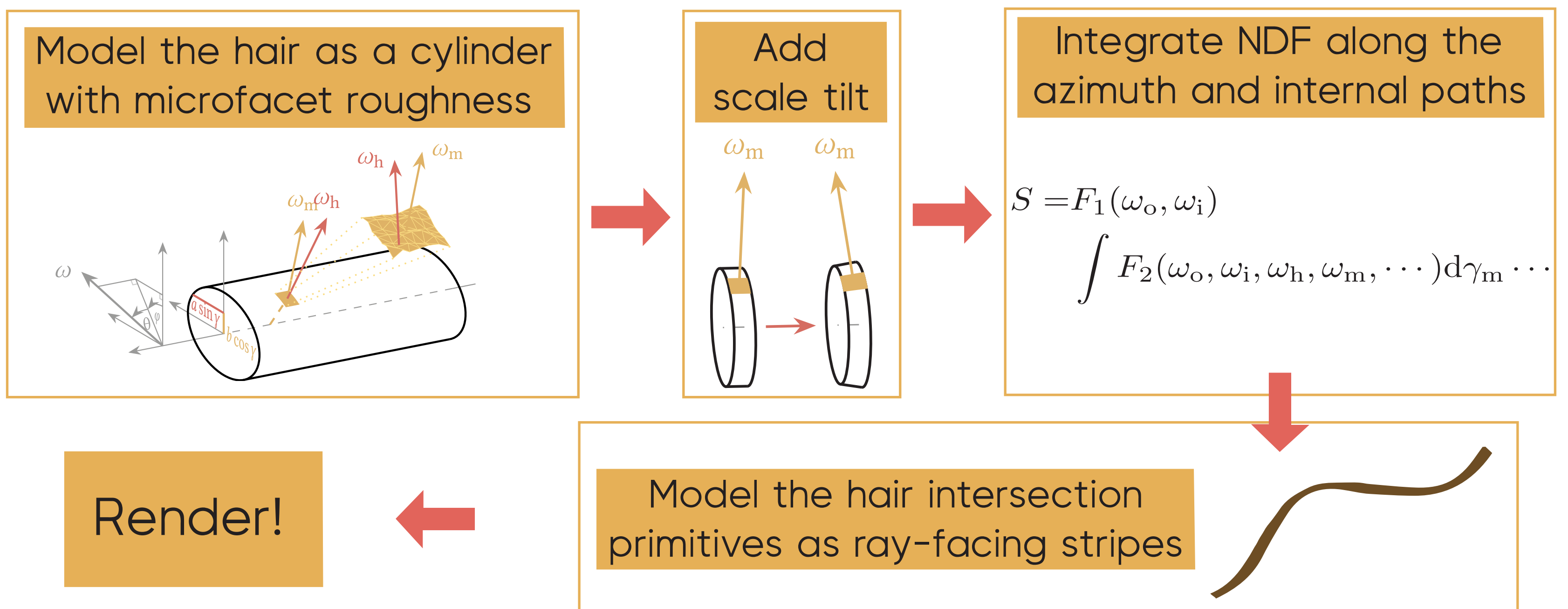
We model a hair fiber as an elliptical cylinder with microfacet roughness and calculate the radiometric quantities directly as light interacts with it. This results in a set of integral equations, which we evaluate by combining quadrature and Monte-Carlo sampling.

REFERENCES

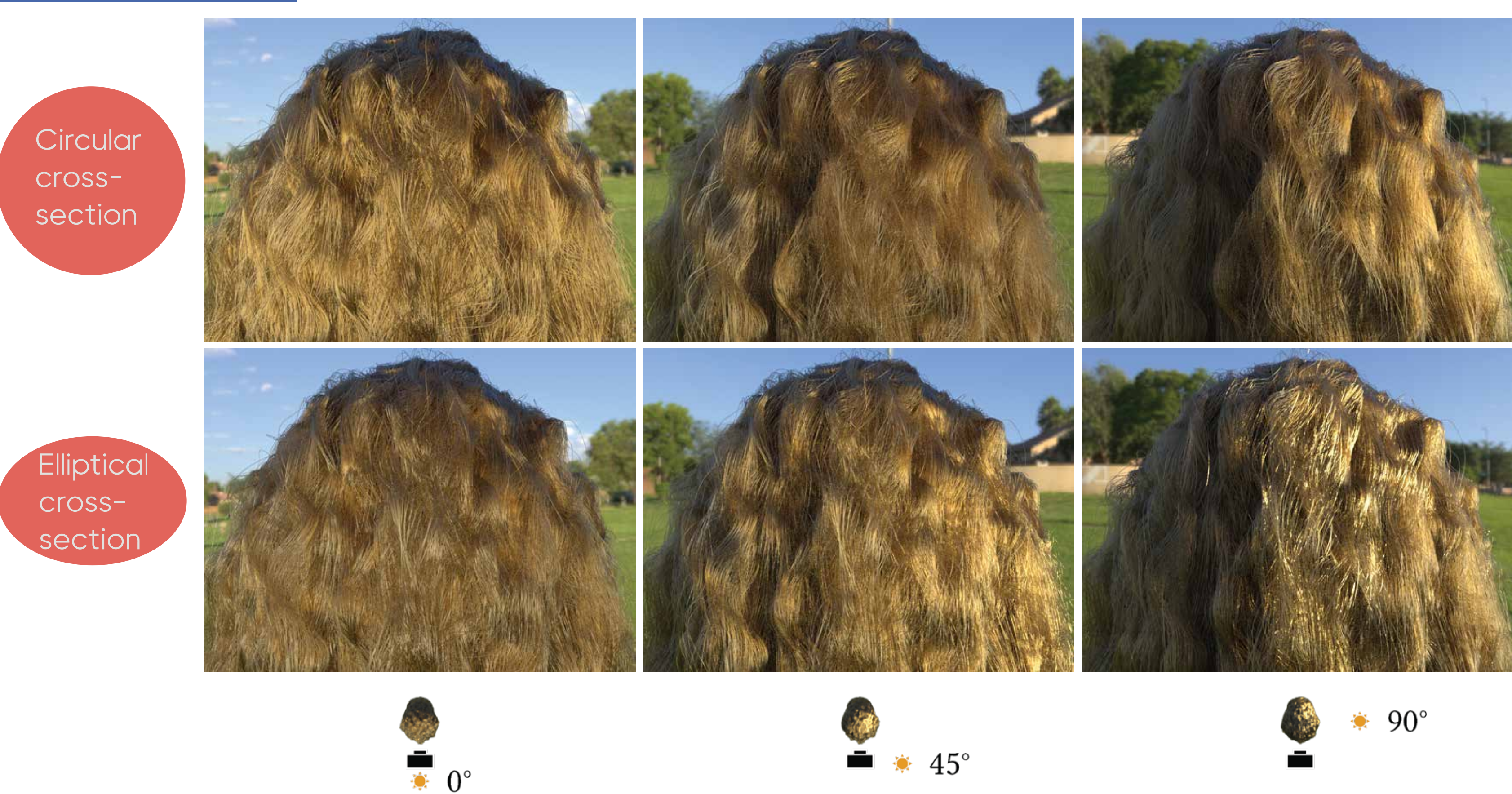
- [1] Stephen R Marschner, Henrik Wann Jensen, Mike Cammarano, Steve Worley, and Pat Hanrahan. 2003. Light scattering from human hair fibers. *ACM Transactions on Graphics (TOG)* 22, 3 (2003), 780–791.
- [2] Pramook Khungurn and Steve Marschner. 2017. Azimuthal scattering from elliptical hair fibers. *ACM Transactions on Graphics (TOG)* 36, 2 (2017), 1–23.
- [3] Eugene d'Eon, Steve Marschner, and Johannes Hanika. 2014. A fiber scattering model with non-separable lobes. In *ACM SIGGRAPH 2014 Talks*. 1–1.
- [4] Alexis Benamira and Sumanta Pattanaik. 2021. A Combined Scattering and Diffraction Model for Elliptical Hair Rendering. *Computer Graphics Forum* (2021).



METHOD



RESULTS



1024x1024, 256 spp, 21 min

1024x1024, 256 spp, 26 min

