

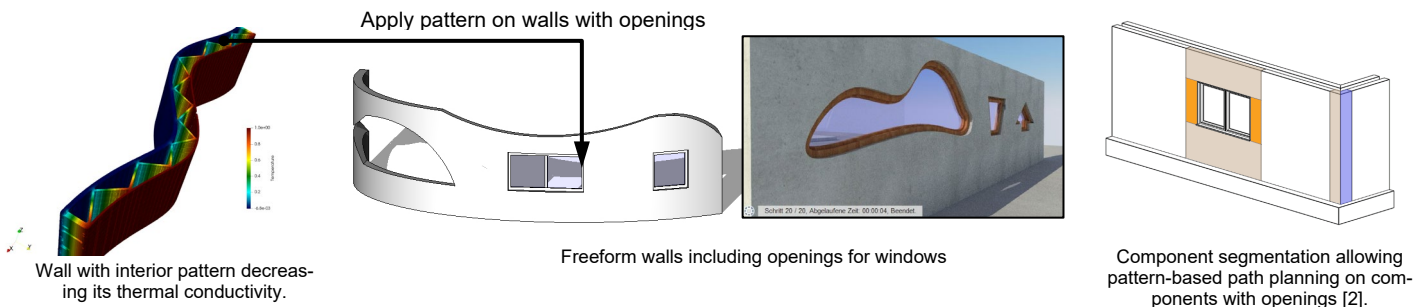
Software Lab:

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Pattern-based printing of building components with openings and functional integrations

Description

Extrusion-based concrete 3D printing is becoming increasingly important in the AEC industry. As an AM method, this technology plays a key role in the ongoing digitalization of the construction industry. In this method, components are manufactured by robots controlled on the basis of digital models. A particularly well suited methodology for generating these digital models the Building Information Modeling (BIM) methodology must be named. When combining BIM and AM a full digital chain from design to manufacturing can be established [1]. For generating fabrication information based on BIM-models, a pattern-based approach has been developed and tested for simple components (walls without openings and columns). In the context of this project, the Fabrication Information Modeling (FIM) methodology [1] is supposed to be extended with additional design patterns. These design patterns should be applicable to complex building components, such as walls with openings for windows and doors or other fixtures (pipes, cables, etc.).

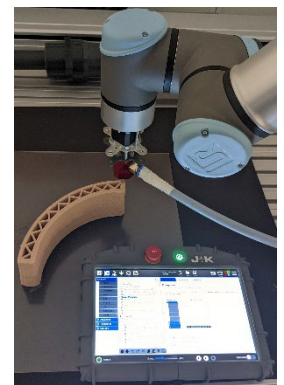


Task

Develop a methodology to enable pattern-based design of fabrication information for building components that include (freeform) openings for doors, windows and other installations.

GENERAL INSTRUCTIONS:

- Generate a BIM model of a residential building featuring irregular shapes
- Split the model into printable components
- Apply pattern-based methodology to generate Fabrication Information Models
- Print components with small-scale clay printing setup
- Develop pick and place methodology for placing installations during print-time



Small-scale clay printing setup

Supervisor

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References

- [1] M. Slepicka, S. Vilgertshofer and A. Borrmann, "Fabrication information modeling: interfacing building information modeling with digital fabrication.," *Construction Robotics*, vol. 6, pp. 87-99, 2022.
- [2] A. Cavieres, R. Gentry und C. Eastman, „A Process-Driven Representation Schema for Masonry Wall Assemblies,“ *Proceedings of the 33rd International Symposium on Automation and Robotics in Construction (ISARC)*, pp. 914-922, 2016.

