

A „VIRTUAL“ WOODEN CONSTRUCTION

Drivers of Wood Construction 2023, Joensuu, Finland, 15.05.2023



The lecture is a trip to the Patrice Lumumba Gallery at KINDL, the center for contemporary art in Berlin, which was, among other things, the venue for this year's Future Festival. The Future Festival is a platform for digitalization in higher education in Germany, which Jade University of Applied Sciences used to highlight the changes in architects' working practices and design process due to the ongoing digital transformation. The computer is not only replacing the architect's pencil. Digital techniques and artificial intelligence are fundamentally expanding and redefining the tools and media of design. They are removing boundaries and opening up new areas of design. In the exhibition, visitors were invited to explore a virtual wooden structure. Combined with real structures built to virtual specifications and experiments with artificial intelligence, reality and virtuality blur in the gallery, illustrating how architecture and its creation process are being transformed by the digital transformation.

Prof. Dr. Gregor Grunwald, M.A. Tobias Hanke, M.A. Jan Yoshio Kawasaki

Faculty of Architecture, Jade University of Applied Sciences, Oldenburg, 10.05.2023

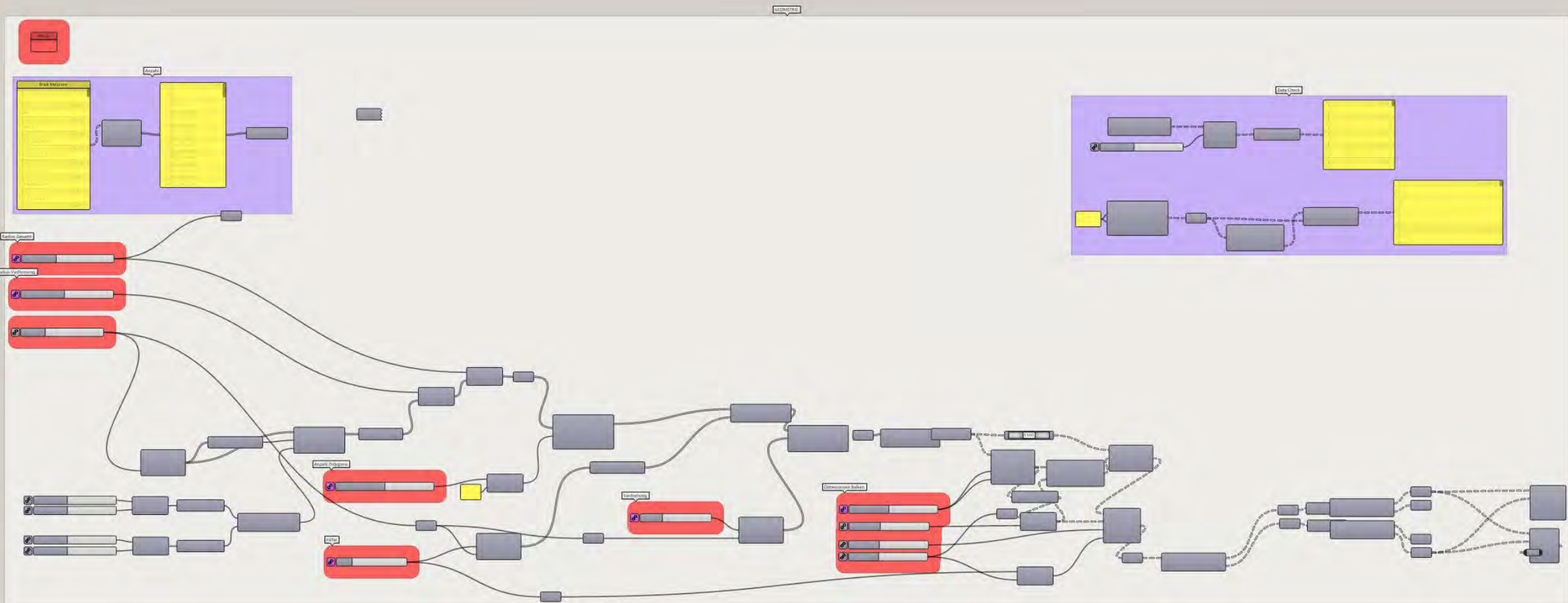
gregor.grunwald@jade-hs.de, tobias.hanke@jade-hs.de, jan.kawasaki@jade-hs.de

A “VIRTUAL” WOODEN CONSTRUCTION

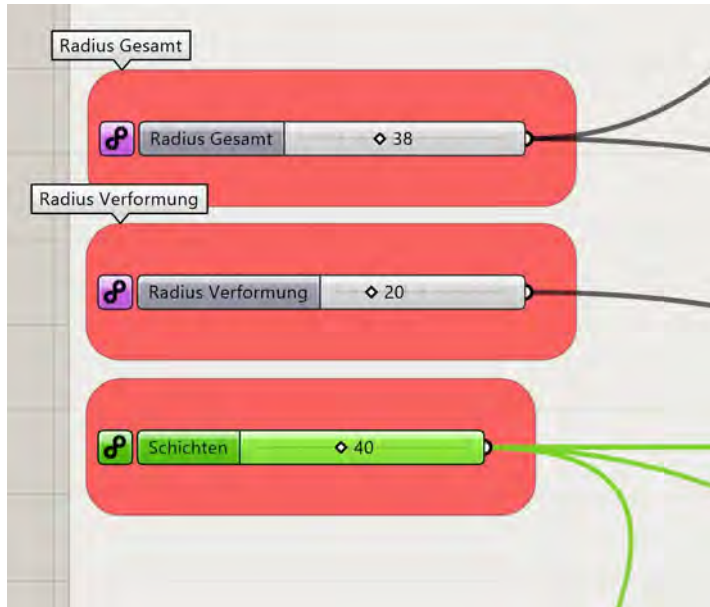
M.A. Tobias Hanke, M.A. Jan Yoshio Kawasaki, Prof. Dr. Gregor Grunwald



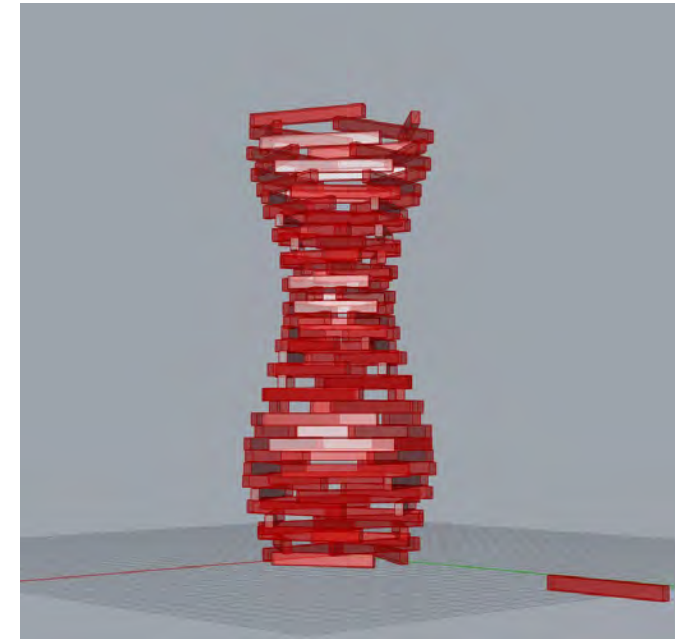
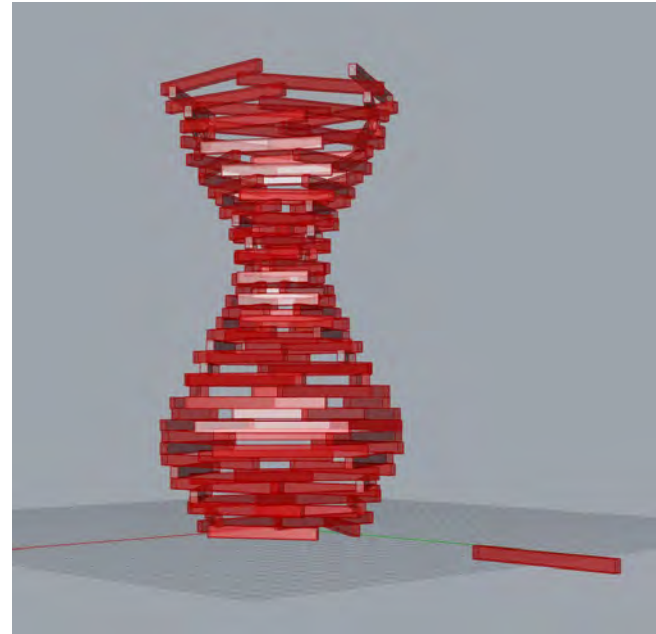
Grasshopper Script Tower Geometry



BASIC GEOMETRY SCRIPTING

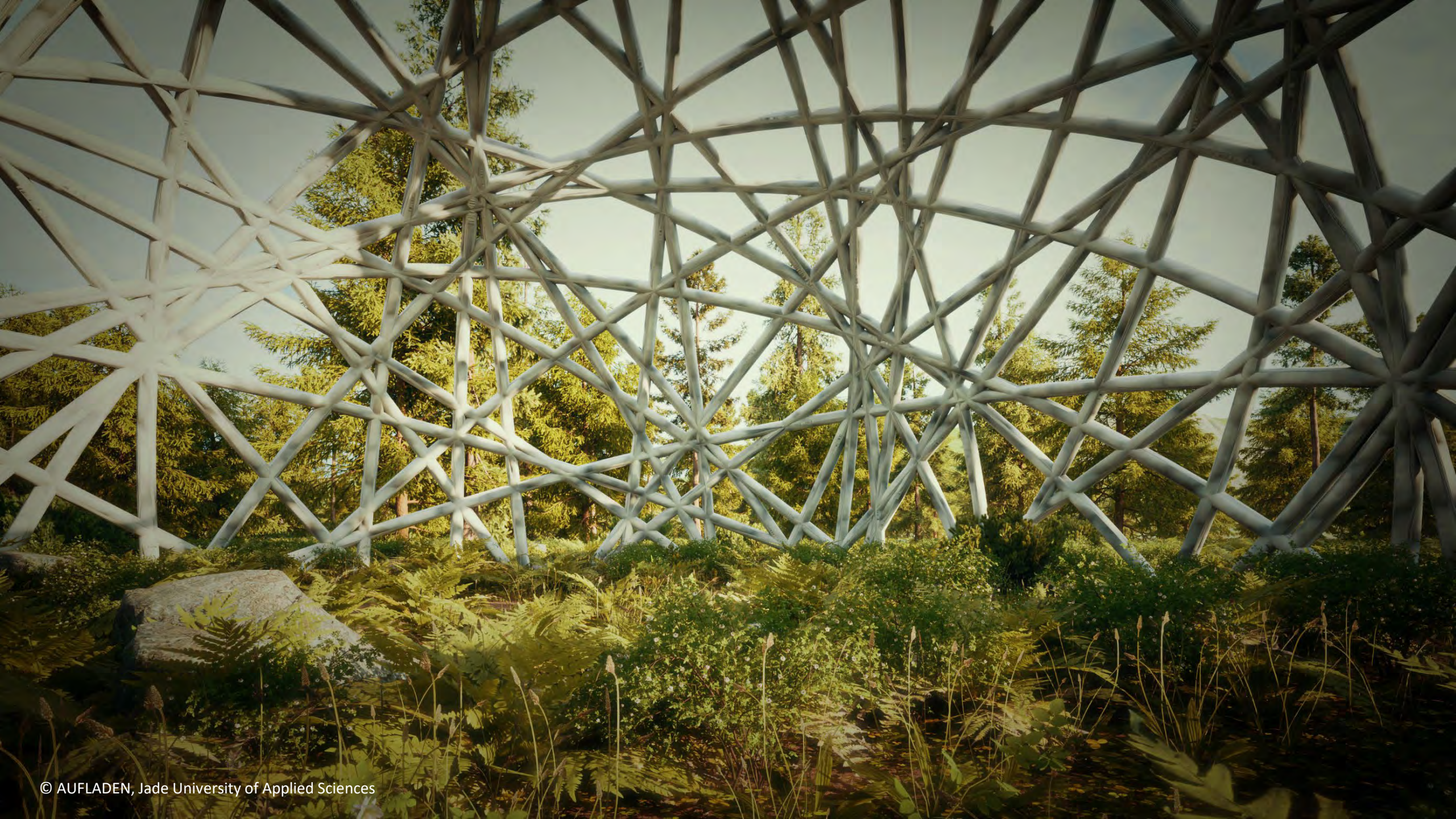


© Screenshot in Grasshopper, own figure



THE RESULT OF THE SCRIPT IS DISPLAYED IN RHINO

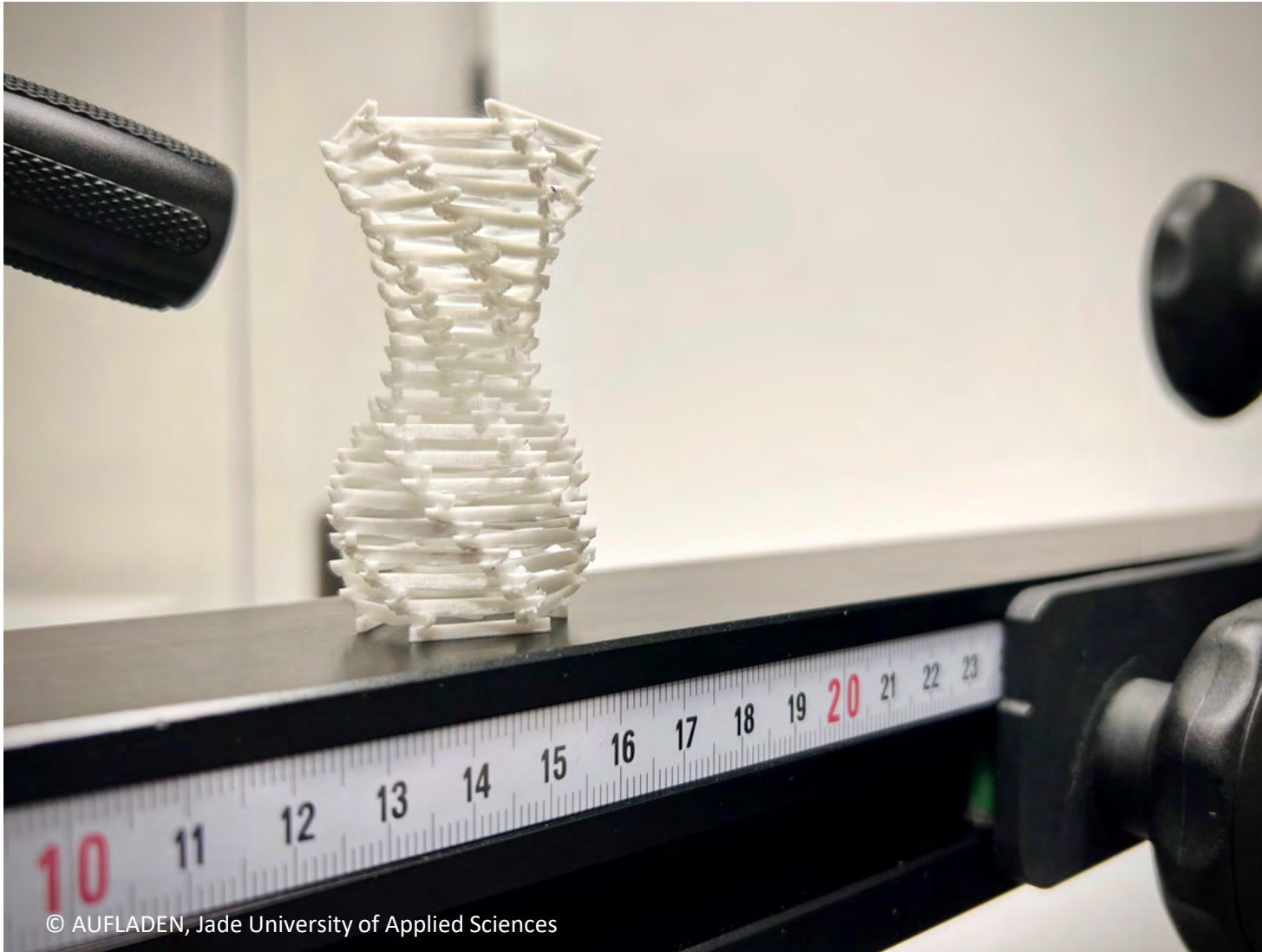




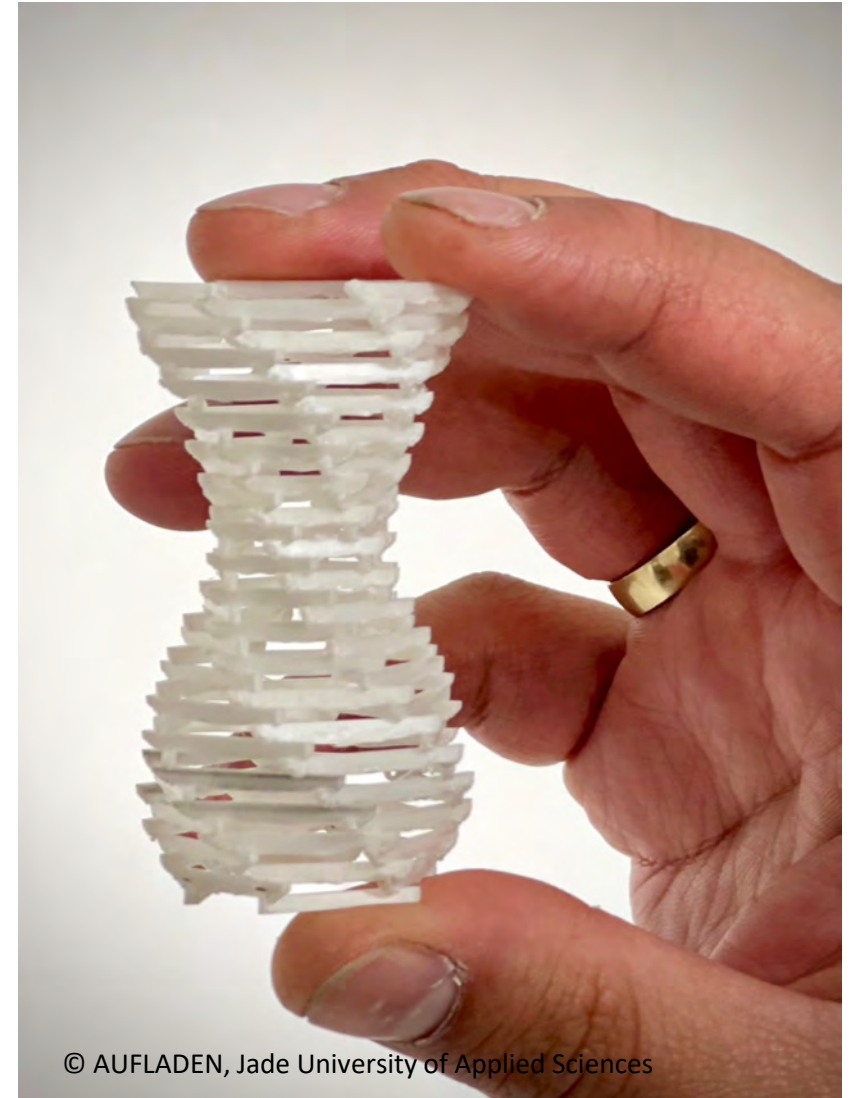




3D PRINTING OF THE TOWER



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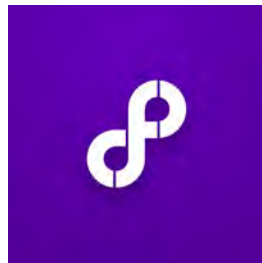
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PRINTING OF THE 3D MODEL FOR EVALUATION AT A SMALLER SCALE

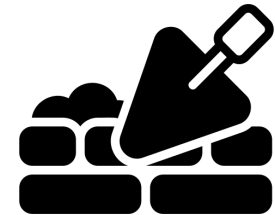
HOW TO BUILT WITH AUGMENTED REALITY?



+



+



**RHINO +
GRASSHOPPER**

+

**FOLOGRAM + AR-
GLASSES**

=

AR ASSISTED BUILDING



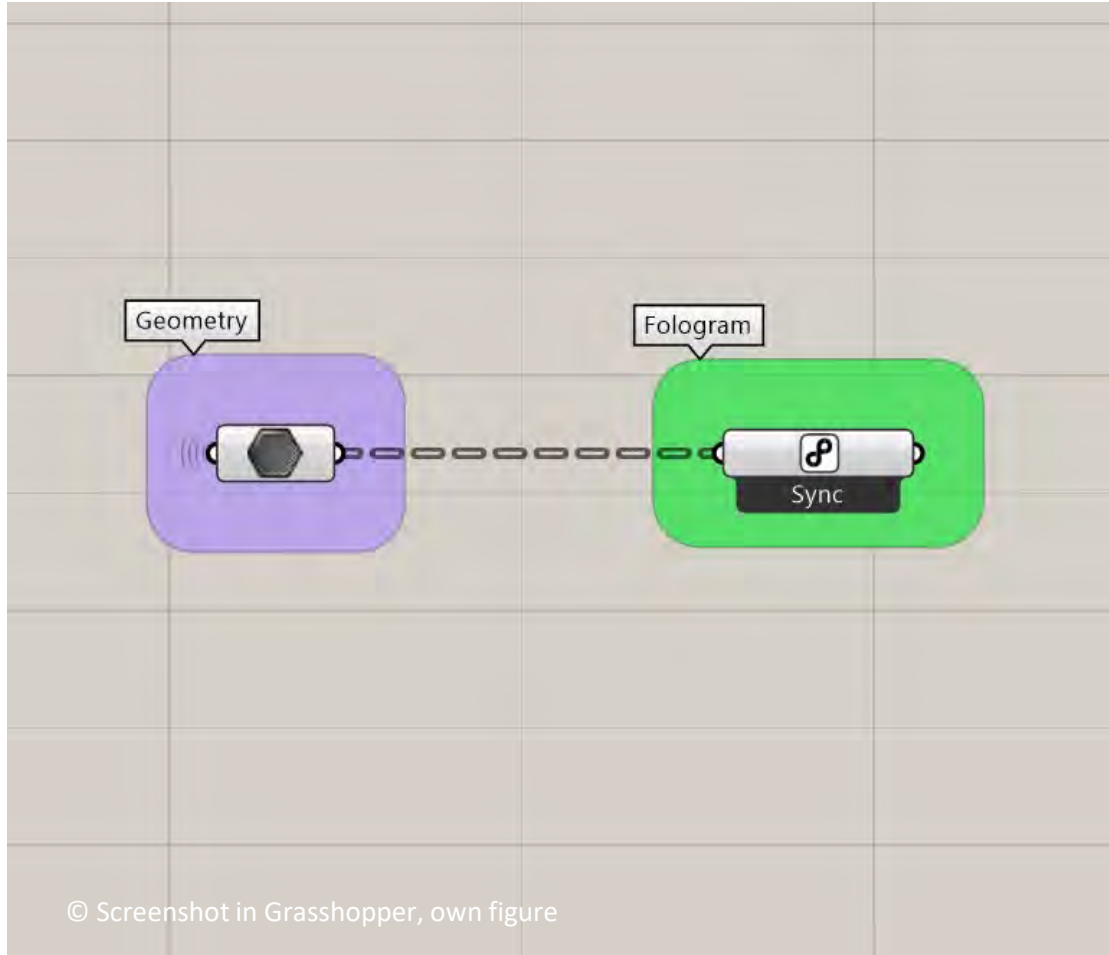
Create the future of digital fabrication

Instant mixed reality experiences from Rhino and Grasshopper

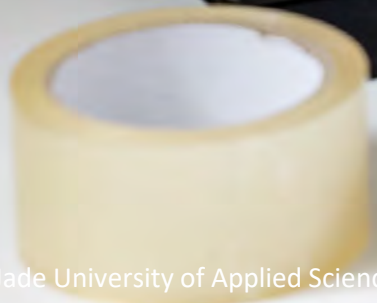
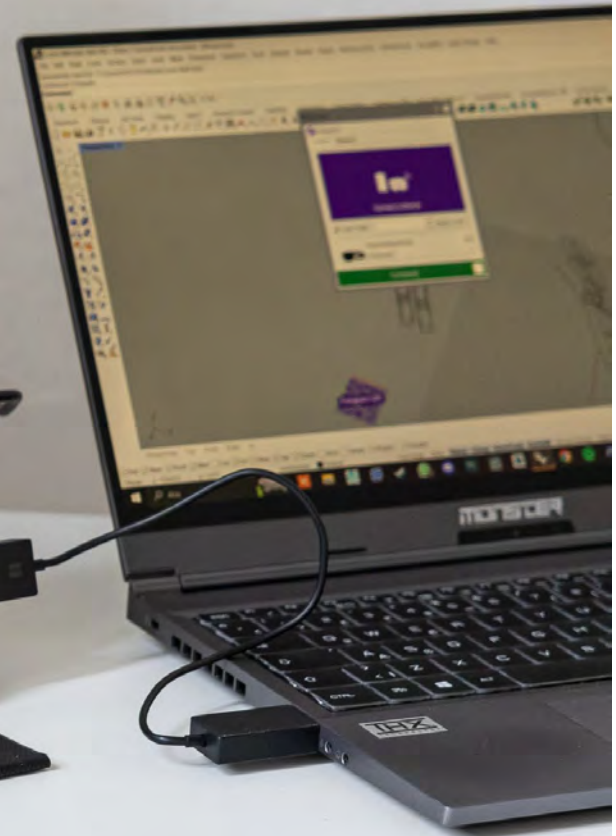
On HoloLens 2, HoloLens 1, iOS and Android

WATCH DEMO

3D MODEL INTO FOLOGRAM



THE NEXT STEP WAS TO TRANSFER THE TOWER USING FOLOGRAM





SCRIPTING IN GRASSHOPPER



Step 1

Basic Geometry



Step 2

Create Layers



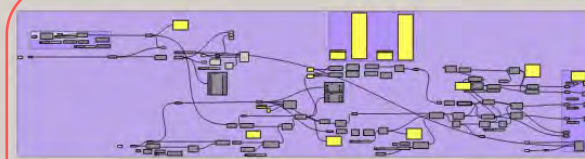
Step 3

**disassemble and
number**



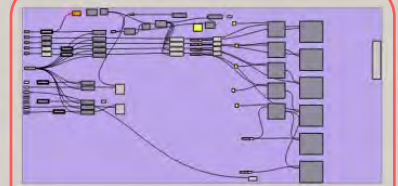
Step 4

**lining up all
individual parts**



Step 5

**Determination of upper and lower
edges and centers of the cut
surfaces**



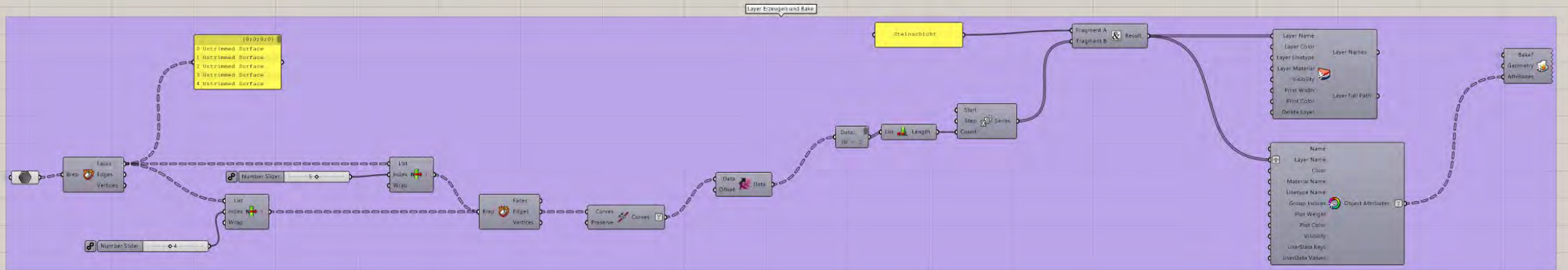
Step 6

**color marking of all
relevant points and
geometry baking**

Design process

Manufacturing process

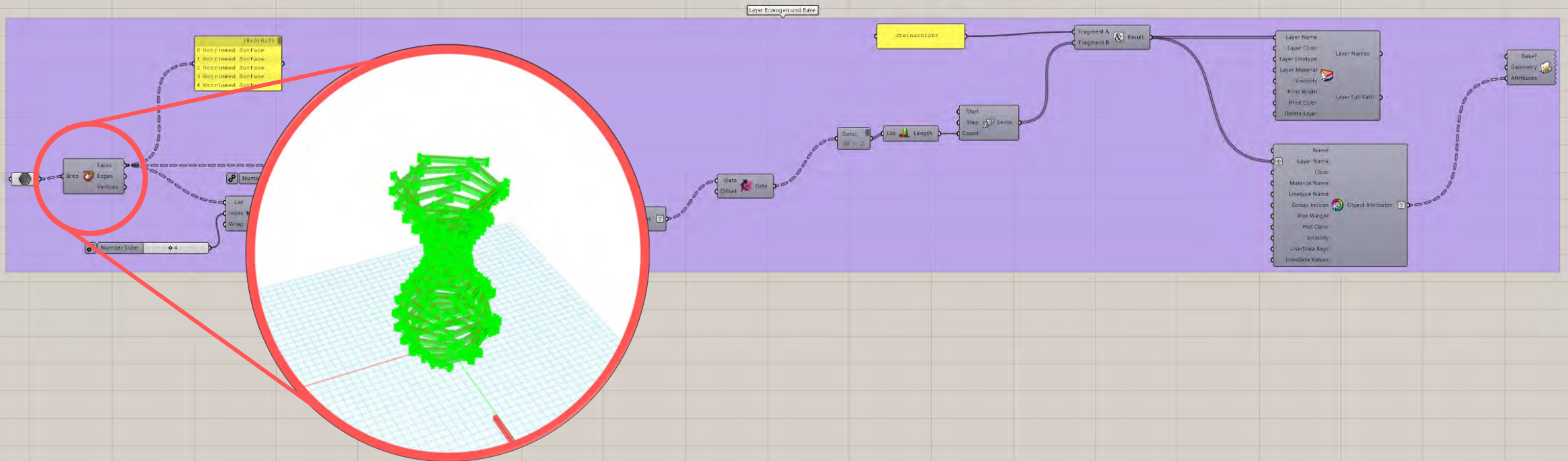
SCRIPTING IN GRASSHOPPER



© Screenshots in Grasshopper, own figure

HOW SCRIPTING IN GRASSHOPPER WORKS // AUTOMATIC LAYER GENERATION

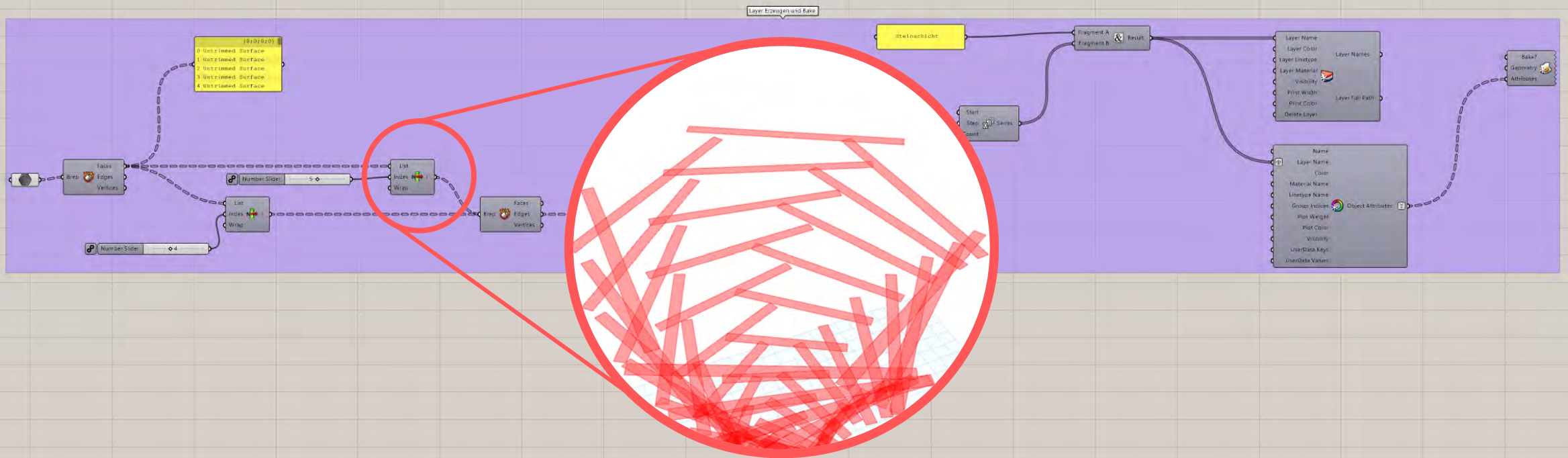
SCRIPTING IN GRASSHOPPER



© Screenshots in Grasshopper, own figure

GEOMETRY OF THE TOWER AS INPUT IS DECOMPOSED WITH DECONSTRUCT BREP

SCRIPTING IN GRASSHOPPER



© Screenshots in Grasshopper, own figure

WITH LIST ITEM THE INDIVIDUAL SURFACES OF ALL PARTS ARE SELECTED VIA AN INDEX

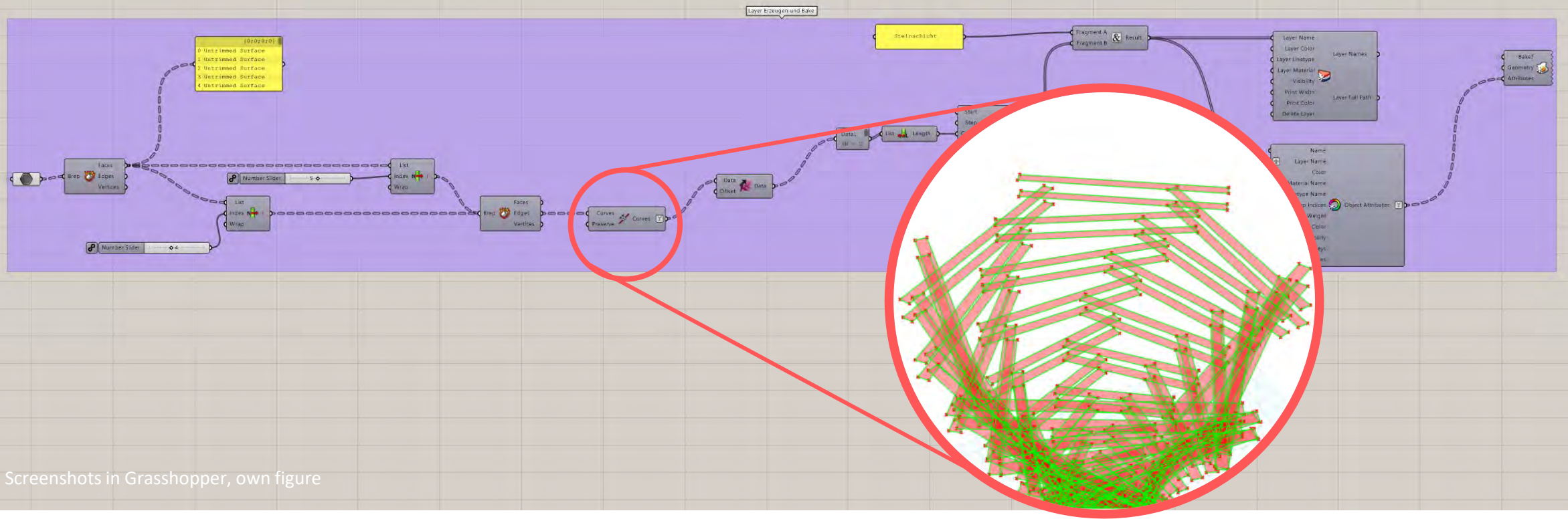
SCRIPTING IN GRASSHOPPER

The image shows a Grasshopper script on a grid background, primarily contained within a purple rectangular area. At the top center, the text "Layer Erzeugen und Bake" is present. The script starts with a cylinder icon on the left. A "Faces" component with a "Brep" input is connected to a "List" component. The "List" component has a "Number Side" input set to 4. The output of the "List" component is connected to a "Wrap" component, which is then connected to another "Faces" component with "Brep", "Edges", and "Vertices" outputs. A yellow callout box labeled "(Brep Brep)" contains a list of "Untrimmed Surface" items indexed from 0 to 4. A red circle highlights a specific part of the script where the "List" component is connected to the "Wrap" component. This circle is magnified in a large red oval, showing a 3D view of a complex red mesh structure with many overlapping, angled surfaces. To the right of the purple area, the script continues with a "Start Step" component connected to a "Fragment A Fragment B" component. This is followed by a "Layer Name" component with various input fields like "Layer Color", "Layer Linetype", etc. Finally, a "Bake" component is connected to an "Attributes" component.

© Screenshots in Grasshopper, own figure

OTHER INDEX MEANS OTHER SURFACE

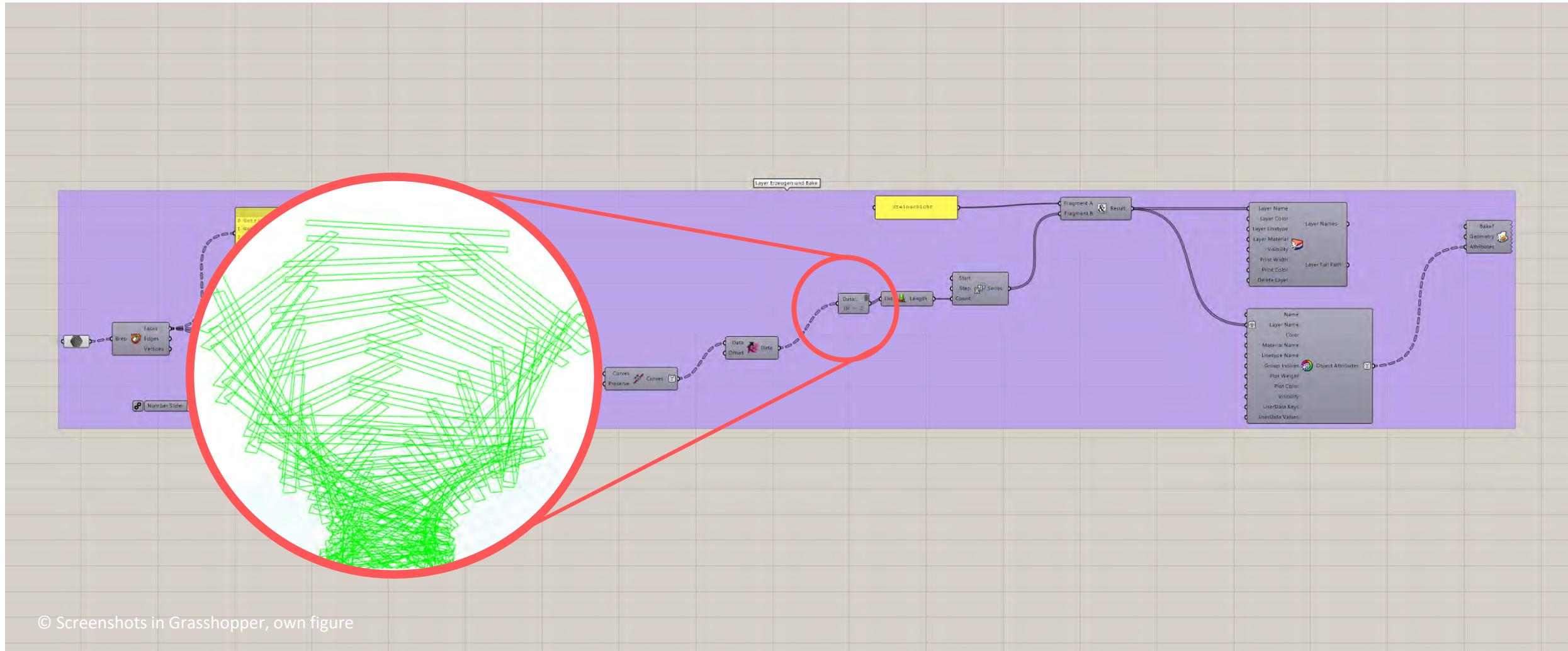
SCRIPTING IN GRASSHOPPER



© Screenshots in Grasshopper, own figure

THE SURFACES ARE DIVIDED INTO LINES AND THEN JOINED TOGETHER

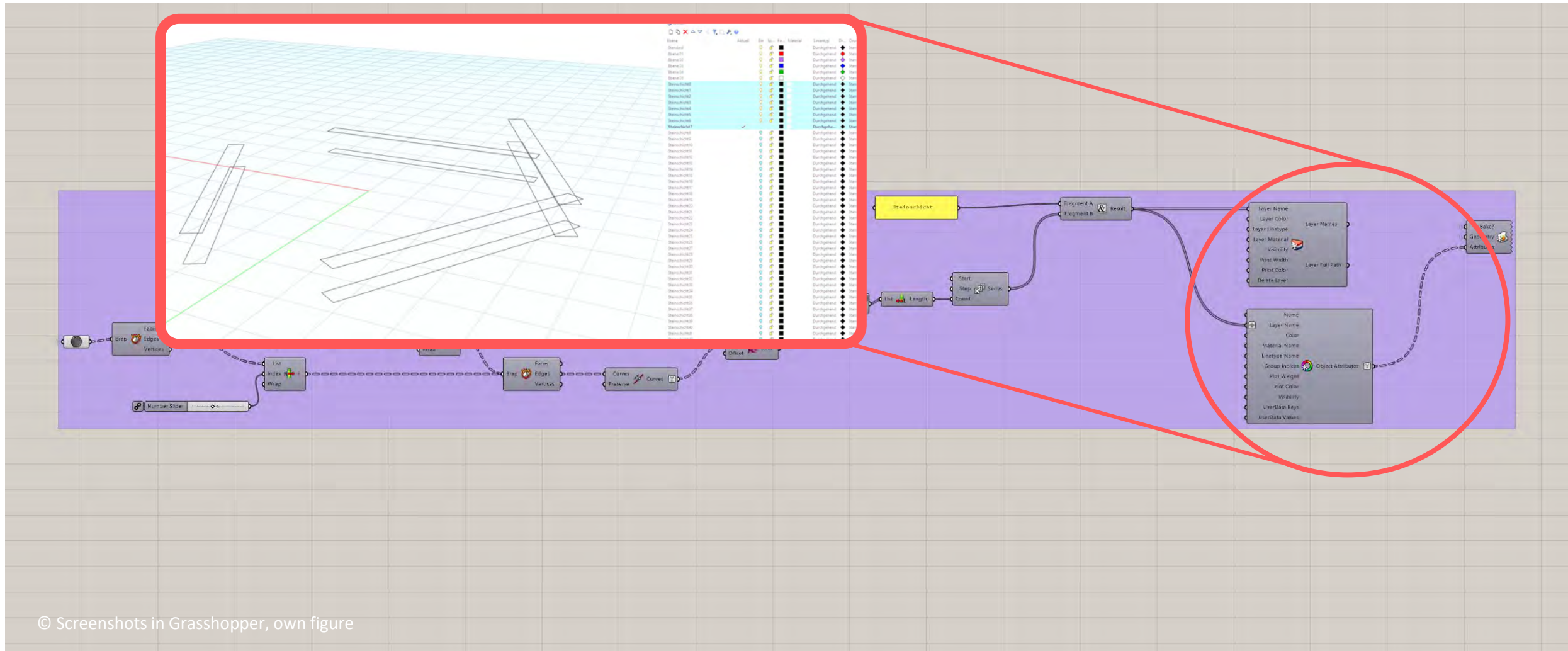
SCRIPTING IN GRASSHOPPER



© Screenshots in Grasshopper, own figure

GEOMETRYOUTPUT

SCRIPTING IN GRASSHOPPER



© Screenshots in Grasshopper, own figure

EACH LINE PAIR IS AUTOMATICALLY ASSIGNED TO A NUMBERED LAYER AND VISIBILITY CAN BE CONTROLLED







<https://e.video-cdn.net/share?video-id=5JsicfU8oZaDqBpboFir4P&player-id=EQXSwJteHsd-jonvxZMcPQ&channel-id=34902>



26. - 28. April 2023

University:Future Festival

Heads Up!

[On Demand](#)

[Programm 2023](#)





Kindl Brauerei – Sudhaus um 1930
© Museum Neuquén




Welcome!

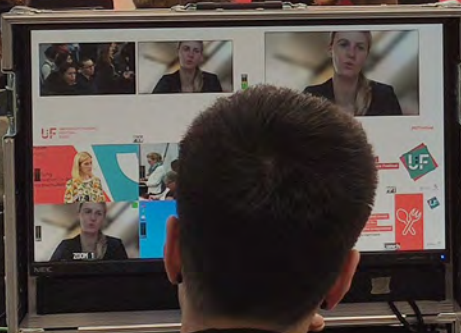
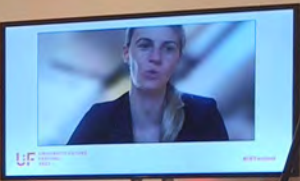
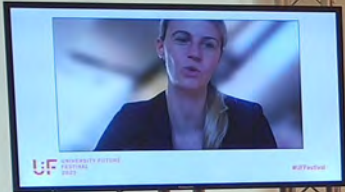
University:Future Festival

Mainstage-Event

Heads Up

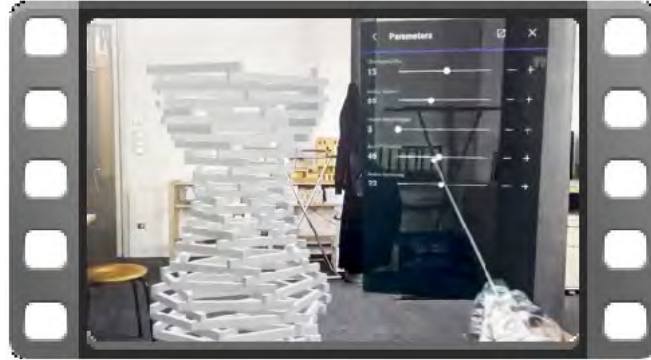



University:Future Festival 2023
Heads Up!
 Mainstage-Event Berlin
 #UFFestival









<https://e.video-cdn.net/video?video-id=6rccUHSAXNxvmH-fAUFSmz&player-id=EQXSwJteHsd-jonvxZMcPQ&channel-id=92508>



Bauen mit Augmented Reality
Kutlu Eng

Bauen mit Augmented Reality
Cubic Tower

Bauen mit Augmented Reality
Cracked Pavilion

FEHLER UND GRENZEN DER KÜNSTLICHEN INTELLIGENZ DALL-E

Entwurfsideen durch die Hilfe von künstlicher Intelligenz

Ist die KI in der Lage bei einer wissenschaftlichen Arbeit zu unterstützen?

ArchIGAN

TRIANGEL PAVILLON UNIVERSITY FESTIVAL 2022



Bauen mit Augmented Reality
Cracked Pavilion

ChatGPT4
in Bing



ChatGPT4
in Bing



EXPLORING TEXT-TO-IMAGE AI

REimagine

Bauen mit Augmented Reality
Hendrik Kötje / Jan Löhner





**VIRTUAL
REALITY**



**AUGMENTED
REALITY**



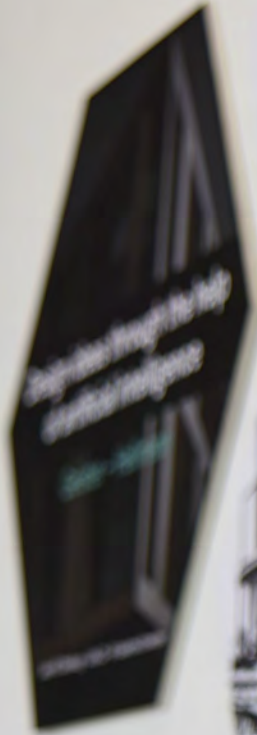
REALITY



"extend photo of a
architectural house to mod
roof overhang with terrace"

"extend photo to garden with
communal seating area,
warm lighting"

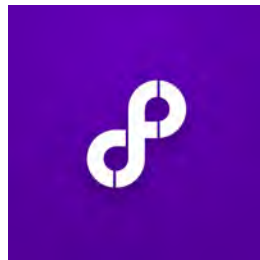
REVISIONS
PROPOSAL
WORK



HOW TO DESIGN WITH AI?



+



AI + GRASSHOPPER

=

CRAZY STRUCTURES

=

AR ASSISTED BUILDING



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