数理・情報のフロンティア
2021 年度採択研究者

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# 計算機による伝統木工支援 ／ Computer-Assisted Wood Craft

## §1. 研究成果の概要

The research concerns analyzing wood grain patterns for applications in visualization and fabrication. The main achievement of this year was the development of a procedural texturing framework for solid wood with knots. Knots are those darker spots in the wood texture, caused by branches growing out form the stem of a tree. They are particularly common to softwoods, such as pine and spruce. There was no previous method to efficiently model their volumetric structure, although it is a common feature seen in many wood materials in our environment. The research was conducted in collaboration with wood engineering scientists. We first studied computed tomography (CT) scan image slices of tree logs from pine and spruce. Then, we used implicit modeling techniques to efficiently model knotted wood. As results, we presented rendered images (Fig. 1). Specifically, we implemented a shader program, where the annual ring pattern is represented by a scalar field of time of added growth. To handle a grafted internal skeleton, we leveraged smooth minimum unions. This work resulted in a publication to be presented at SIGGRAPH 2022 (1). For the future steps, we want to develop a system to automatically infer the volumetric annual ring pattern based on a reference image of the exterior of a physical piece of wood, and use this information for applications in computer numerical control (CNC) fabrication of artifacts and structures.

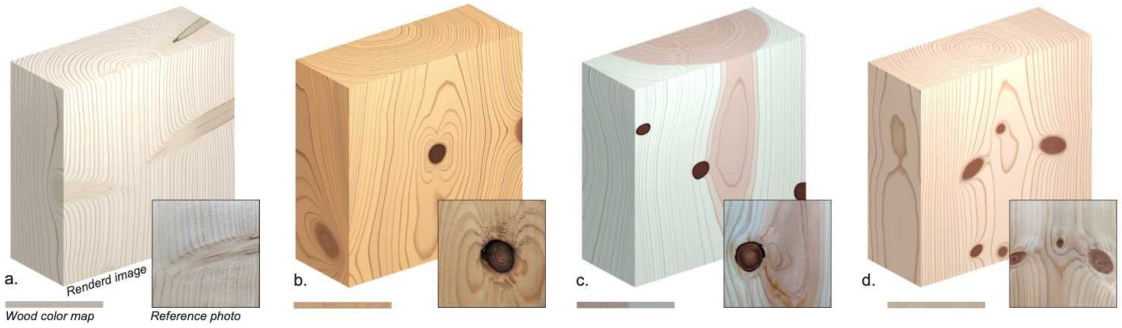


Fig. 1

【代表的な原著論文情報】

1. Maria Larsson, Takashi Ijiri, Hironori Yoshida, Johannes Huber, Magnus Fredriksson, Olof Broman, and Takeo Igarashi. ”Procedural Texturing of Solid Wood with Knots.” ACM Trans. Graph. 41, 4, Article 45 (Proceedings of SIGGRAPH) 9 pages. July 2022. (Accepted for publication)