INFORMED MILLING

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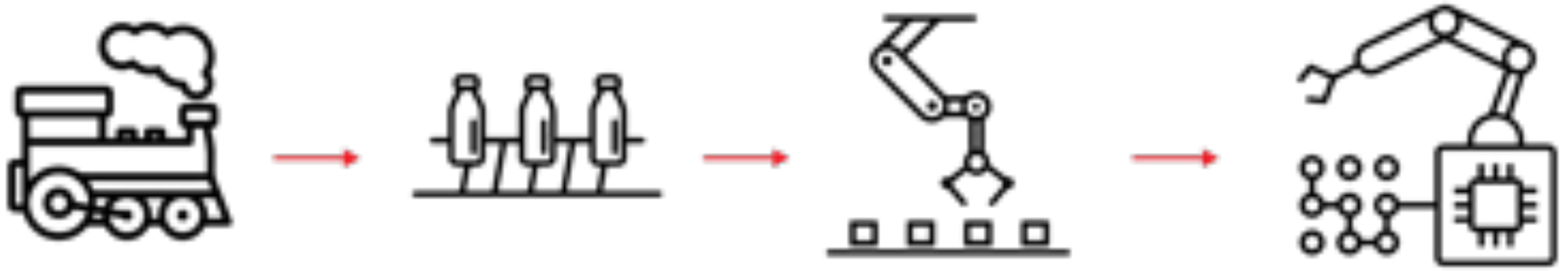
“the craft of building with **timber** is lost,
but it could be reinvented through **robotics**”

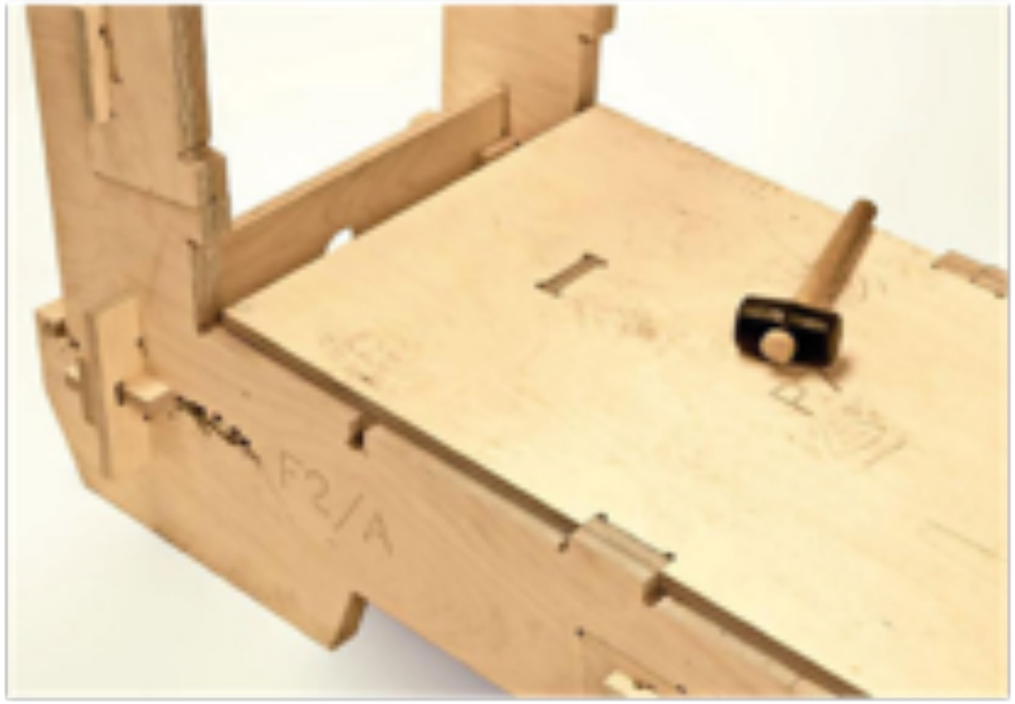
- Jan Dierck. Foster+Partners

RESEARCH

REVOLUTIONARY PROCESS



mechanical production | **mass production** | **automation** | **artificial intelligence**

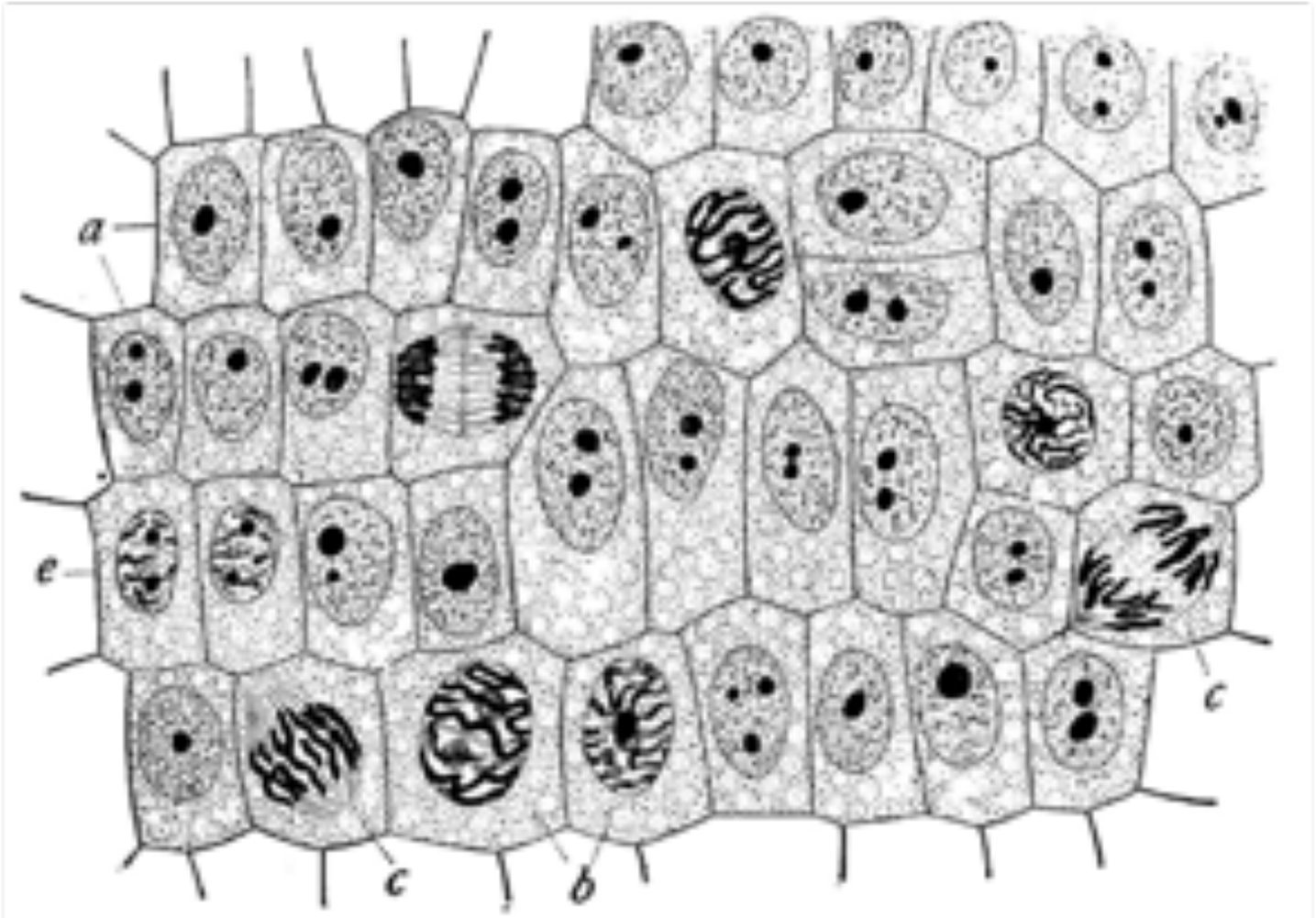


CONCEPT DEVELOPMENT

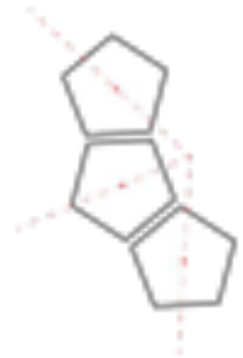
D2RP feedback loop

performance-based design

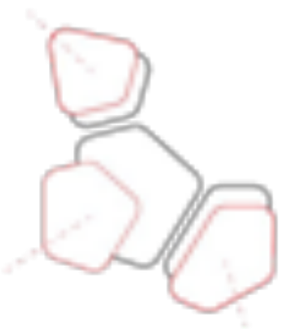
cyber physical



Onion (Allium cepa) root cells in different phases of the

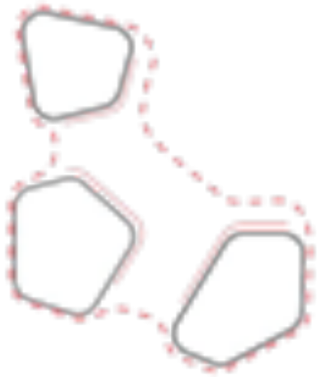


solar porosity

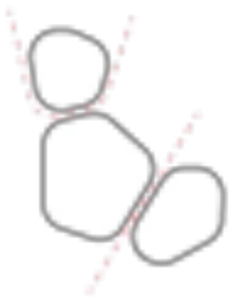


acoustic morphing

mesh structure



robotic optimization



structural awareness

COMPUTATIONAL ANAYSIS

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SOLAR ANALYSIS

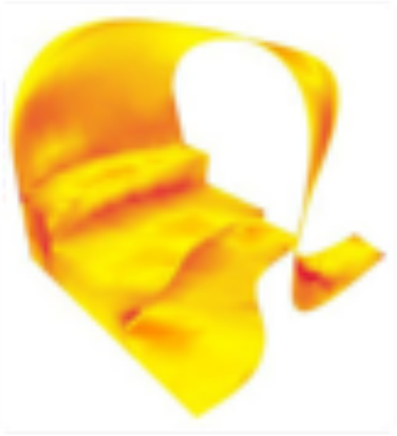
human load

snow load

wind load

all loads

deformation

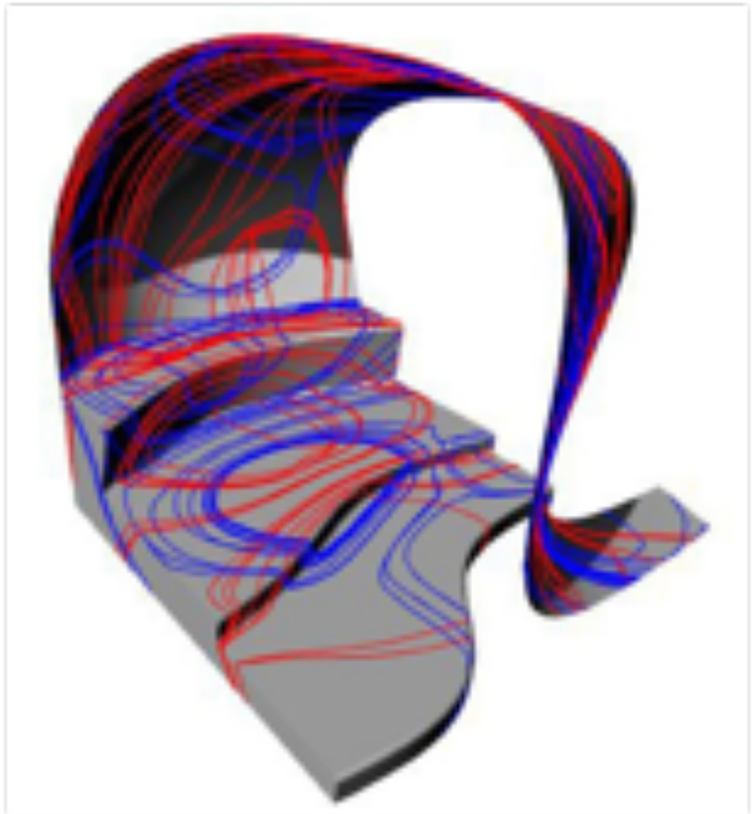


stress: stress dominant

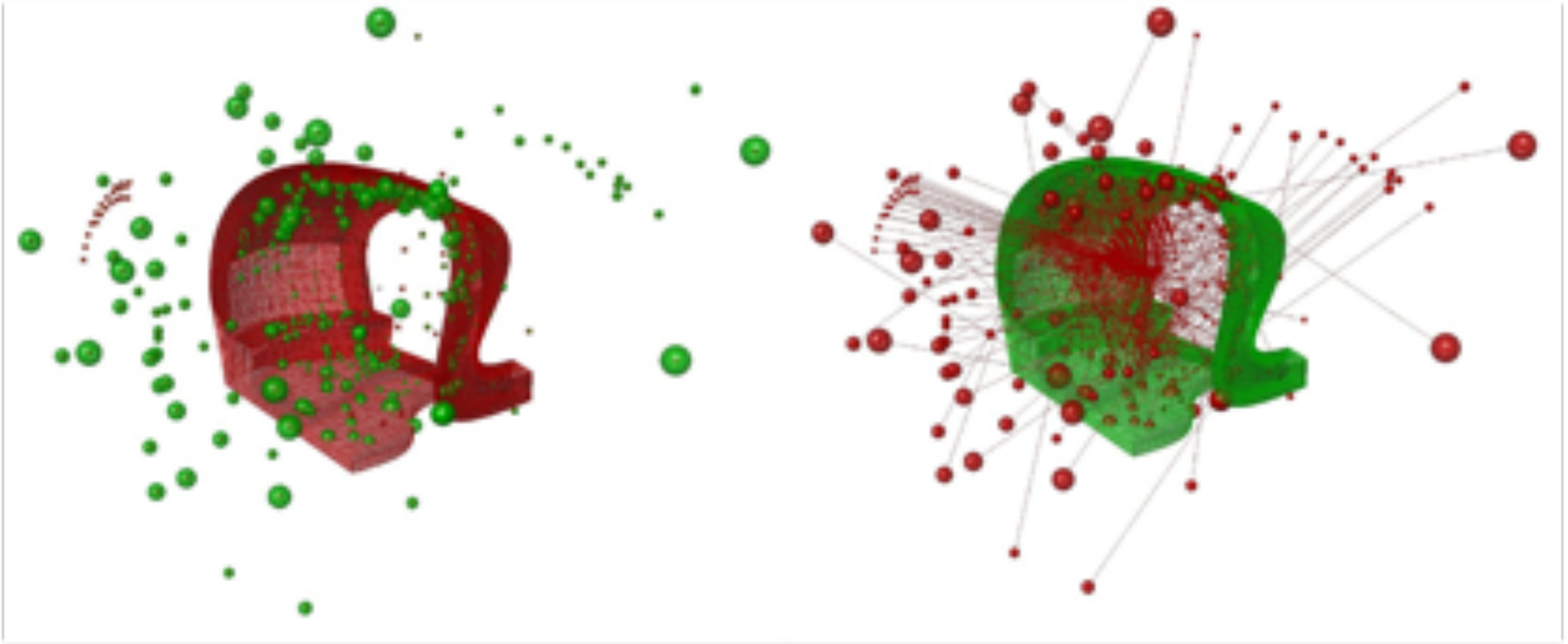
stress: tension dominant

cross-section

SOLAR ANALYSIS



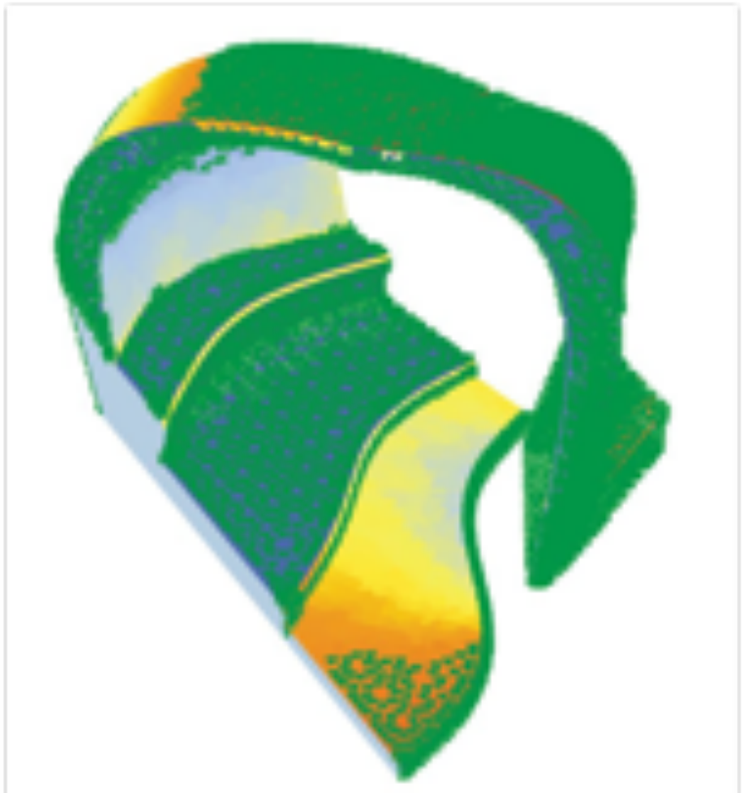
iso curves



acoustic reverberation vectors and amplification

SOLAR ANALYSIS

area of high solar radiation

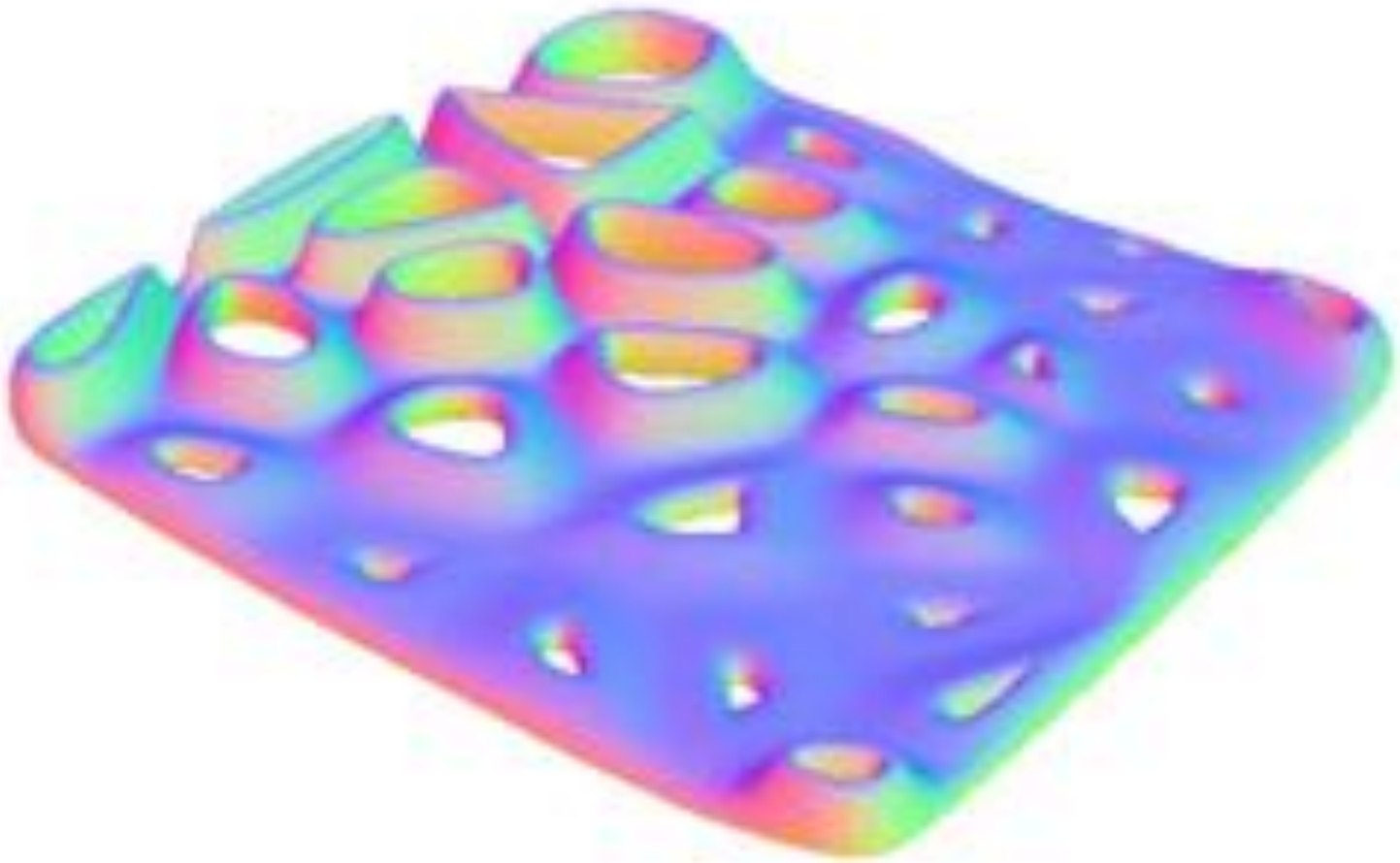


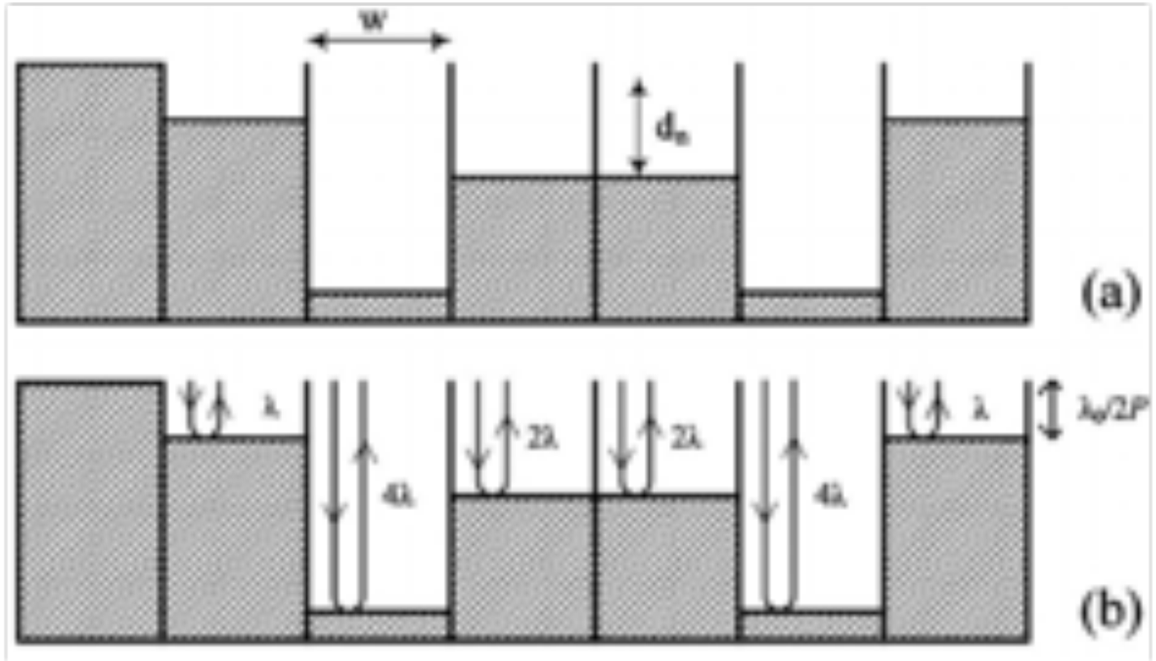
points of interest

area of low solar radiation

DESIGN DEVELOPMENT

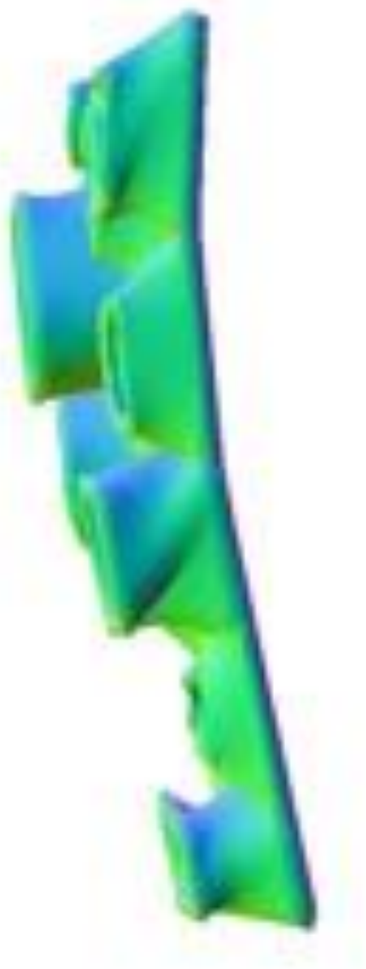
INPUT TESTING

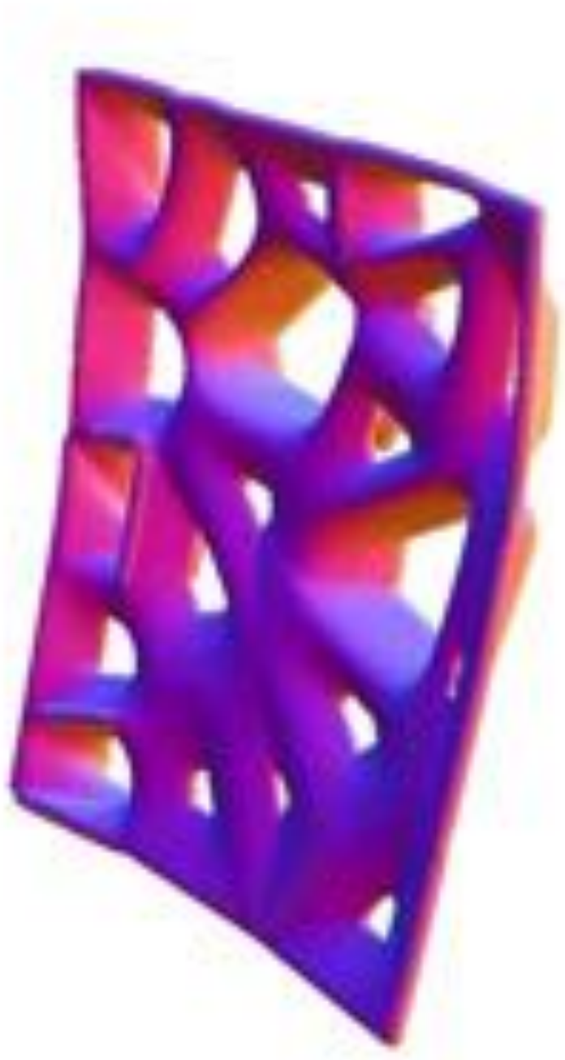




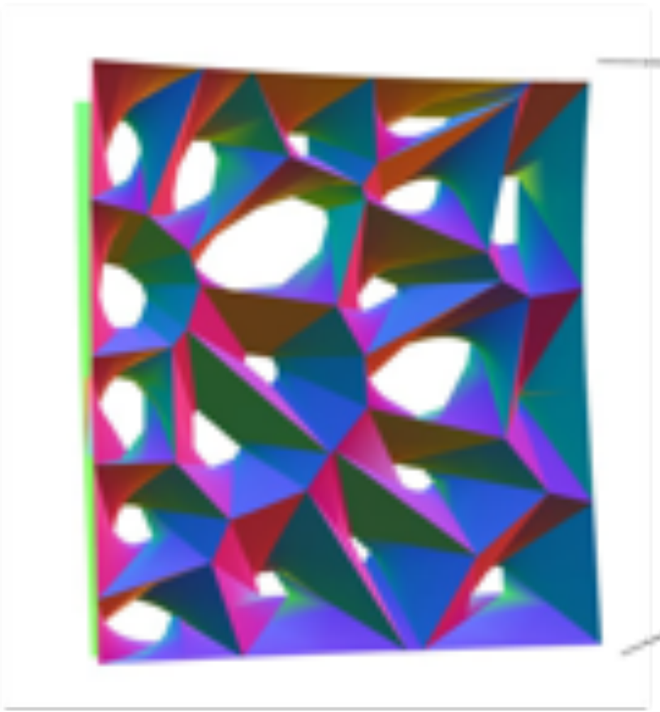
Modulation: one period of a quadratic residue diffuser

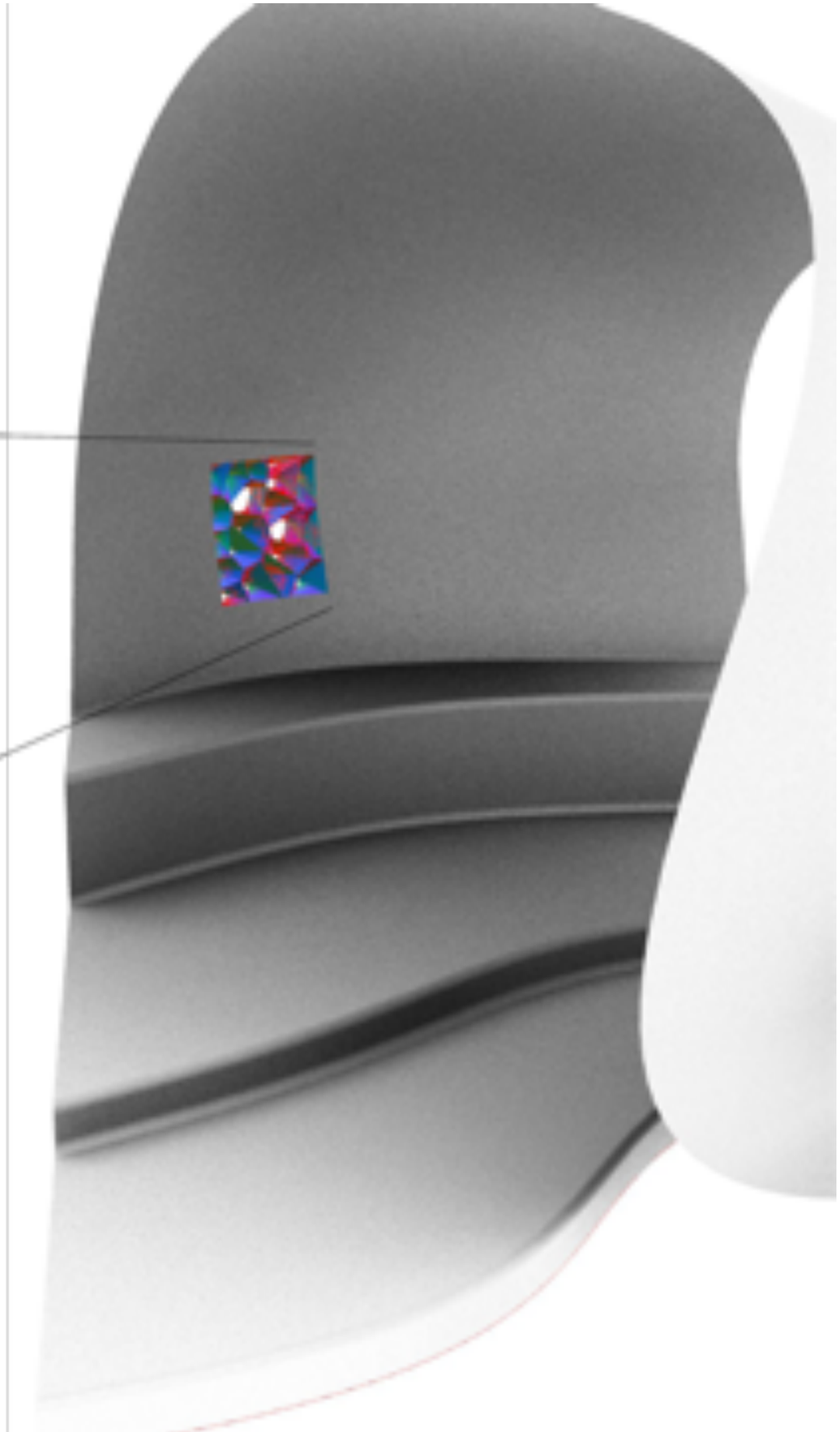
Bashirkis, N. Angus, J. A. N. Cox, T. J. 2008. Lobe and zero residue sequence diffusers. 666. Salford





PAVILLION PORTION





FINAL GEOMETRY

FINAL GEOMETRY

ERGONOMIC ADJUSTMENTS

original model

change surfaces for functional purposes

smoothen surfaces

trim to relevant element

PRODUCTION DEVELOPMENT

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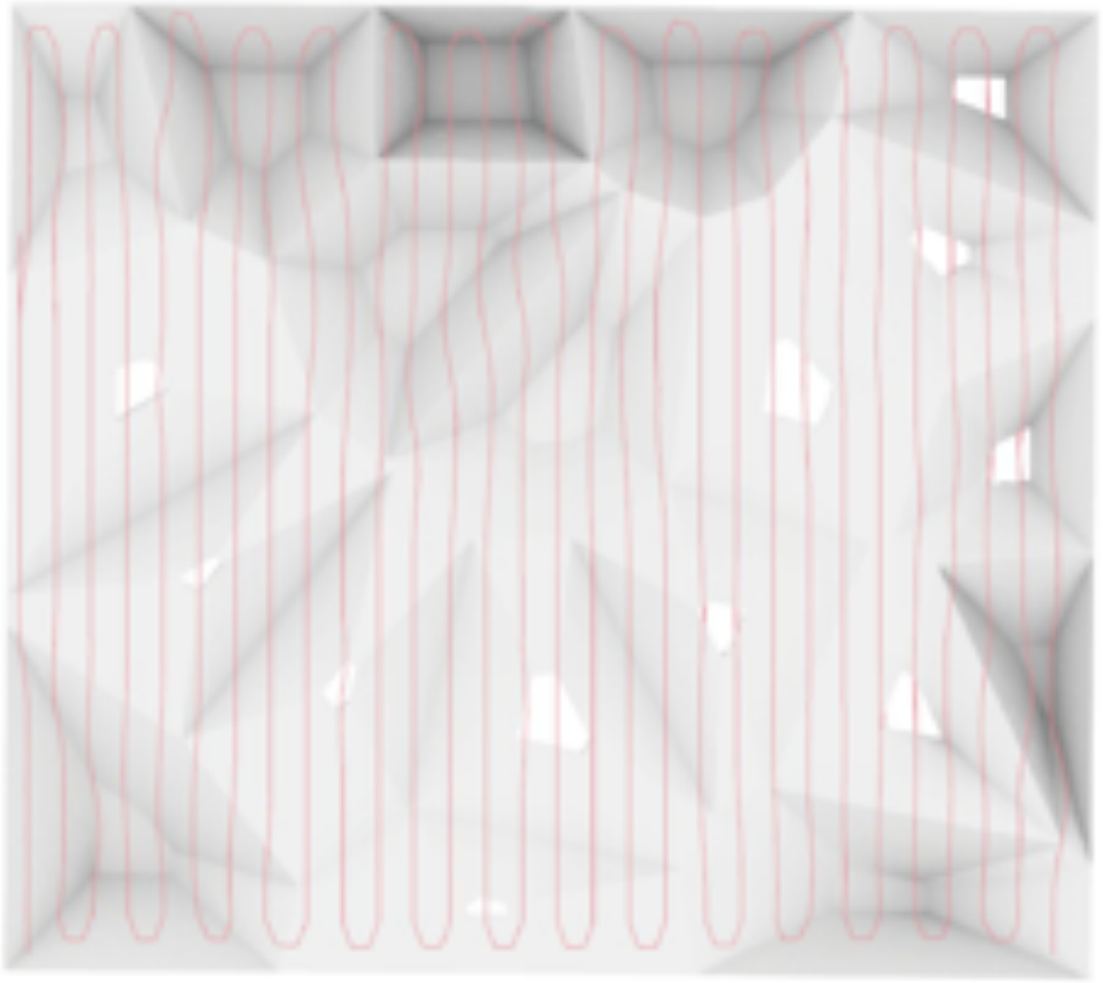
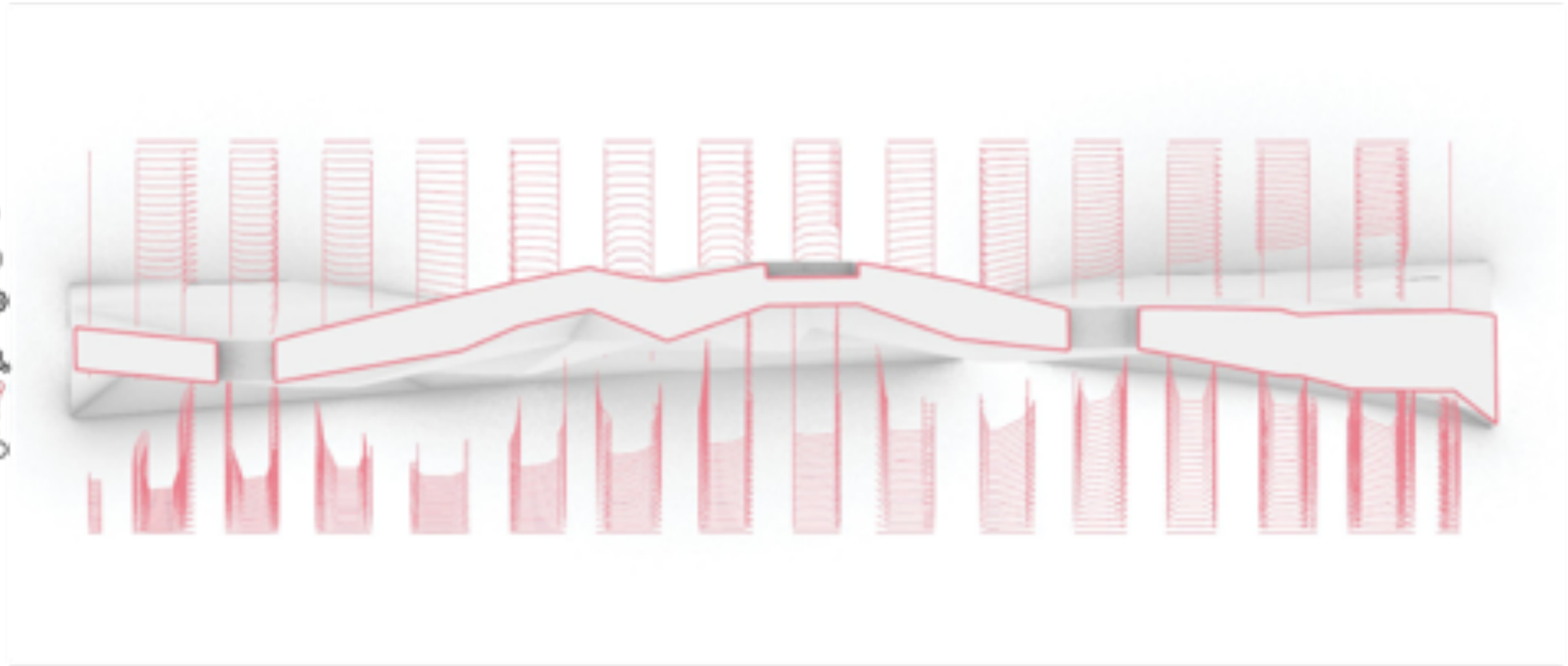
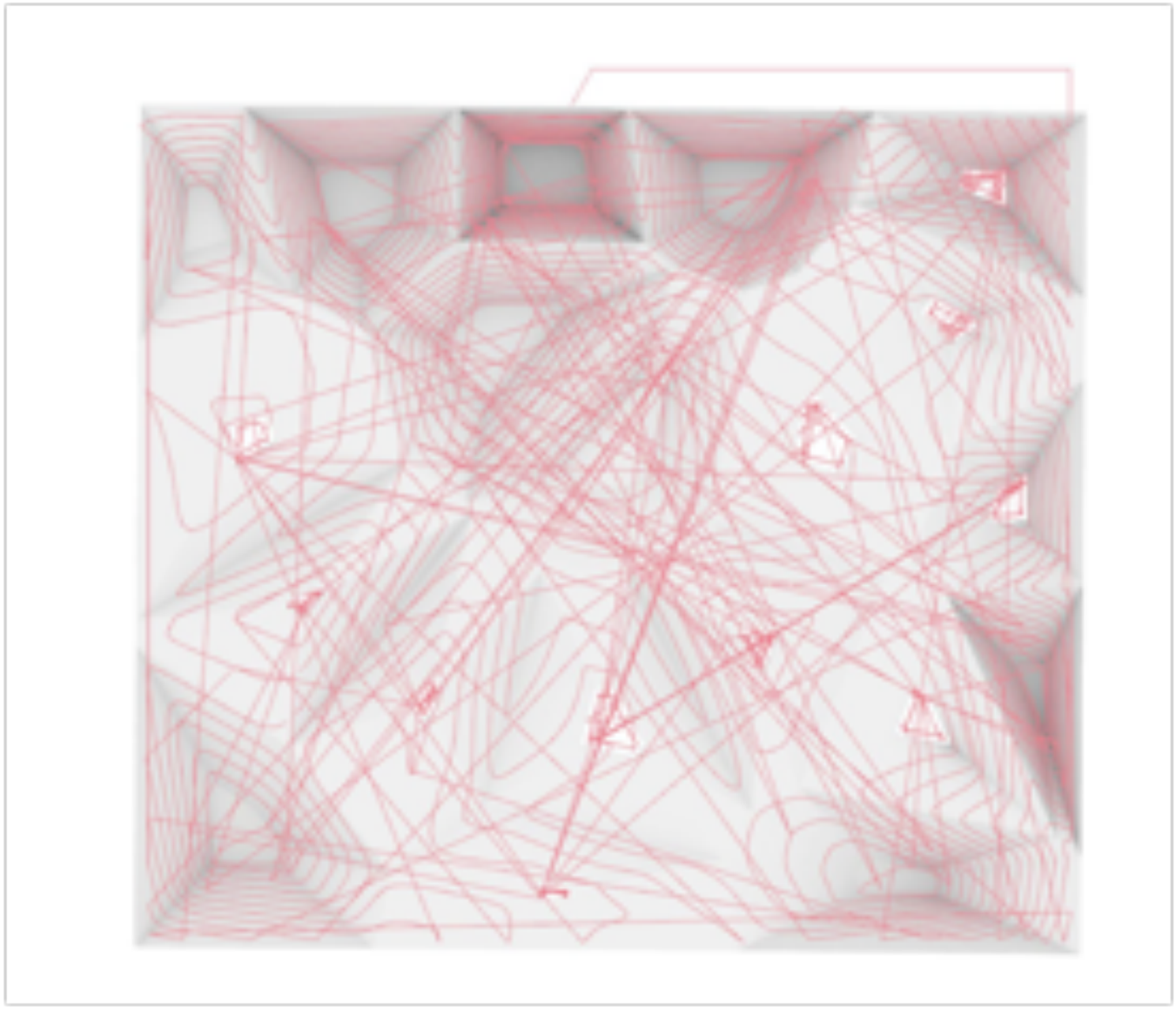
RAW REMOVAL PATH



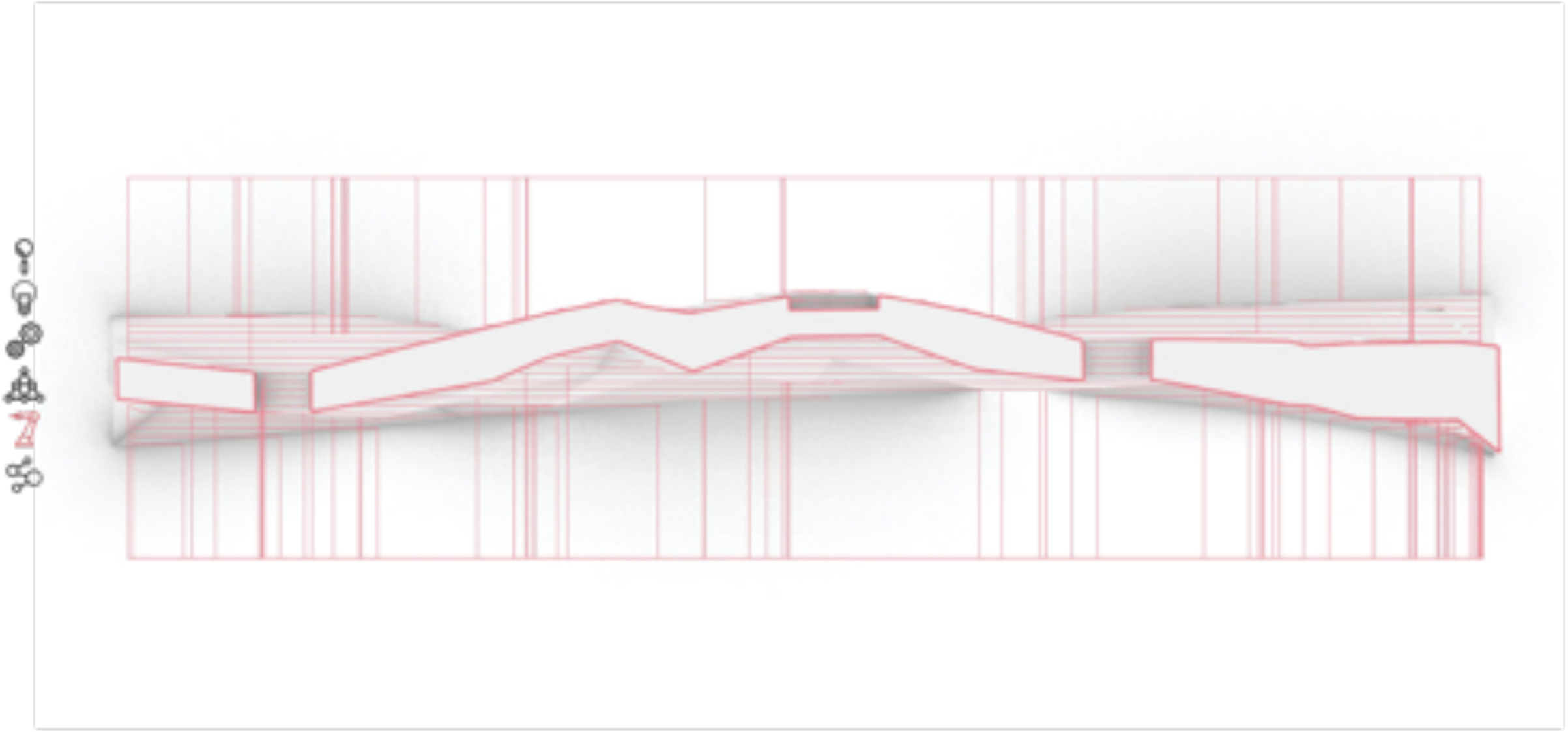
RAW REMOVAL PATH

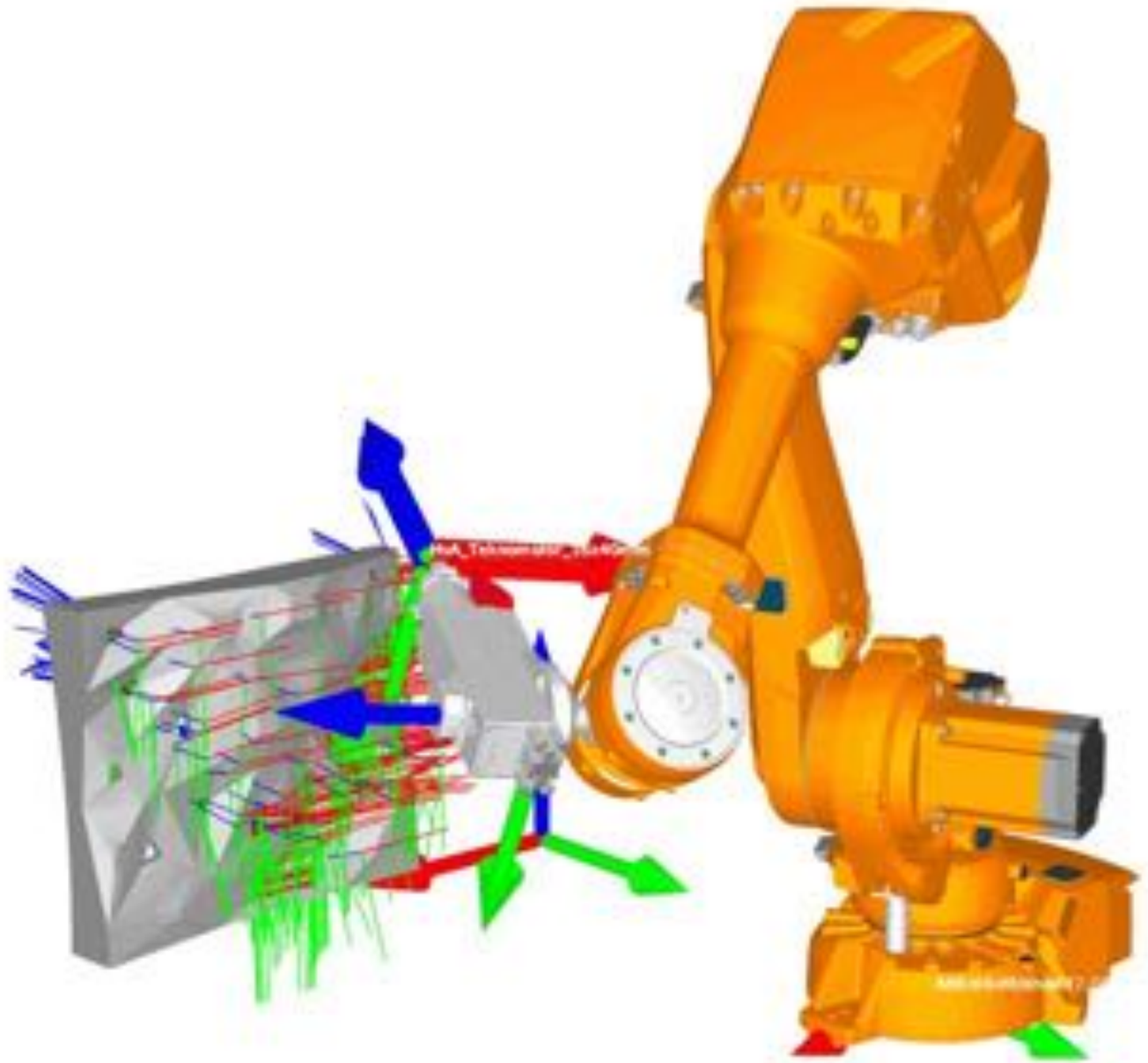


FINE REMOVAL PATH



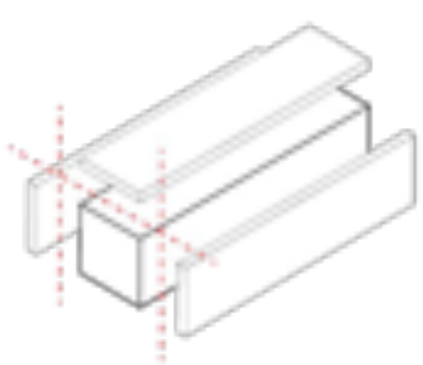
FINE REMOVAL PATH

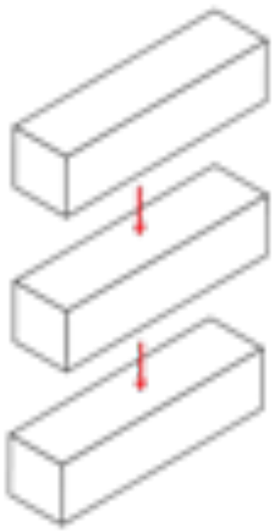


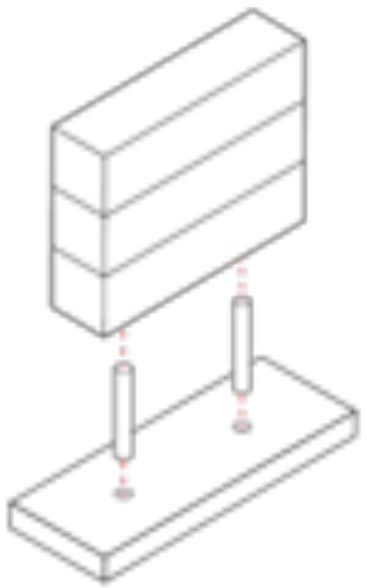


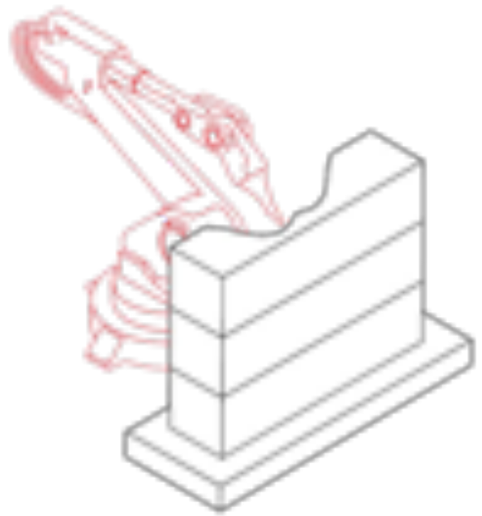
PRODUCTION SETUP

PRODUCTION PROCESS





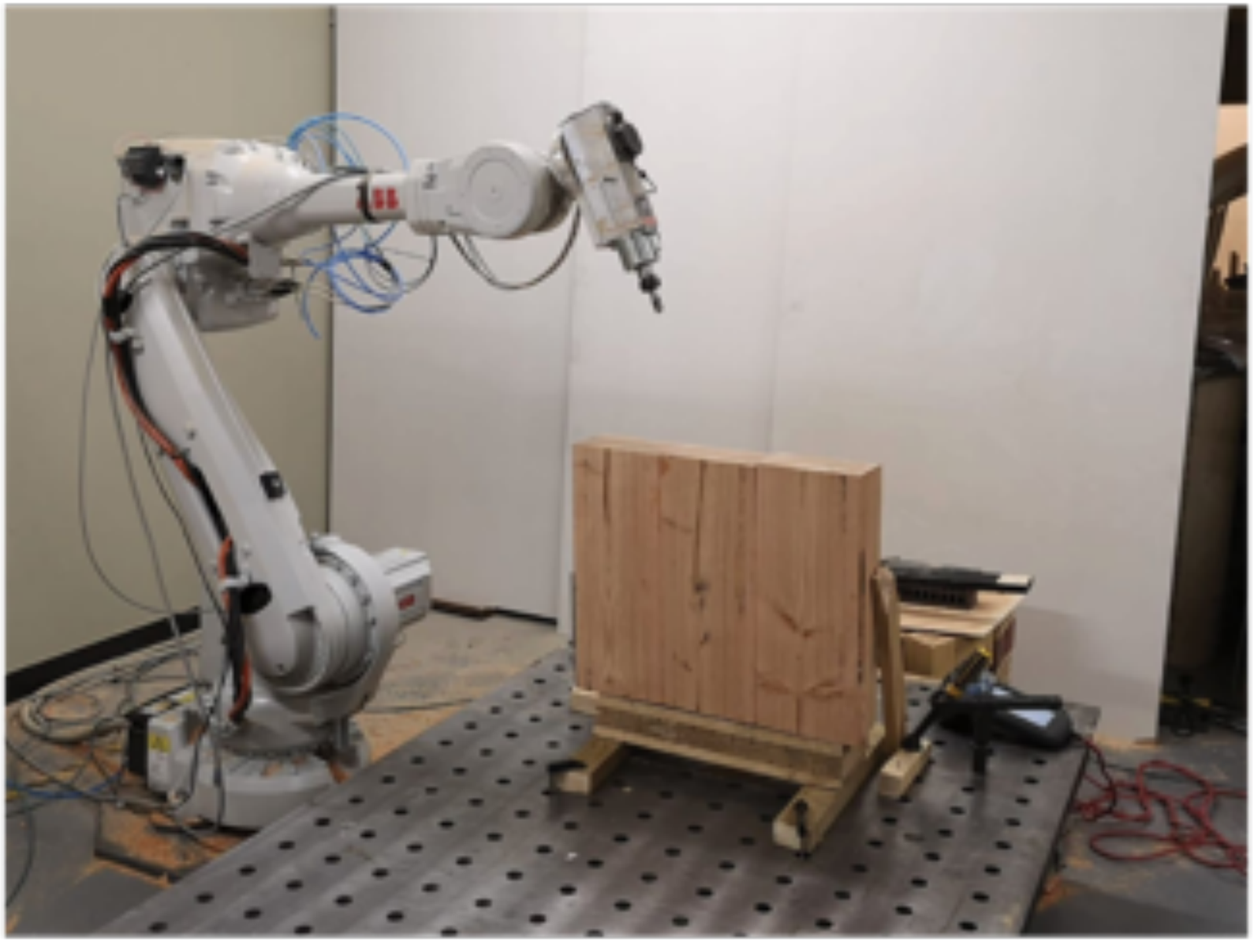




BEAM PACKING

MOUNTING SETUP

READY FOR MILLING



PRODUCTION MILLING

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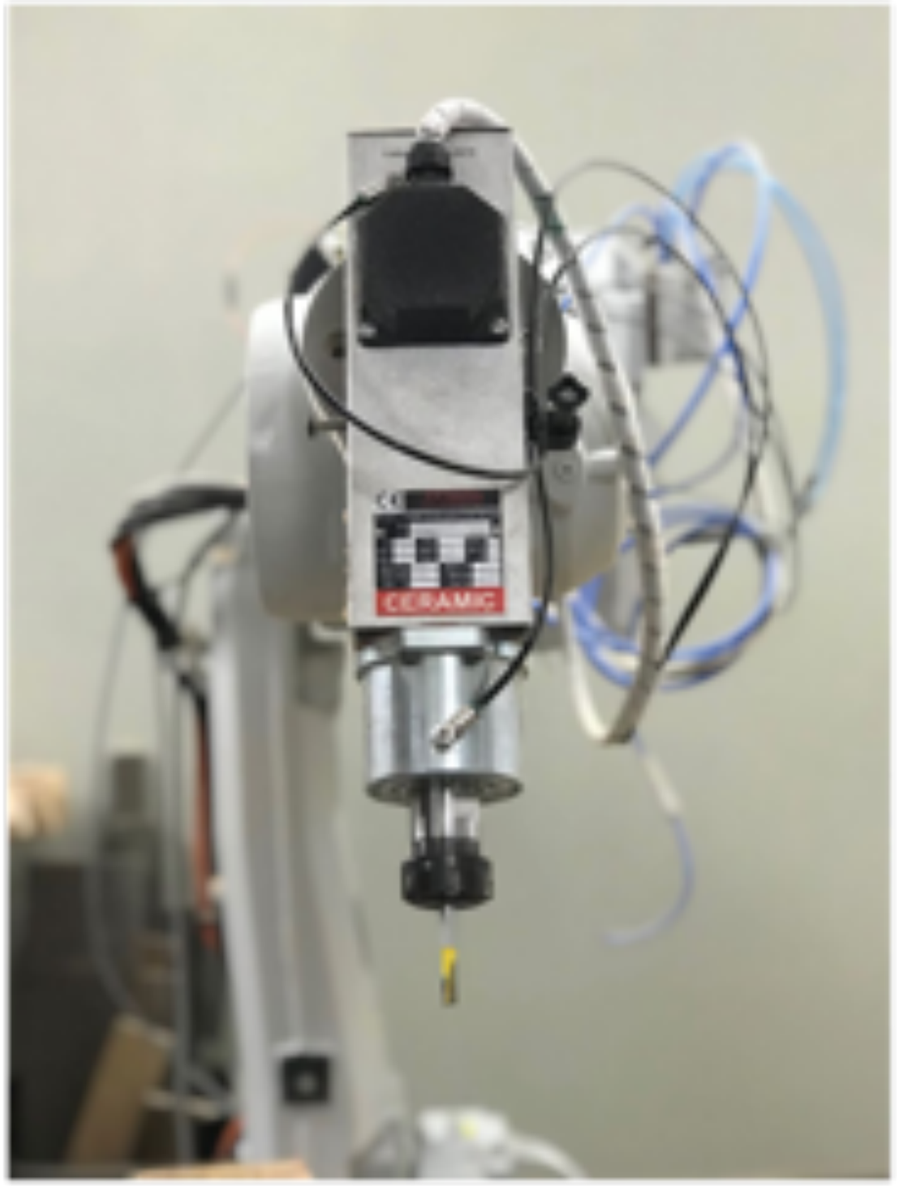
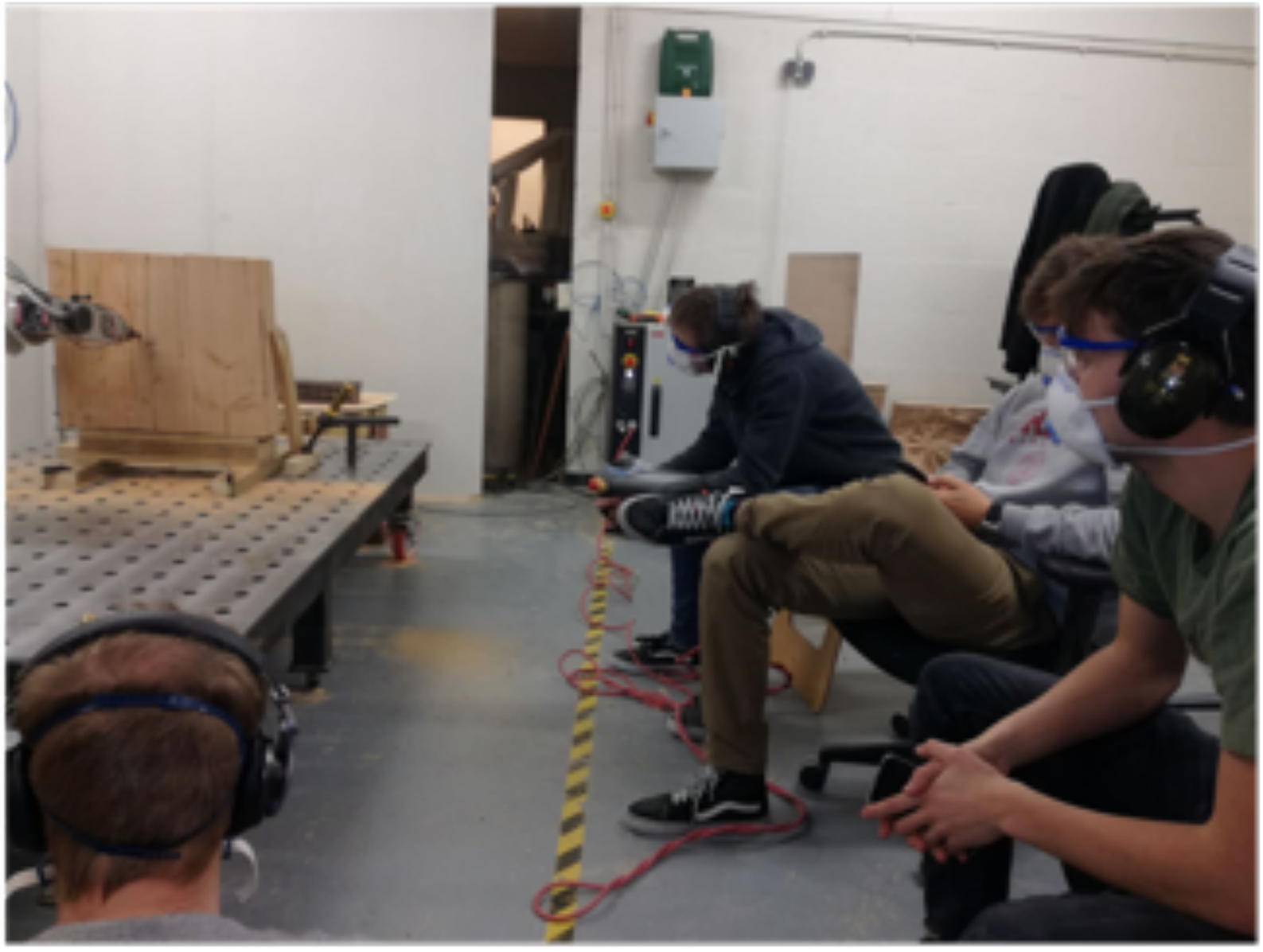

CERAMIC

FINE REMOVAL



PRODUCTION

RP2D FEEDBACK LOOP

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Much time is lost not drilling

Toolpath optimization:
- Traveling Sales man problem solved with the Greedy Search and 2 opt swap.
- Chip manufacturers also often encounter it.
- The shortest possible distance between chips during design.
- Lobster catchers, pick up traps. Group of heuristic algorithms.

Toopath Failures:
- Raw removal line simplification should have been avoided, cause the accuracy got reduces. Solution: the fine removal was applied more than ones, therefore more meeling time was needed.
- No lines were designed to remove the materials in the wholes, **solution:** another script was developed
- The distance of the fine removal lines in the vertical dimension was more than the width of the tool, so the almost vertical surfaces were not milled out and the design of the path was not time efficient. **Solution:** Another fine removal path was developed, the meandering path that reduces the time a lot and miles out the whole surface equally.

PRODUCTION

RP2D FEEDBACK LOOP

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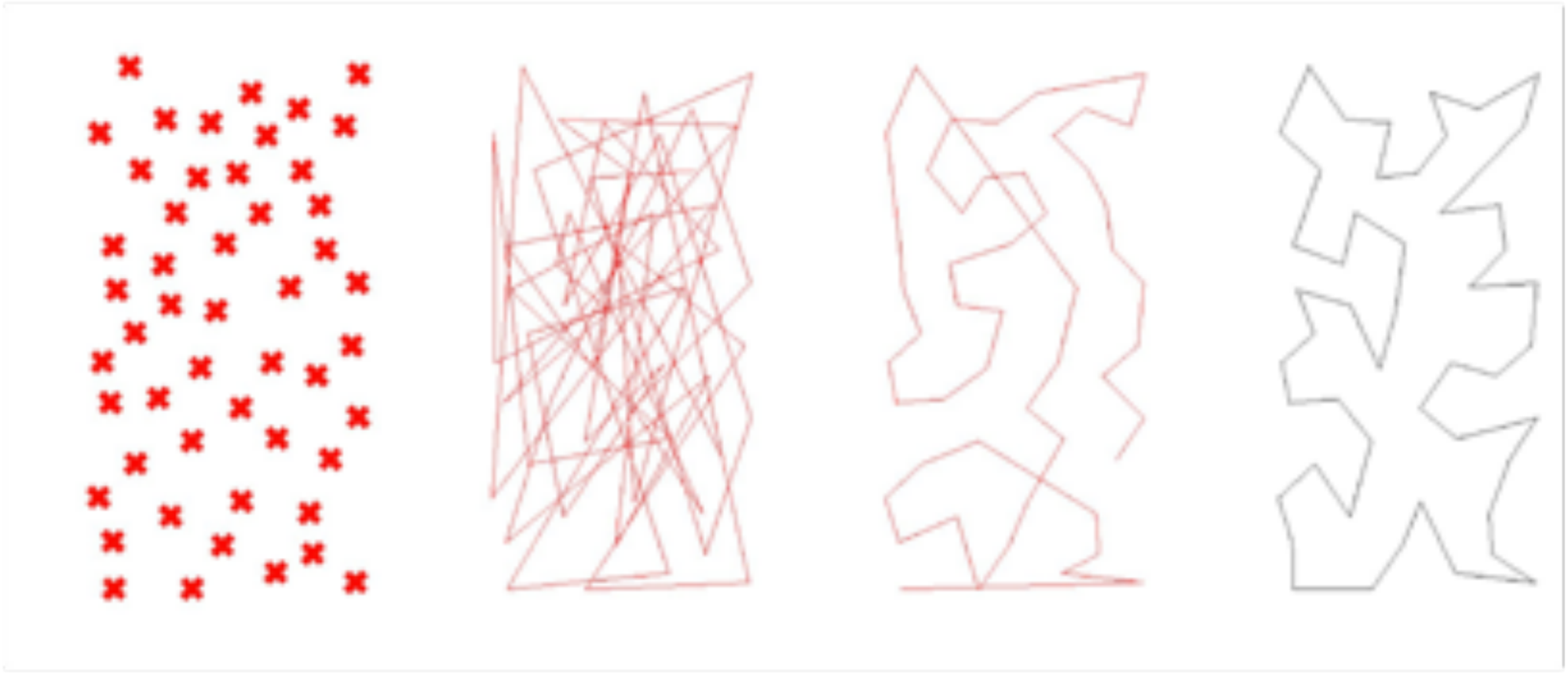
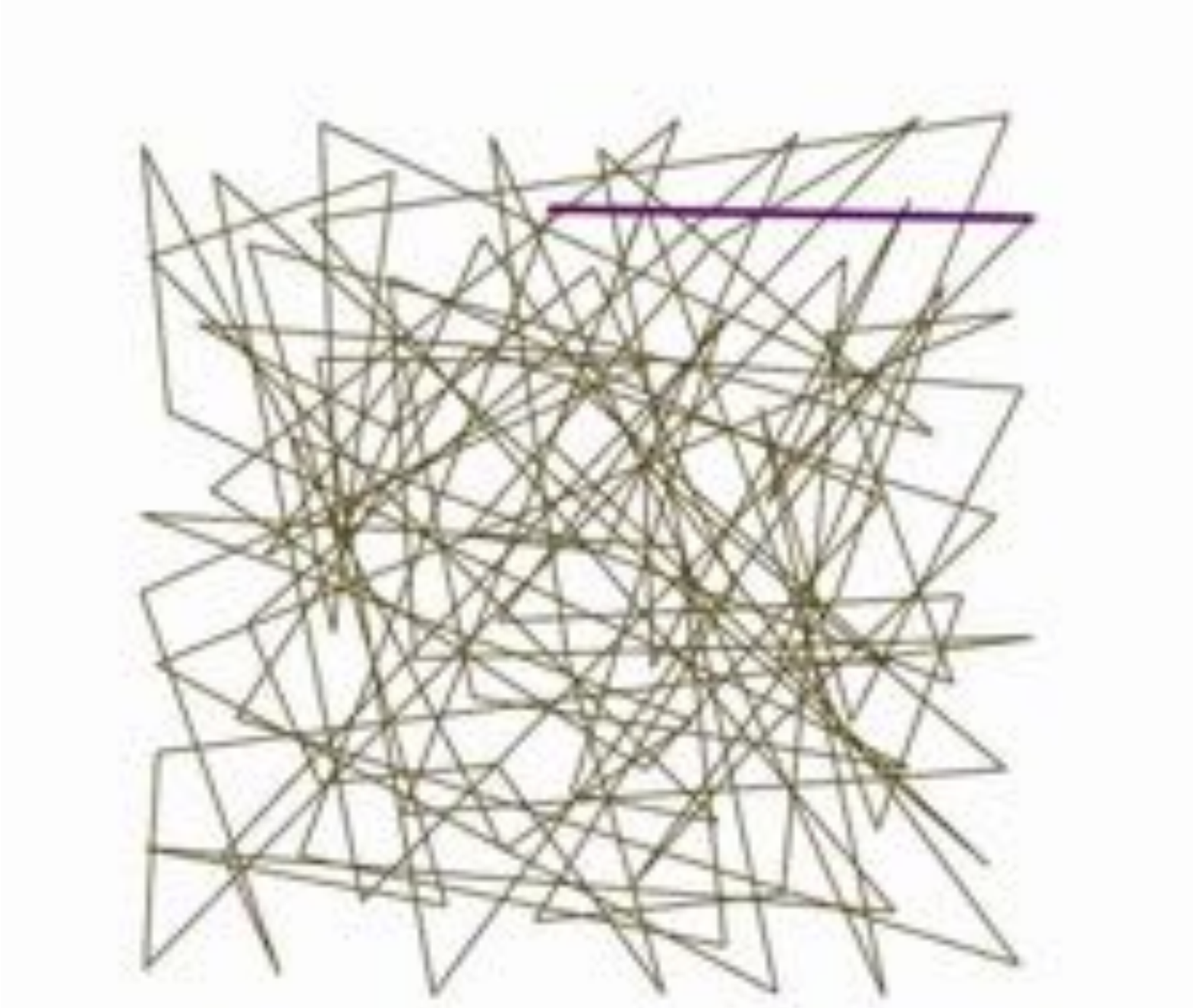
TRAVELLING SALESMAN

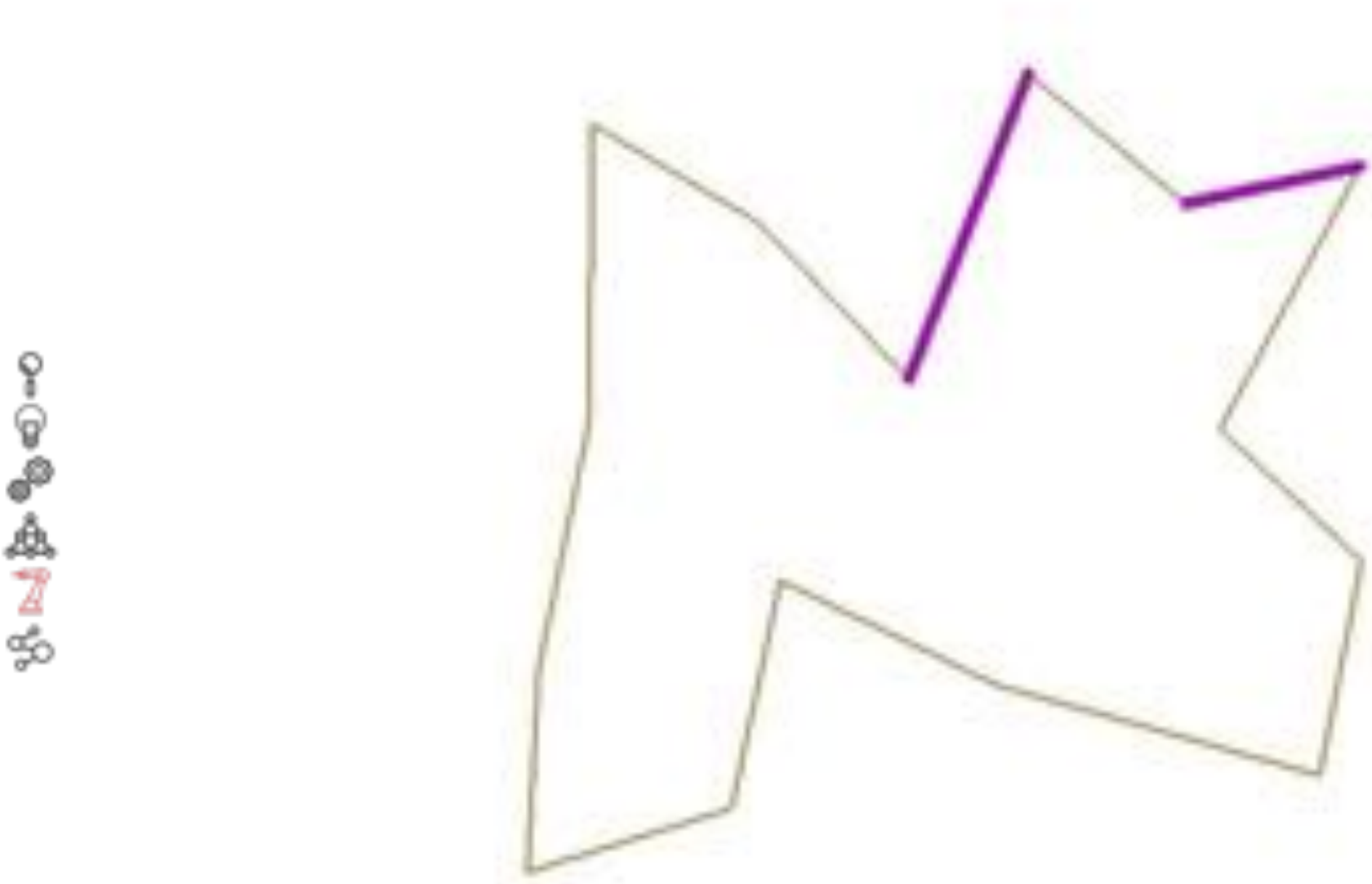
TRAVELLING SALESMAN



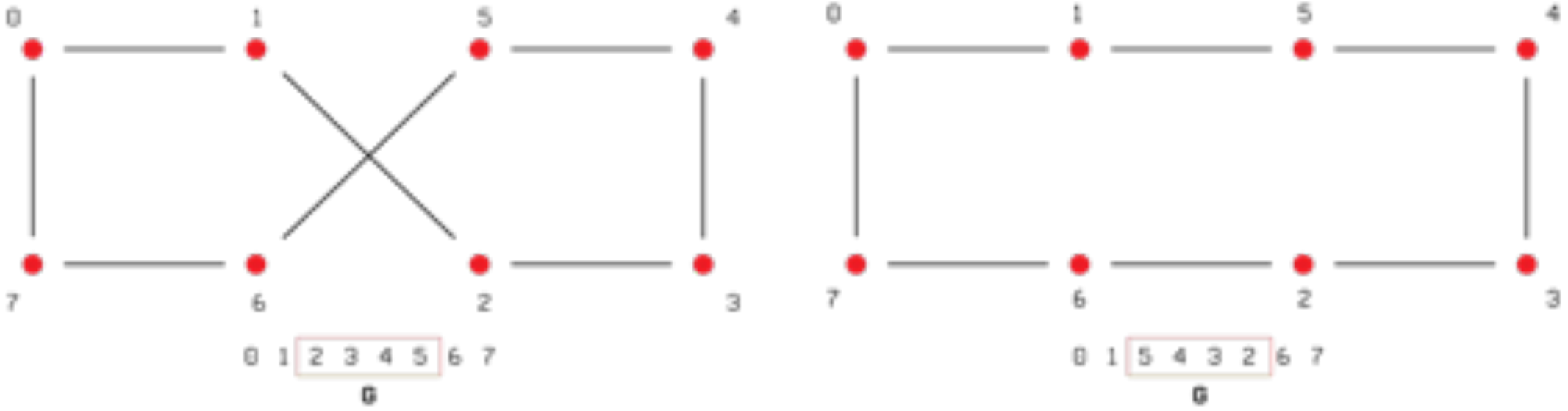
GREEDY LINES



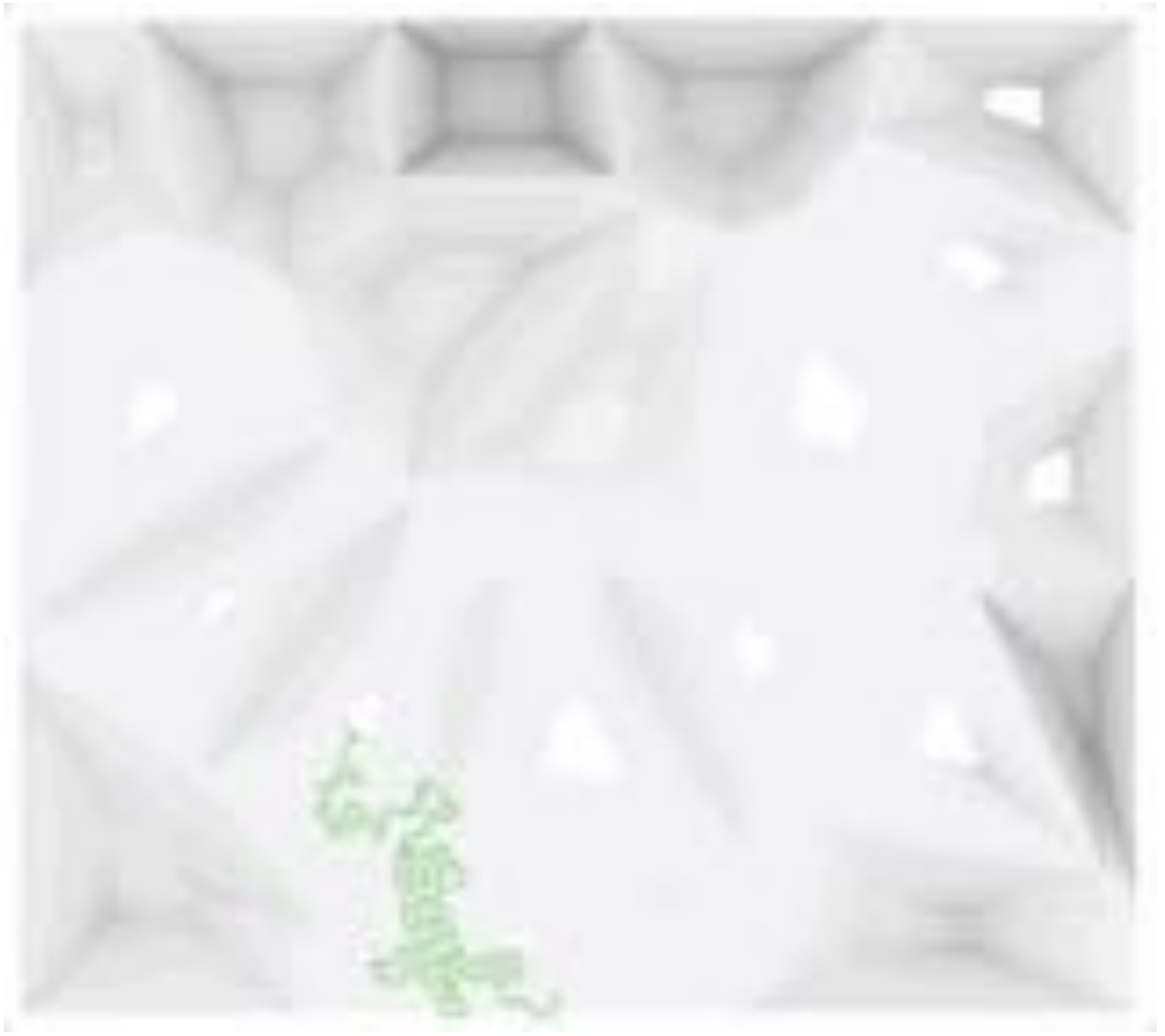
TRAVELLING SALESMAN



LINE SWAPPING



TRAVELLING SALESMAN



PRODUCTION MILLING

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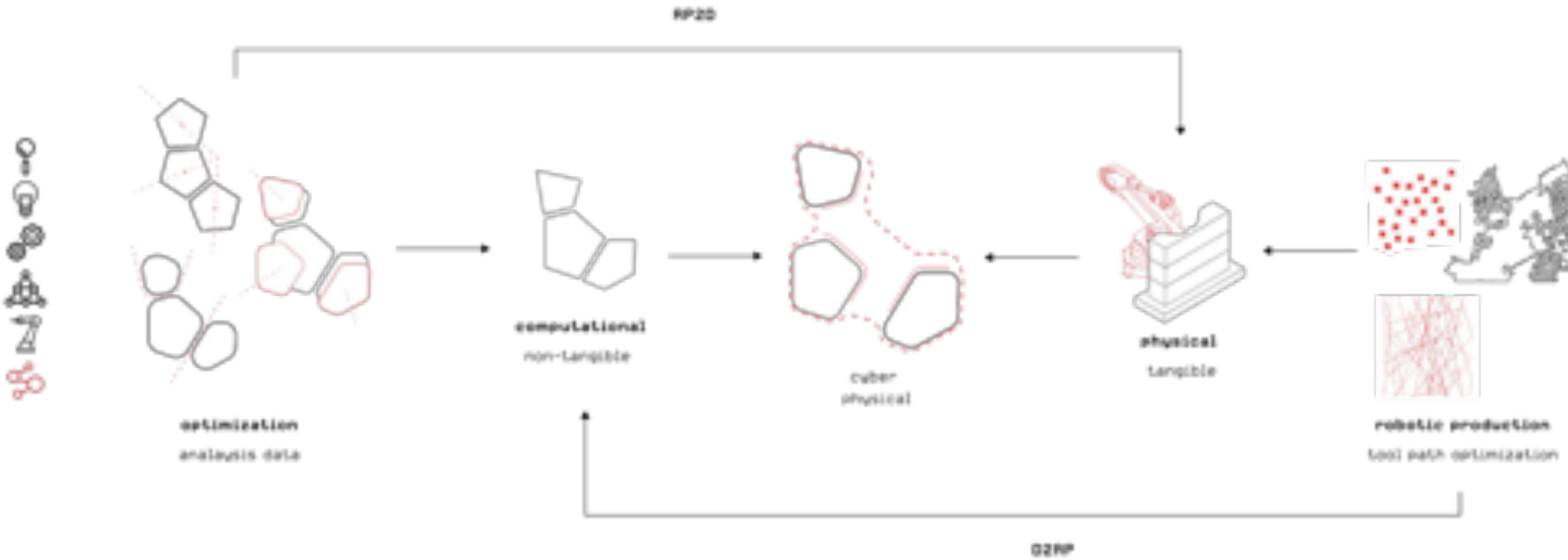
MILLING

RECONCEPTUALIZE

D2RP & RP2D LOOP



thank you