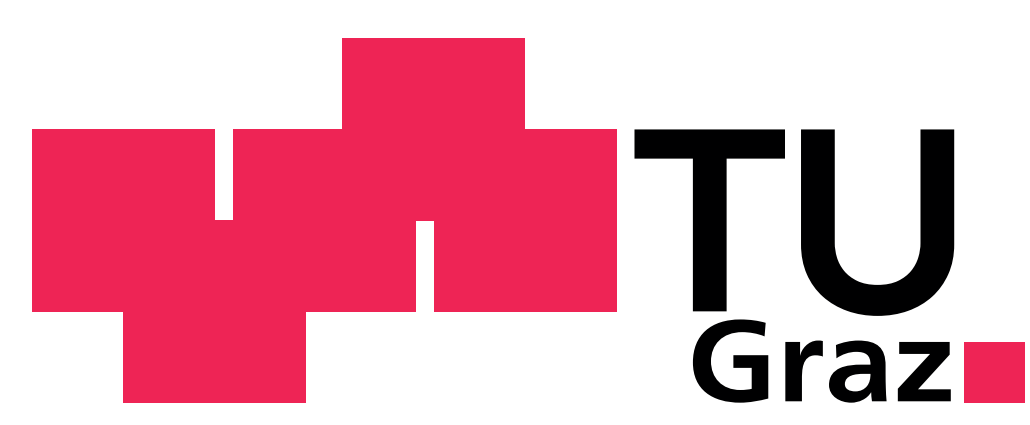


# KNITSIM: KNITTING SIMULATION FOR FABRIC PATTERN VISUALIZATION



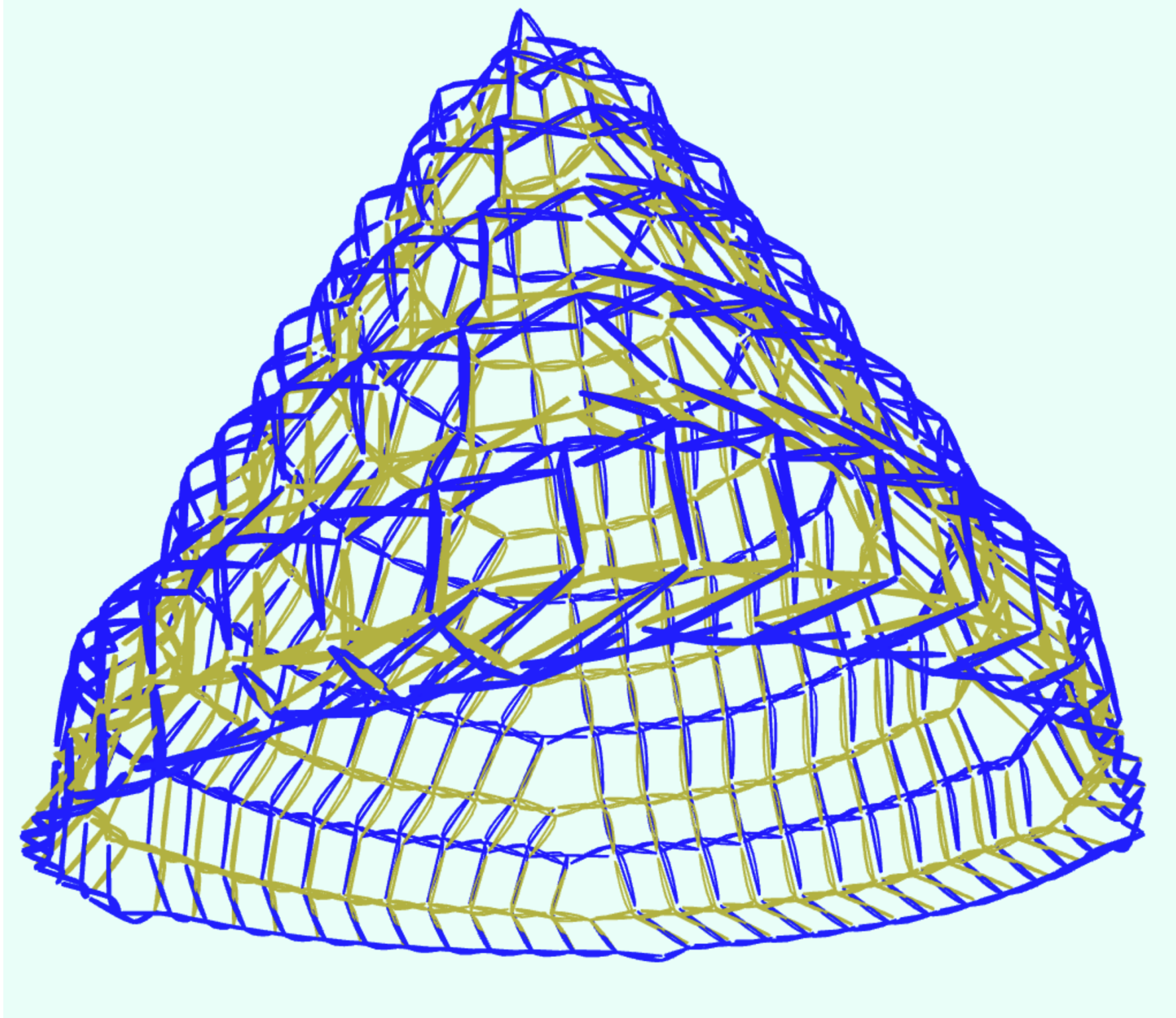
Benedikt Kantz<sup>1\*</sup>, Peter Waldert<sup>1</sup>,  
Tobias Schreck<sup>1</sup>, Reinhold Preiner<sup>1</sup>

<sup>1</sup>Institute of Visual Computing, Graz University of Technology  
\* Corresponding author, [benedikt.kantz@tugraz.at](mailto:benedikt.kantz@tugraz.at)



## KNITTING PROCESS

- Lengthy and manual, requires careful planning; and results in 3D pieces:
  - (a) is inherently 3D due to offsets,
  - (b) knitting pieces are commonly 3D structures, e.g. socks, hats, clothing, ...
- Goal: simulate relaxing fabrics to visualize final piece based on knitting pattern.
- Our Approach: web-based simulation of fabric and pattern combinations beforehand using an interactive code editor.



## EXISTING GENERATIVE SYSTEMS

- *deepKnit* [1]: Machine Learning (ML)-based generation of novel fabrics, including visualization.
- Narayanan et al. [2]: generates patterns (graphs) from meshes, with manual adjustments.
- Yu and McCann [3]: code-based generation.

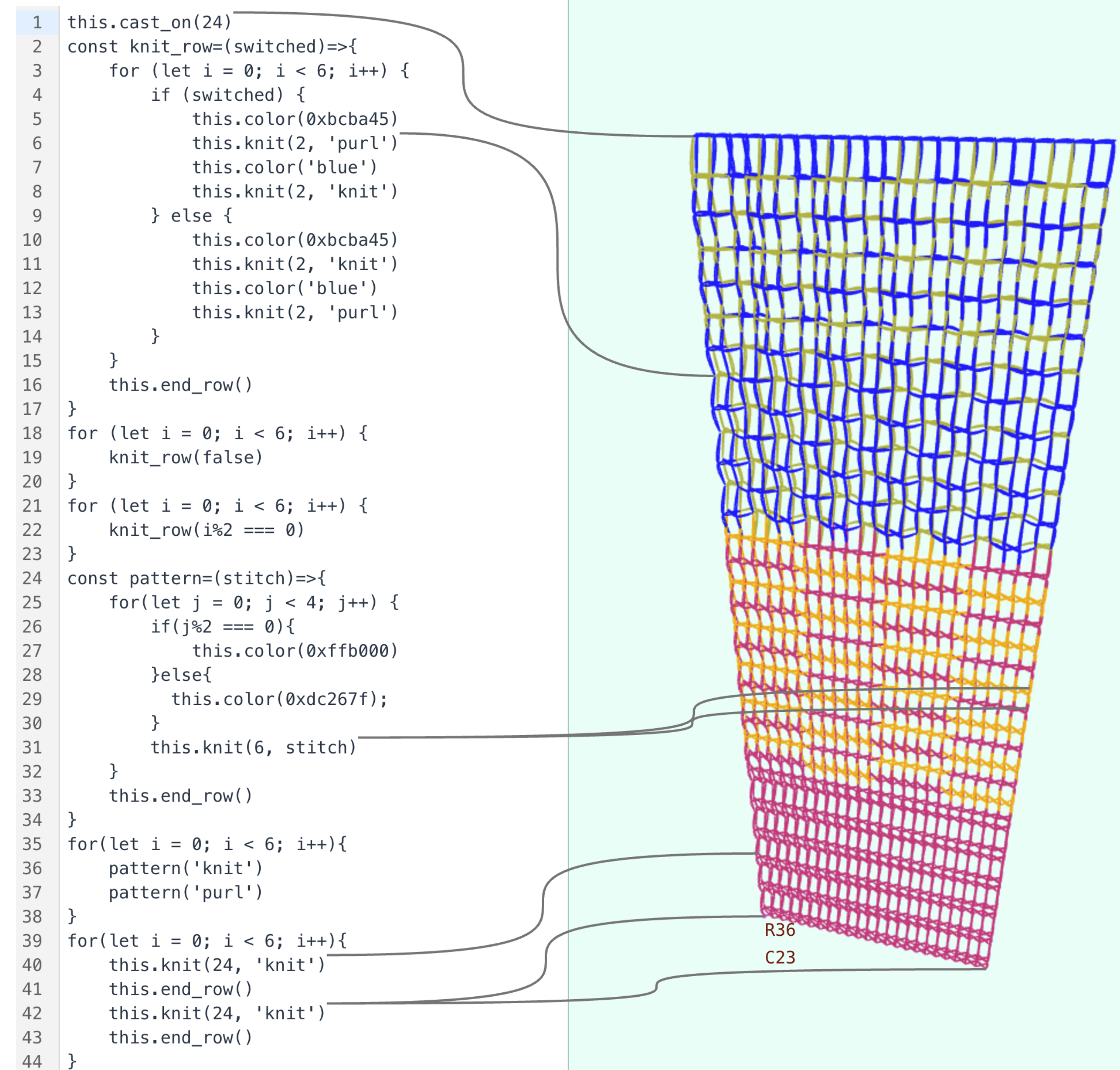
## EXISTING KNITTING EDITORS

- Yu and McCann [3]: linking code to 2D-view of knitting patterns.
- *Knitting Skeletons* [4]: add force simulation to gauge fabric stresses.

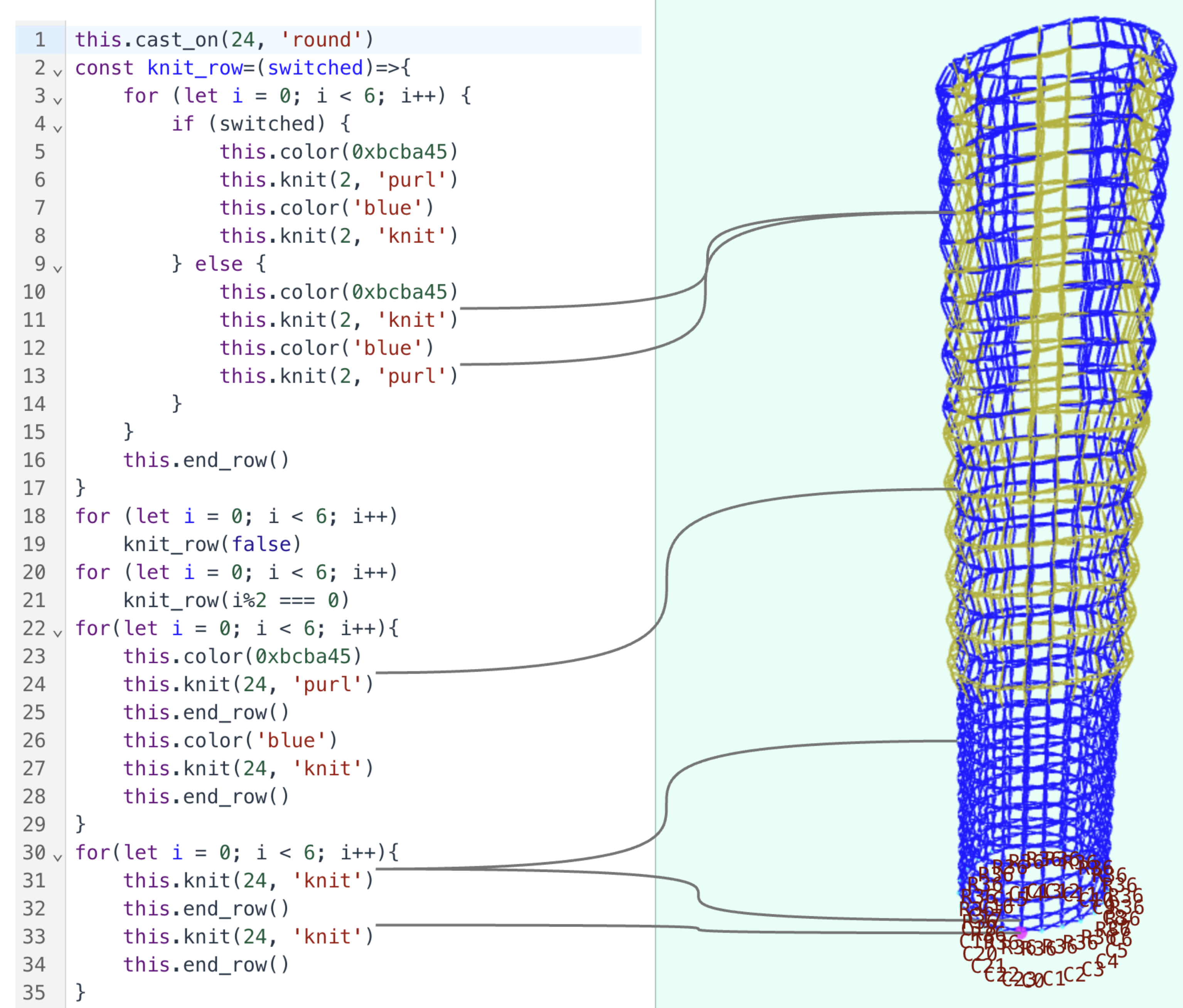
→ KnitSim: an integrated & coherent design and editing framework on the web.

## LINKED VIEWS

Code Editor



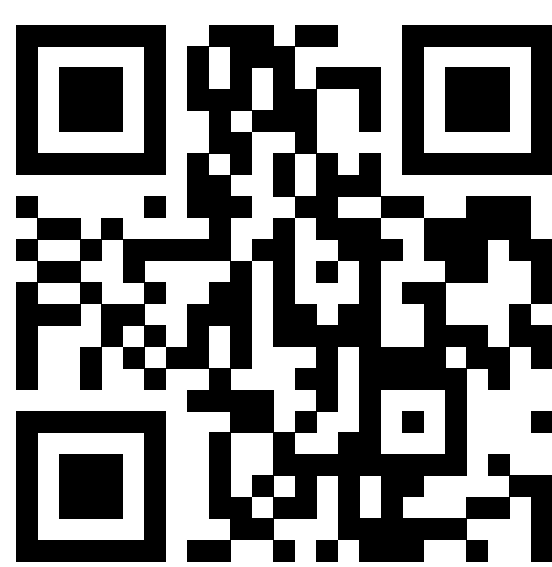
Code Editor



## BUILDING ON KNITSIM

- Code building improvements: Language Model (LM)-assistance, block-based building of code.
- Improve traceability: through highlights in code & 3D-view.
- Fabric rendering: improved rendering of continuous and interlocking knits.
- Allow for more complex topologies: e.g. shirts, trousers, ...

## LINK



Demo

Code

## REFERENCES

[1] Fabian Scheidt, Jifei Ou, Hiroshi Ishii and Tobias Meisen. ‘deepKnit: Learning-based Generation of Machine Knitting Code’. In: *Procedia Manufacturing* 51 (2020). 30th International Conference on Flexible Automation and Intelligent Manufacturing (FAIM2021), pp. 485–492. ISSN: 2351-9789.

[2] Vidya Narayanan, Kui Wu, Cem Yuksel and James McCann. ‘Visual knitting machine programming’. In: *ACM Trans. Graph.* 38.4 (July 2019). ISSN: 0730-0301.

[3] Tianhong Catherine Yu and James McCann. ‘Coupling Programs and Visualization for Machine Knitting’. In: *Proceedings of the 5th Annual ACM Symposium on Computational Fabrication*. SCF ’20. Virtual Event, USA: Association for Computing Machinery, 2020. ISBN: 9781450381703.

[4] Alexandre Kaspar, Liane Makatura and Wojciech Matusik. ‘Knitting Skeletons: A Computer-Aided Design Tool for Shaping and Patterning of Knitted Garments’. In: *Proceedings of the 32nd Annual ACM Symposium on User Interface Software and Technology*. UIST ’19. New Orleans, LA, USA: Association for Computing Machinery, 2019, pp. 53–65. ISBN: 9781450368162.