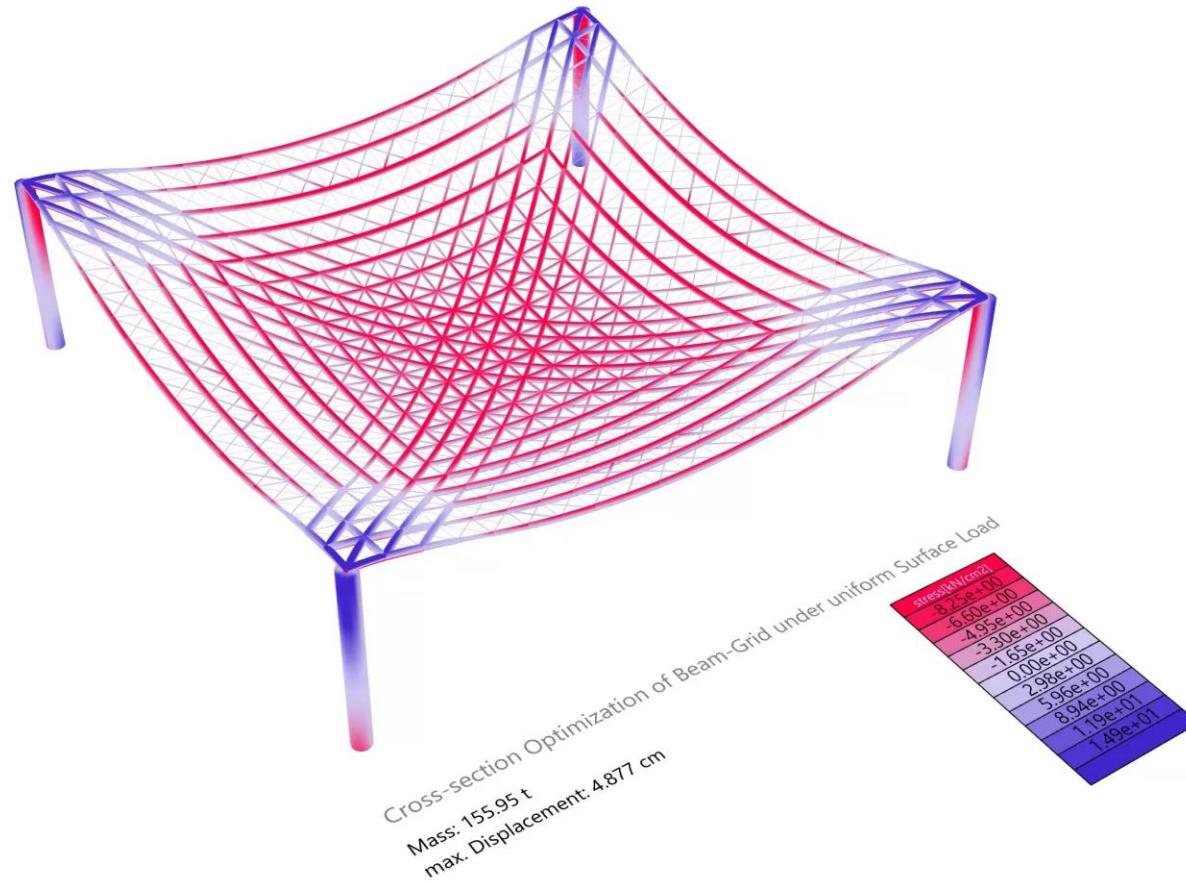
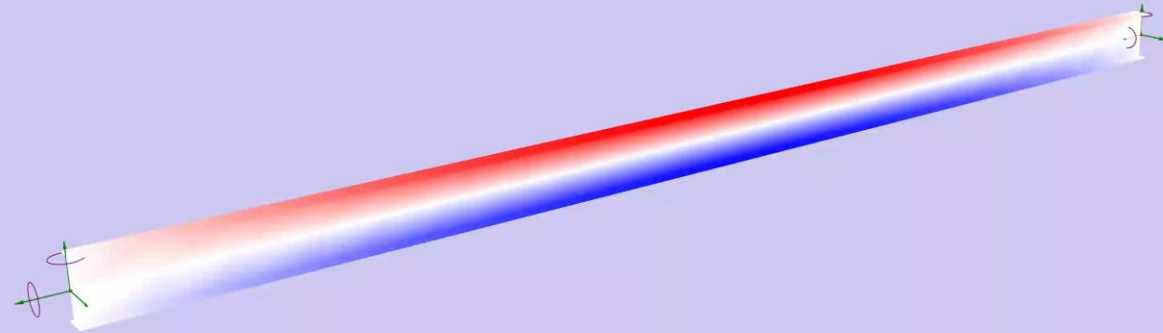
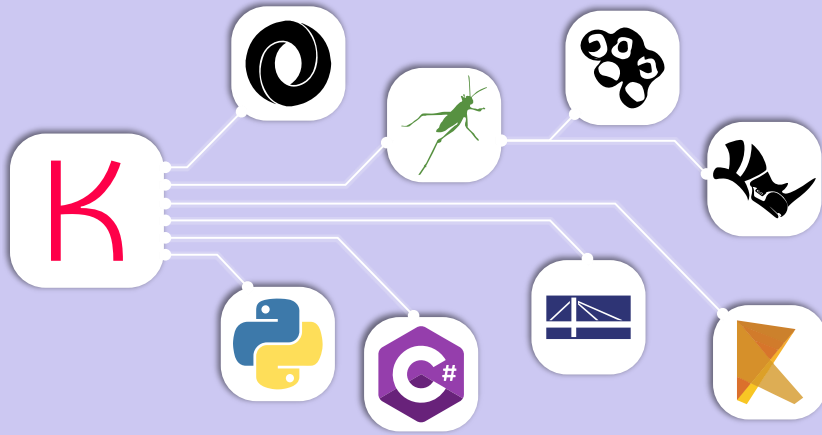


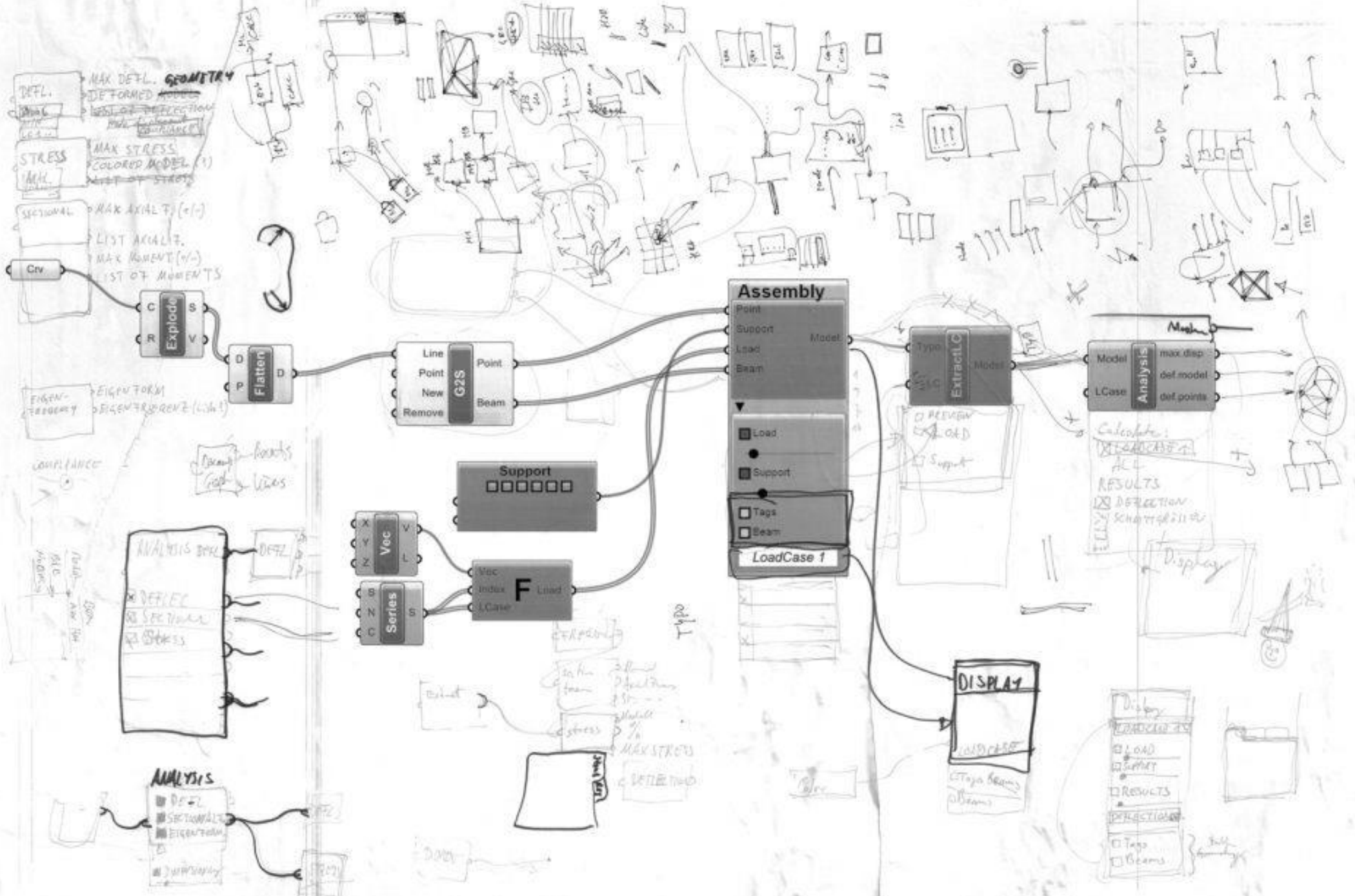
KARAMBA3D



Parametric Engineering

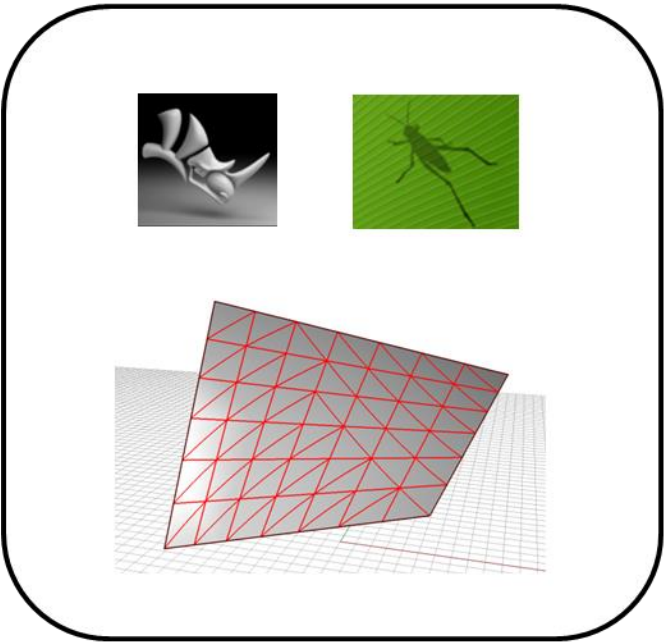
- Quick and accurate Finite Element Analysis (FEA)
- Parametric engineering
- Interactive Results
- Specially tailored for the early design phases



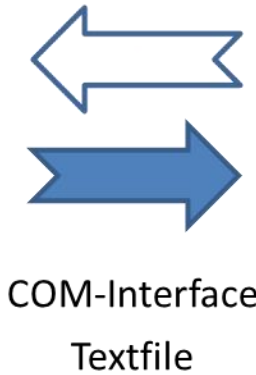


,Bottleneck' Import & Export

Geometric model



Structural model



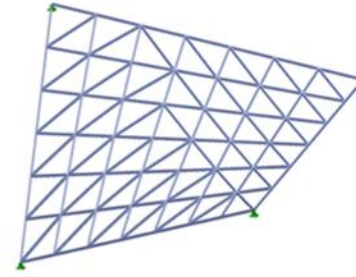
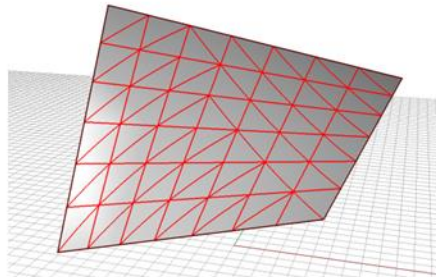
Integrated Workflow

Geometric model

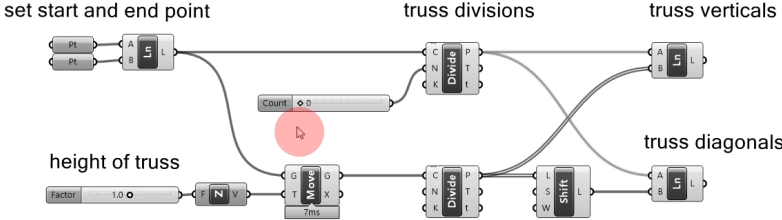
Structural model



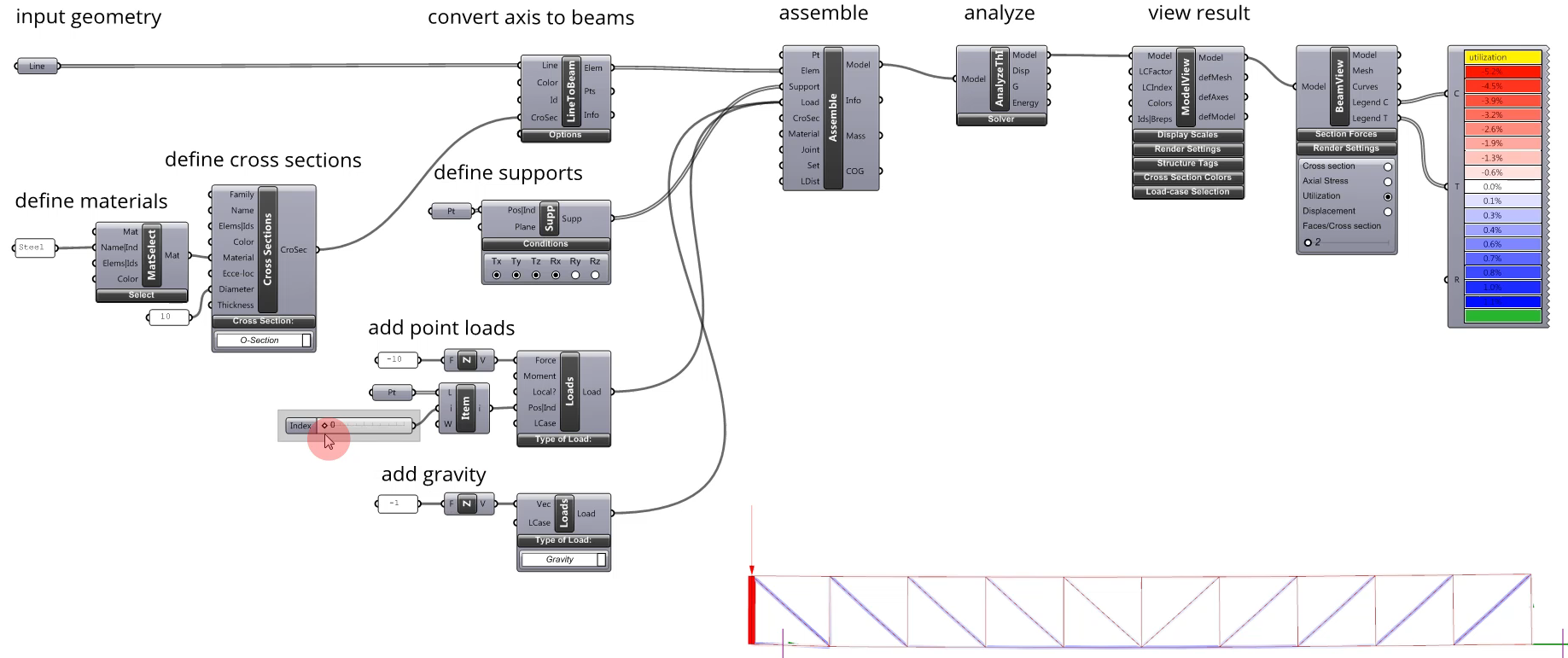
KARAMBA3D



Parametric Geometry

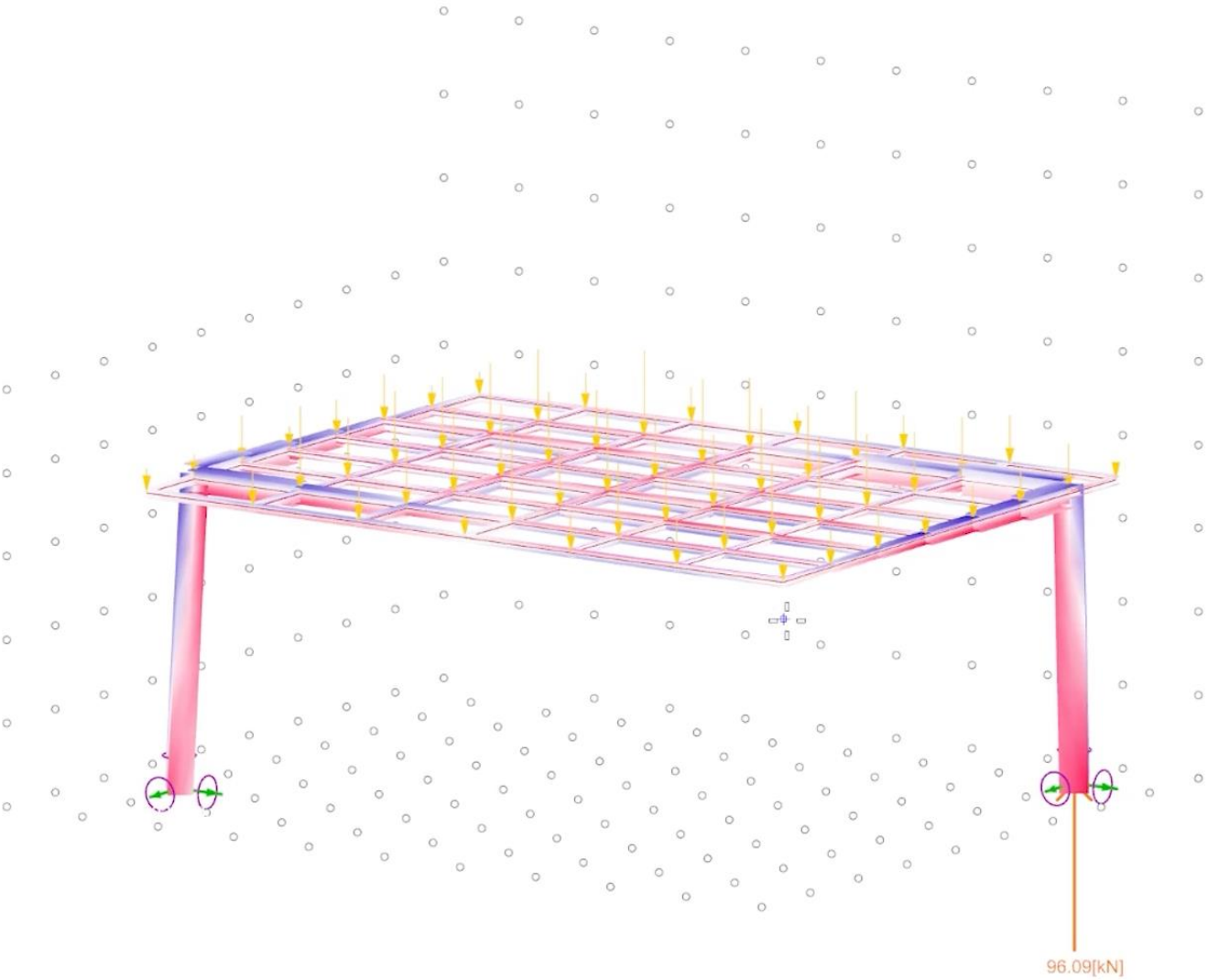
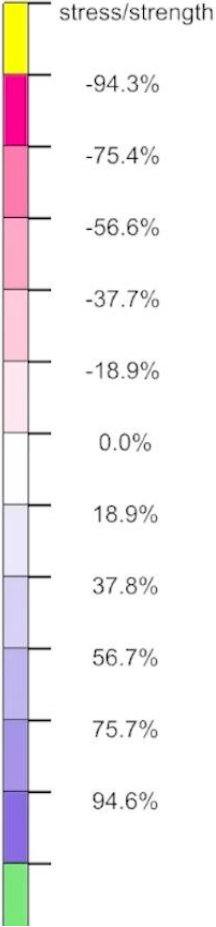


Parametric Structure

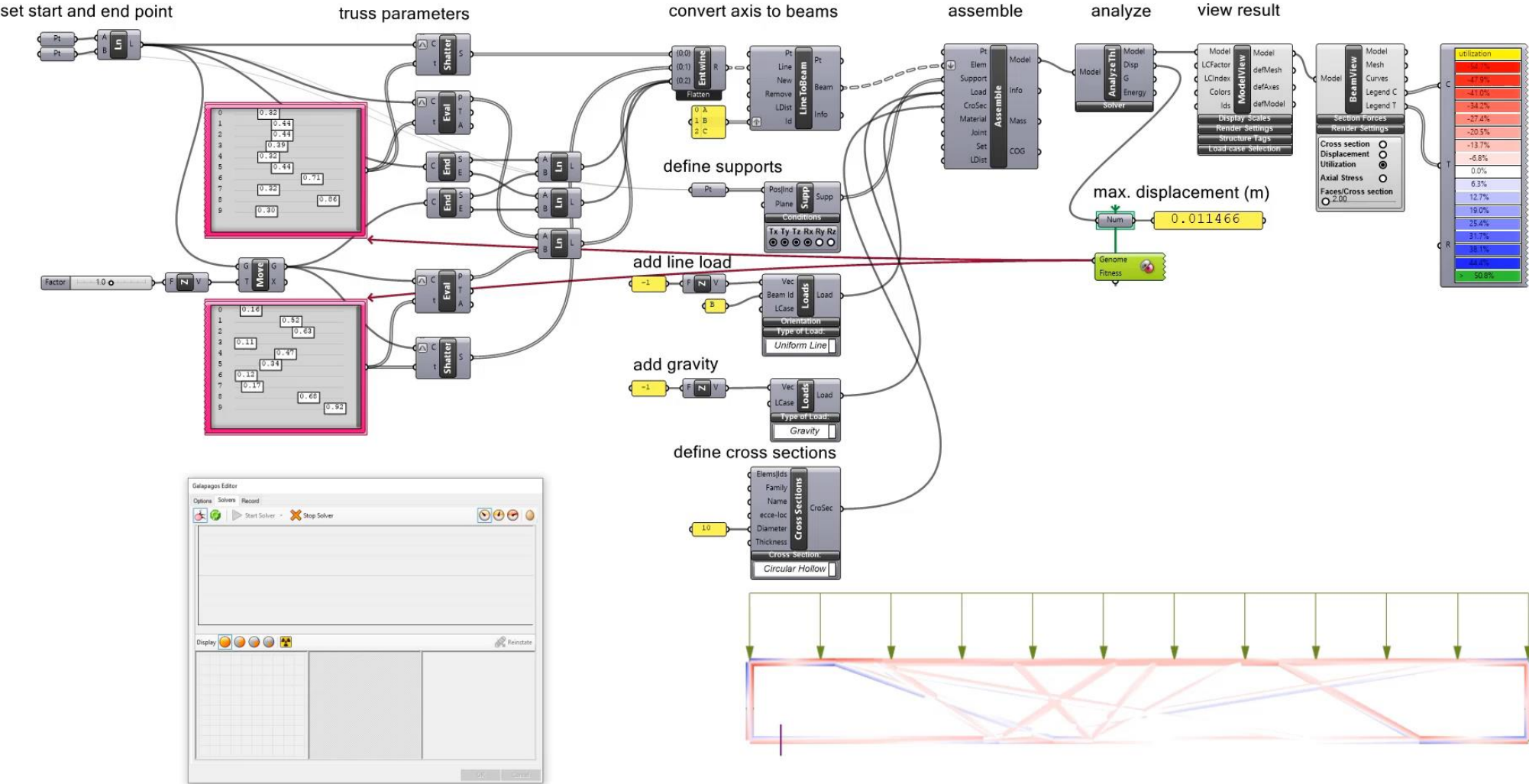


Interactive Results

max displacement (cm):22.938263
total mass (t): 4.149729
number of joints: 58
number of beams:99



Optimized Structure



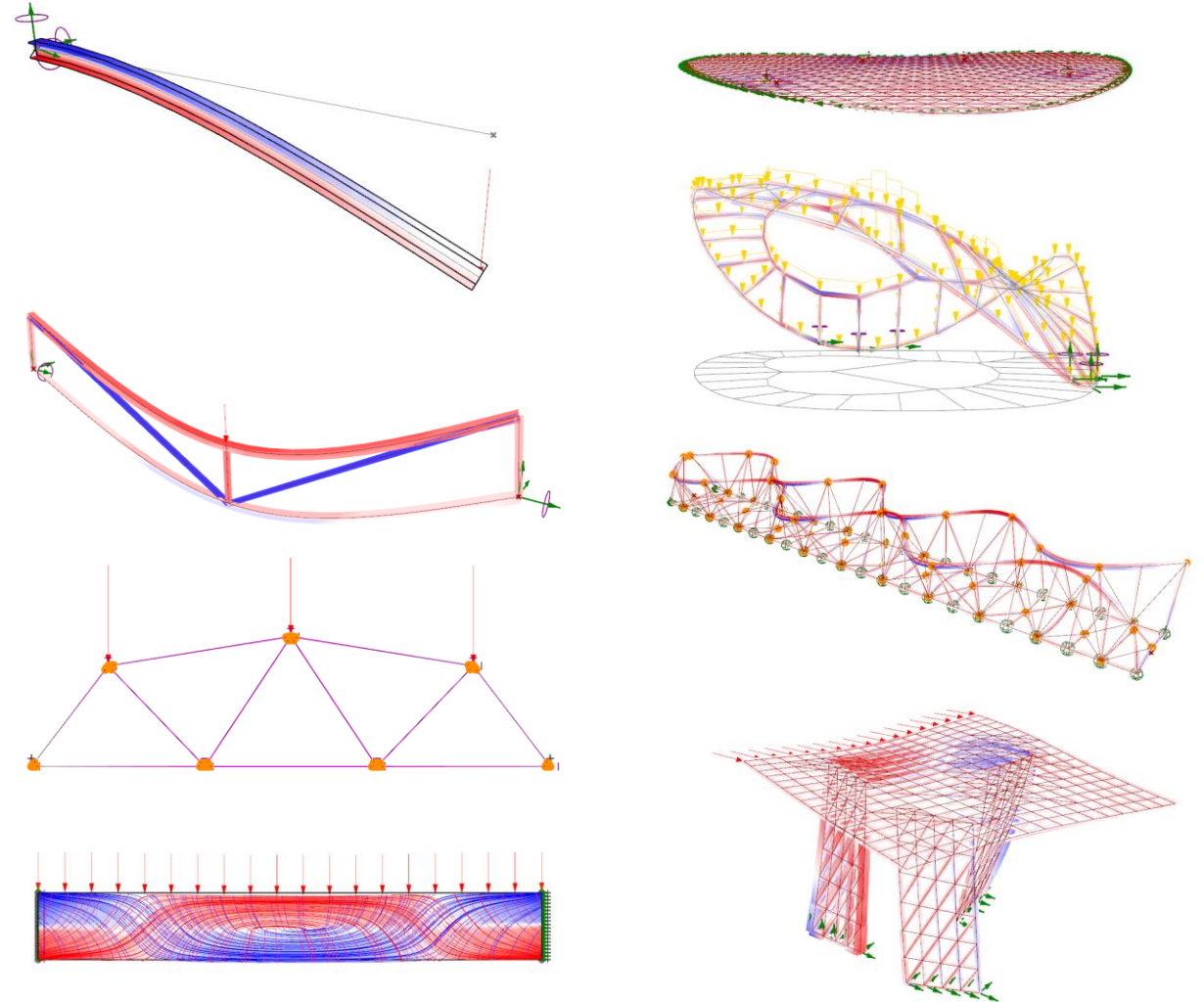
Functionality

Analysis

- Analysis THI | THII
- Nonlinear
- Buckling Modes
- Eigen Modes | Natural Vibrations

Formfinding & Optimization

- Large Deformations
- BESO for Beams & Shells
- Optimize Cross-Sections
- Optimize Reinforcement
- Tension / Compression Eliminator



Graphic Display of Results

Model View

Model Model

LCFactor defMesh

LCIndex defAxes

Colors

Ids|Brops defModel

Display Scales

Deformation ☒

50

Reactions ☐

1

Loads ☒

0.2

Supports ☒

0.2

Local axes ☐

1

Joints ☒

1

Render Settings

Tags

Colors

Load-case

Beam View

Model

Mesh

Curves

Legend C

Legend T

Section Forces

Filled ☐

Numbers ☐

Scale

0.5

Mx ☐

My ☐

Mz ☐

Nx ☐

Vy ☐

Vz ☐

Render Settings

Cross section ☒

Axial Stress ☐

Utilization ☐

Displacement ☐

Faces/Cross section ☐

2

Shell View

Model Model

LayerInd Mesh

Legend C

Legend T

Display Scales

Local layer axes ☐

1

Render Settings

Cross section ☒

Utilization ☐

Displacement ☐

Princ. Stress 1 ☐

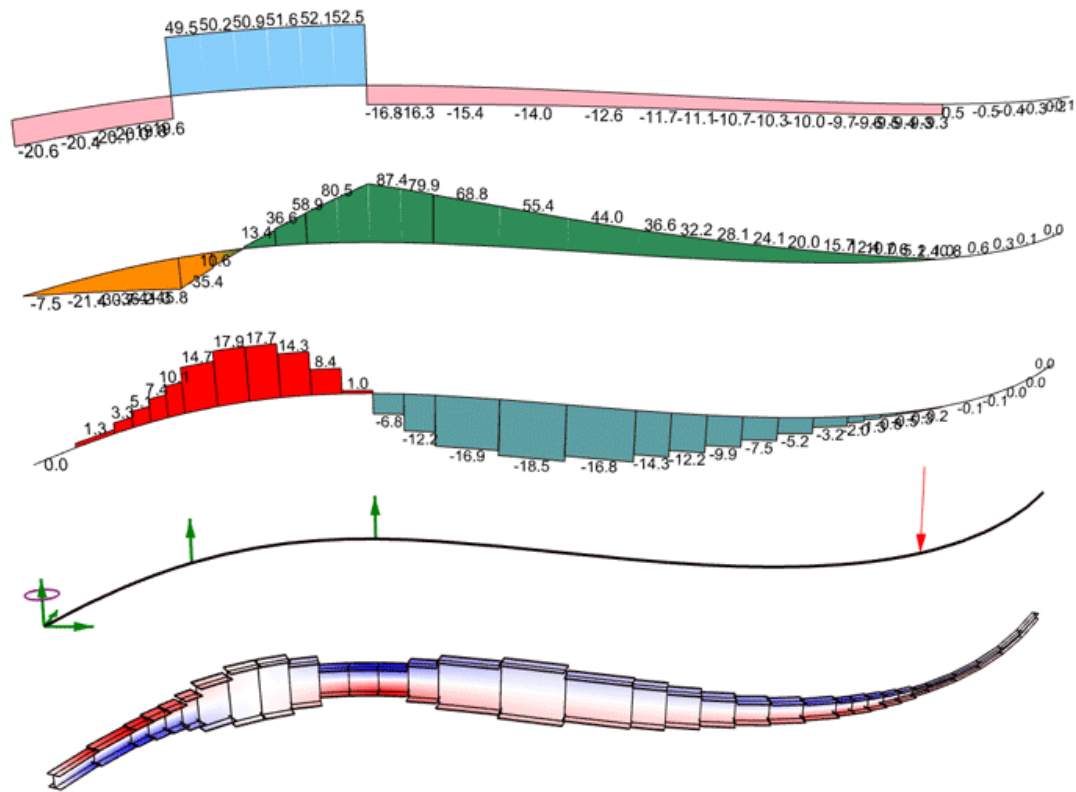
Princ. Stress 2 ☐

Van Mises Stress ☐

Fiber of results ☐

Princ. Stress 1-2 ☐

1



Numeric Output of Results

Deformation-Energy

Model	Model
ElemIds	Ax-Energy
LCase	Be-Energy

Nodal Displacements

Model	Model
LCase	Trans
	Rot

Principal Strains Approximation

Model	Model
DefModel	P
Point	VT1
Scale	VT2

Reaction Forces

Model	Model
Model	RF
	RM
	Pos
LCase	SumRF
	SumRM

Utilization (Beams)

Model	Model
ElemIds	Util
LCase	sig-max
	sig-min
	tau-max
nSamples	Util-N
Elast	Util-Vy
	Util-Vz
gammaM0	Util-Mt
gammaM1	Util-My
	Util-Mz
Details?	Details
Utilization of:	
Beams	

Beam Forces

Model	Model
BeamIds	N
	Vz
LCase	Vy
	Mt
maxL	My
NRes	Mz

Beam Resultant Displacements

Model	Model
BeamIds	N
LCase	M
maxL	V
NRes	

Utilization (Shells)

Model	Model
ElemIds	Util
LCase	
Utilization of:	
Shells	

Beam Displacements

Model	Model
BeamIds	Trans
LCase	Rot
maxL	
NRes	

Shell Forces

Model	Model
Model	n1
	n2
ShellIds	m1
	m2
LCase	vx
	vy
Result Type:	
Principal	

Shell Forces

Model	Model
Model	nox
	nyy
	nxy
ShellIds	mxx
	myy
	mxy
LCase	vx
	vy
Result Type:	
Local	

Shell Principal Stress Vectors

Model	Model
Model	P
	Sig1-Vec
	Sig2-Vec
Layer	Sig1-Val
	Sig2-Val
Type of Result:	
PrincStress	

Shell Principal Force Vectors

Model	Model
Model	N1-Vec
	N2-Vec
	M1-Vec
	M2-Vec
ElemIds	N1-Val
	M1-Val
	N2-Val
	M2-Val
Type of Result:	
PrincForce	

Shell Principal Stress Lines

Model	Model
Layer	Model
Sources	Lines1
Seg-L	Lines2
dA	
Type of Result:	
PrincStress	

Shell Principal Moment Lines

Model	Model
Sources	Lines1
Seg-L	Lines2
dA	
Type of Result:	
PrincMoment	

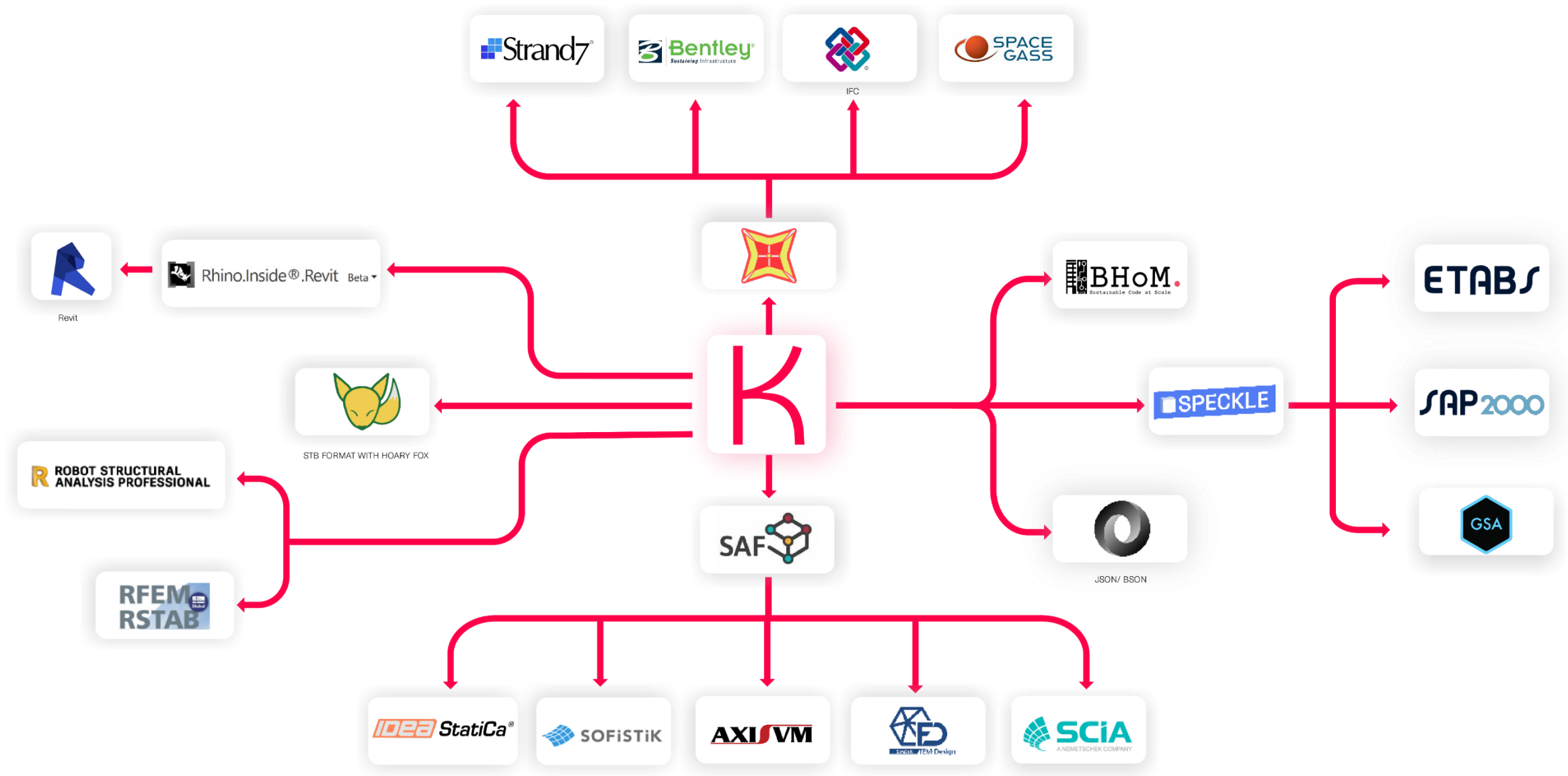
Shell Force Flow Lines

Model	Model
Layer	Model
ForceDirs	Model
ForceDirPos	
Sources	Lines
Seg-L	
dA	
Theta	
Type of Result:	
ForceFlow	

Shell Iso Lines

Model	Model
Layer	Model
Vals Pts Lines	Lines
Seg-L	Value
Smooth	
Properties	
Sig1	☐
Sig2	☐
Util	☐
Disp	☒
Thick	☐
m1	☐
m2	☐
Type of Result:	
IsoLines	

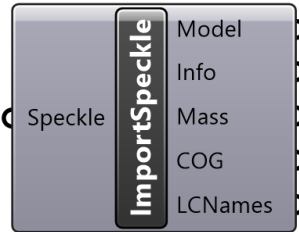
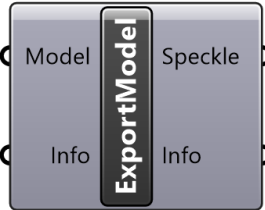
Integration into Software Ecosystems



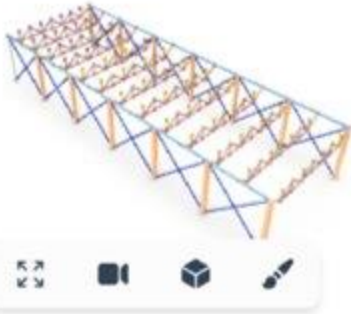
Speckle Structural Model Exporter & Importer



Speckle



The screenshot displays the Karamba3D software interface. The top menu bar includes File, Edit, View, Define, Draw, Select, Assign, Analyze, Display, Design, Detailing, Options, Tools, and Help. The main workspace shows a 3D model of a structural frame. A large red 'K' is overlaid on the left side of the workspace. A dark blue panel on the right side of the workspace displays the 'Speckle 2.17.2' plugin interface. This panel includes a header with 'Karamba3D Tests / karamba_examples / Pushed 3 elements from Grasshopper' and an 'EDIT' button. Below the header, it shows a user profile for 'karamba_examples' with a 'GH' icon and a 'Pushed 3 elements from Grasshopper' message. There is an 'EXPAND DATA VIEW' button and an 'ADD' button. A 'Filters Groups (0)' dropdown is also visible. A 'Model Explorer' panel on the left side of the workspace shows a tree view of the model's components. A 'Member Force Diagram' dialog box is open in the foreground, showing options for 'Load Case/Load Combination/Model Case', 'Component' (Axial Force, Torsion, Inplane Shear, Shear 2-2, Moment 2-2, Inplane Moment, Shear 3-3, Moment 3-3), 'Scaling' (Automatic, User Defined), 'Display Options' (Fill Diagram, Show Values at Controlling Stations on Diagram), and 'Include' (Frames, Piers, Spandrels, Links). The 3D view shows a complex structural frame with red and yellow members, and a '3D View: Axial Force Diagram (Dead, Rp)' is displayed.



- Material
- ☐ Aluminum AW3004H14
 - ☐ Steel S235
 - ☐ Wood (VHill)

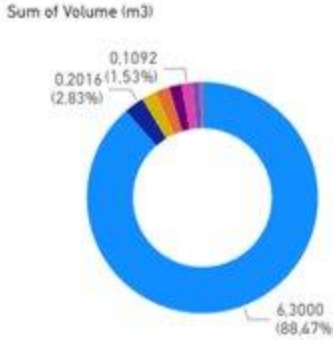
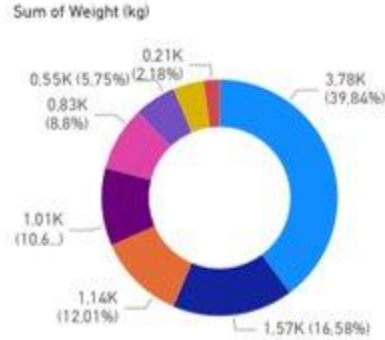
- Element
- ☐ Beam
 - ☐ Bracing
 - ☐ Column
 - ☐ Truss_A1
 - ☐ Truss_A2
 - ☐ Truss_C
 - ☐ Truss_D
 - ☐ Truss_E

9,49K

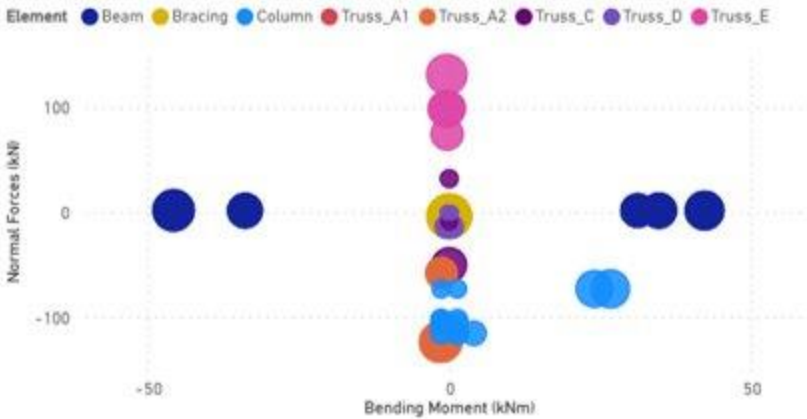
Sum of Weight (kg)

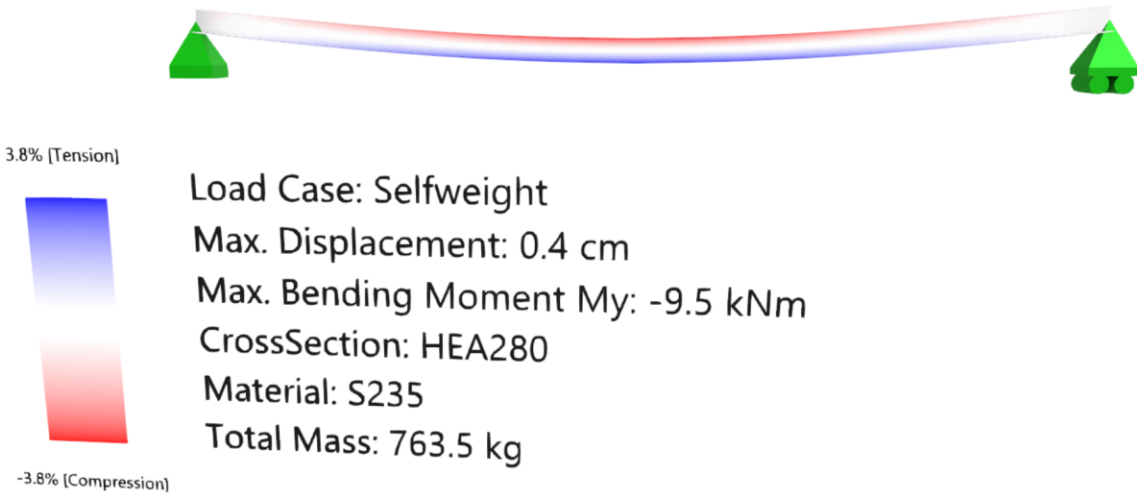
7,1212

Sum of Volume (m3)



Element	Material	Cross Section	Bending Moment (kNm)	Normal Forces (kN)	Utilisation	Volume (m3)	Weight (kg)
Truss_A2	Steel S235	IPE120	-1.54	-124.30	82 %	0.0016	12.95
Truss_A2	Steel S235	IPE120	-1.54	-124.30	82 %	0.0016	12.95
Truss_A2	Steel S235	IPE120	-1.54	-124.30	82 %	0.0016	12.95
Truss_A2	Steel S235	IPE120	-1.54	-124.30	82 %	0.0016	12.95
Truss_A2	Steel S235	IPE120	-1.54	-124.30	82 %	0.0016	12.95
Truss_A2	Steel S235	IPE120	-1.54	-124.30	82 %	0.0016	12.95
Truss_A2	Steel S235	IPE120	-1.54	-124.30	82 %	0.0016	12.95
Truss_A2	Steel S235	IPE120	-1.54	-124.30	82 %	0.0016	12.95
Truss_A2	Steel S235	IPE120	-1.54	-124.30	82 %	0.0016	12.95
Truss_A2	Steel S235	IPE120	-1.54	-124.30	82 %	0.0016	12.95
Truss_A2	Steel S235	IPE120	-1.54	-124.30	83 %	0.0016	12.95
Truss_A2	Steel S235	IPE120	-1.54	-124.30	83 %	0.0016	12.95
Truss_A1	Steel S235	IPE120	-1.54	-124.04	82 %	0.0016	12.95





PARAMETERS

Cross Section
HEA280

Deformation Scale
0 100 94

Length [m]
5 15 10

Line Load [kN]
0.1 5 1

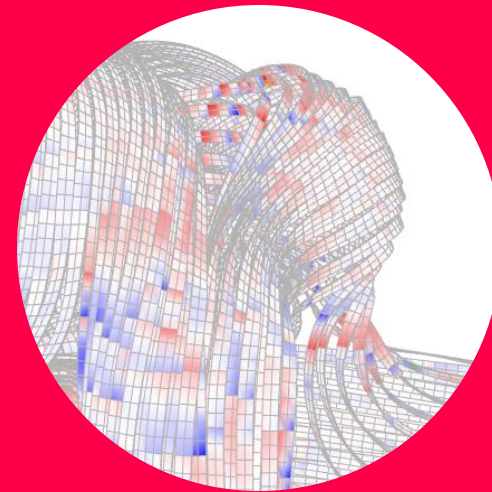
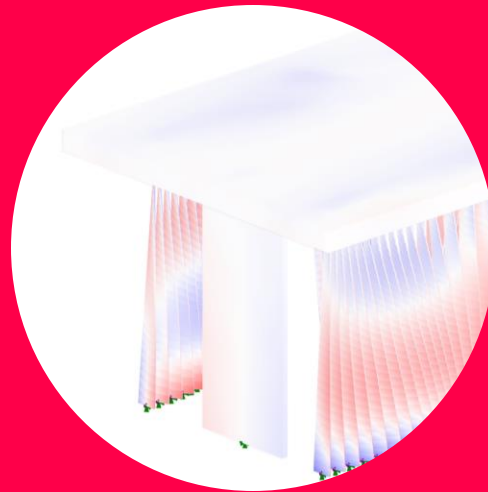
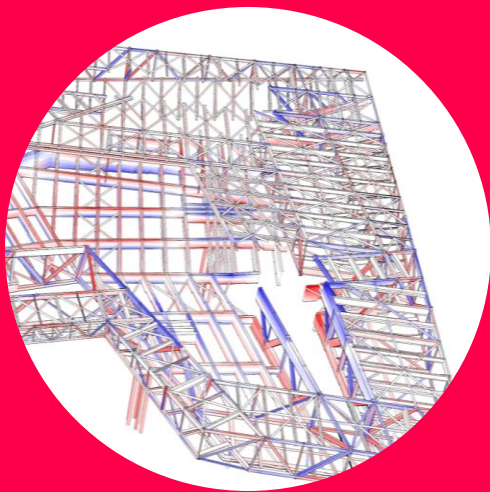
LoadCase
Selfweight

Point Load [kN]
0.1 5 2

Position - Support
0.5 1 1

Position - Point Load
0 1 0,5

CASE STUDIES





Expo Cultural Park Greenhouse Garden

ARCHITECTURE

Delugan Meissl Associated Architects

ENGINEERING

Bollinger+Grohmann

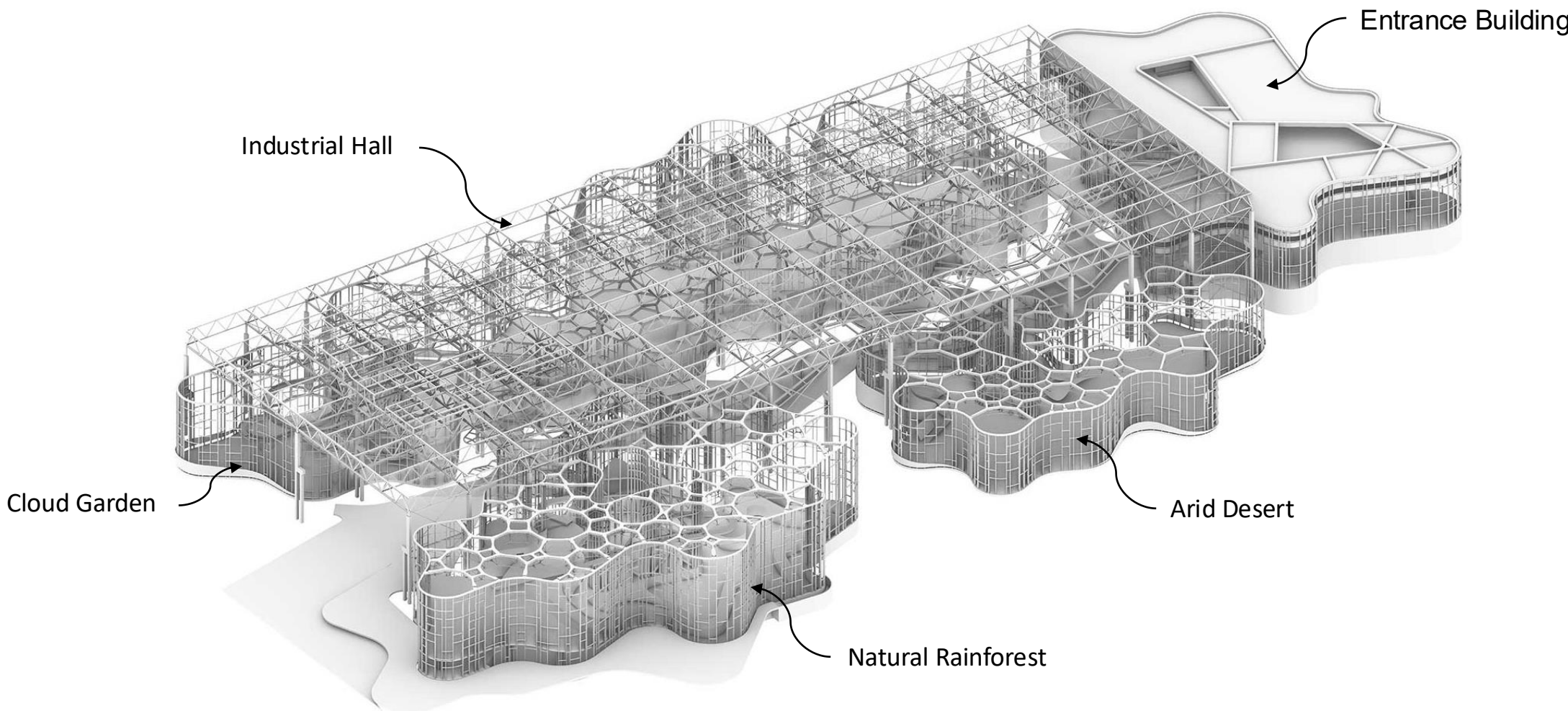
LOCATION

Shanghai, China

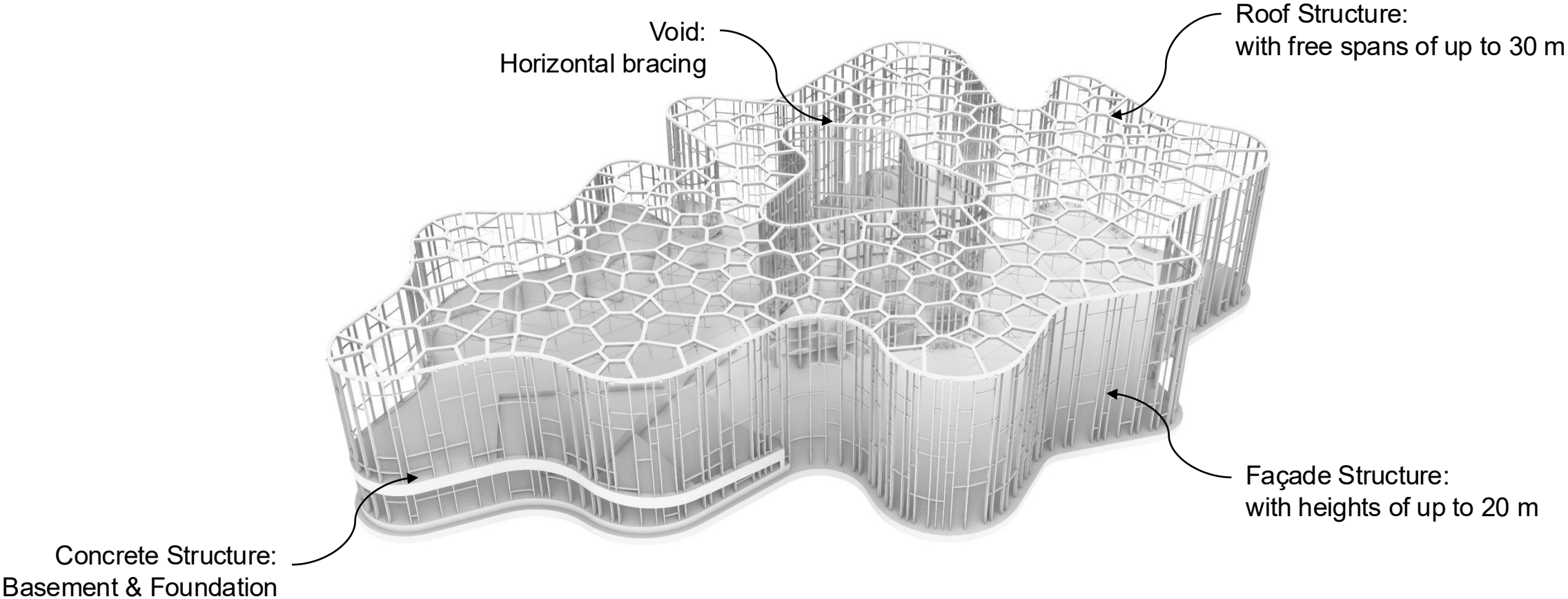
STATUS

Completed
2024

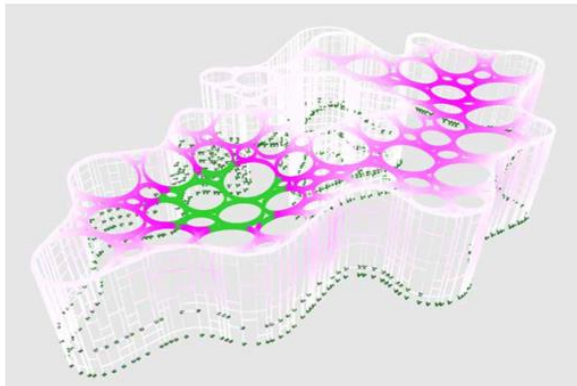
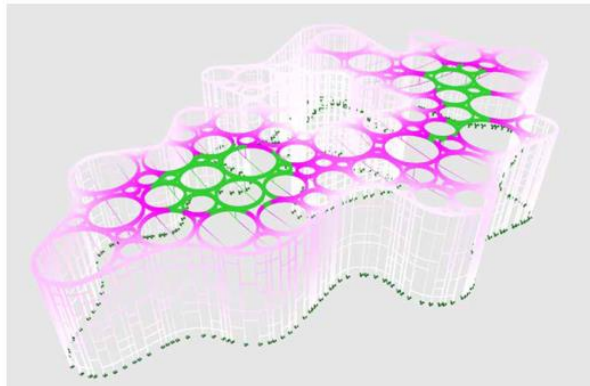
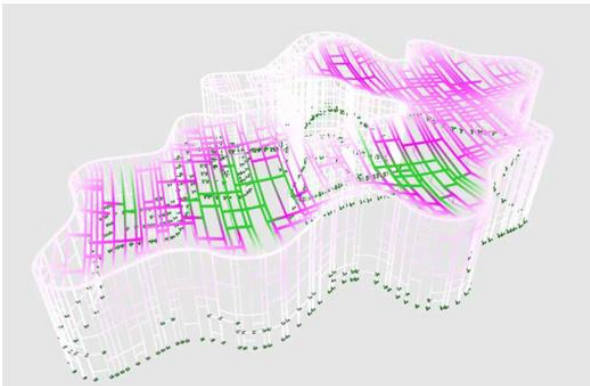
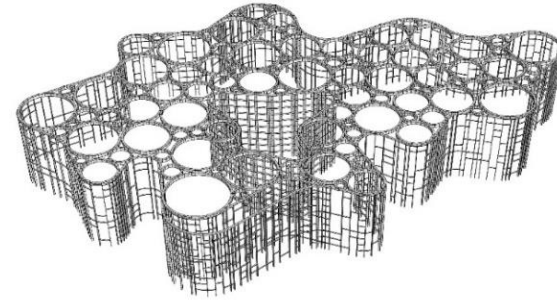
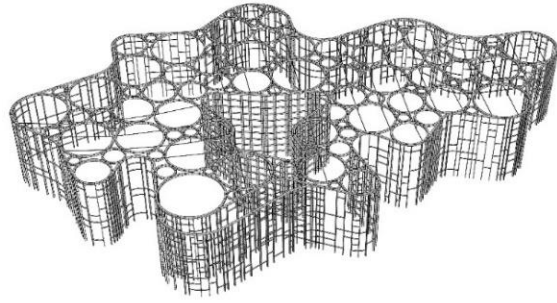
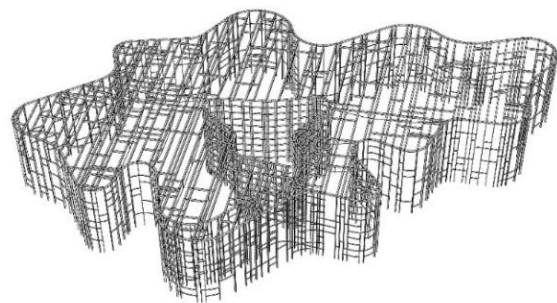
Global Structural Overview



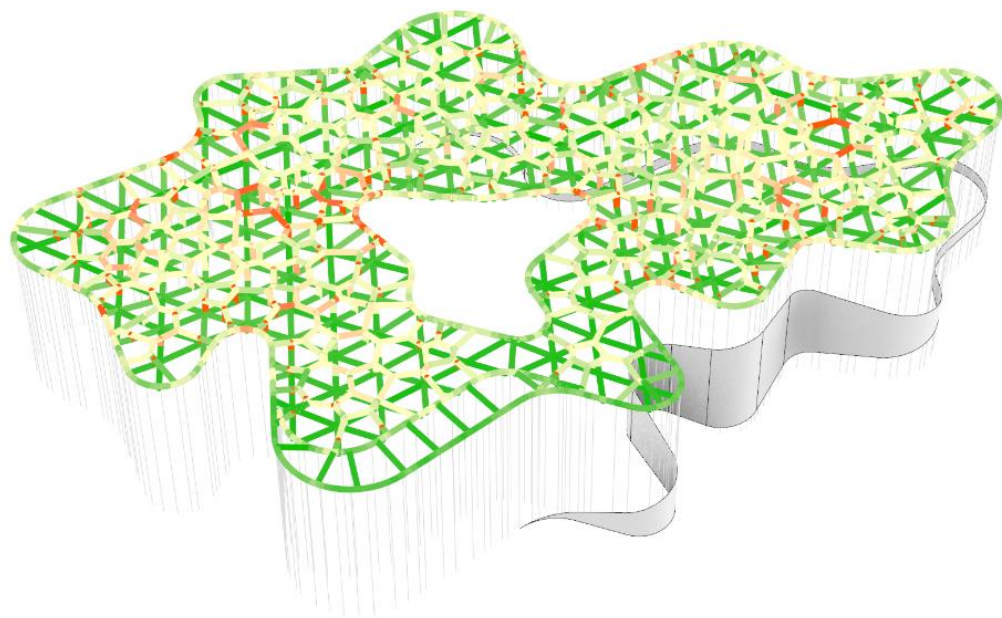
Natural Rainforest – Structural System



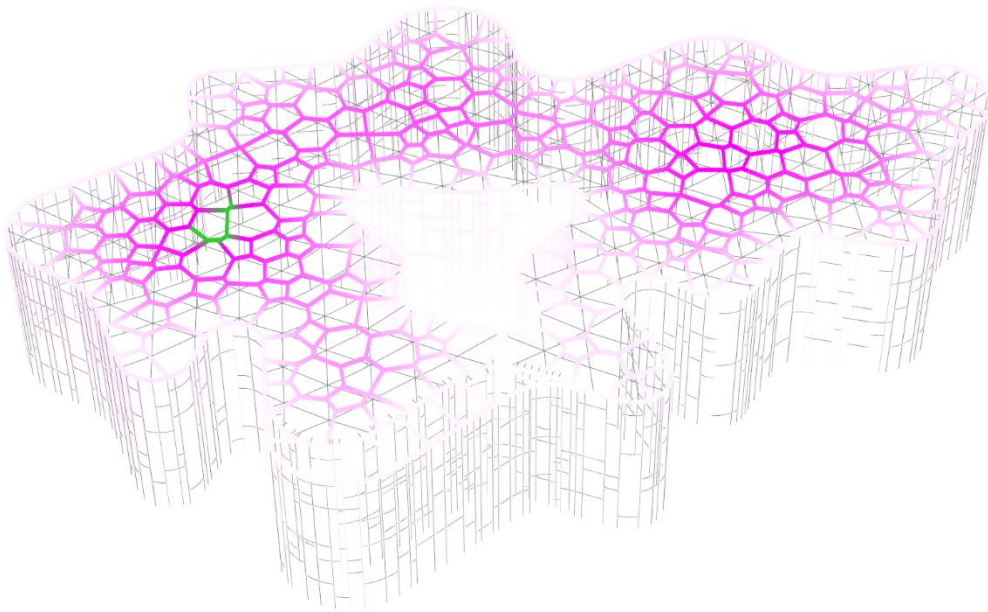
Designer Exploration



Roof Structure

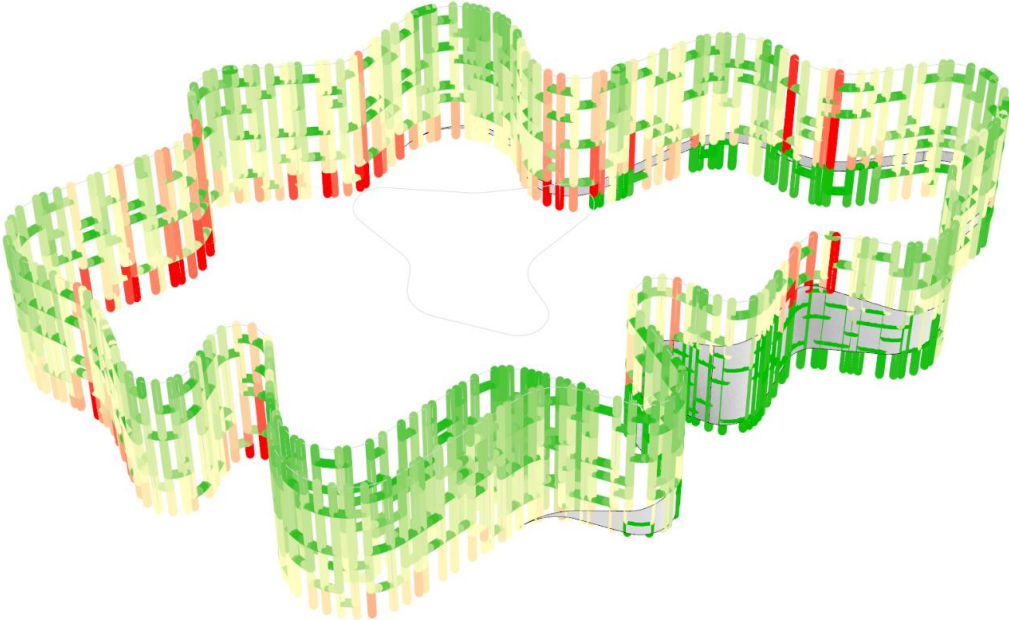
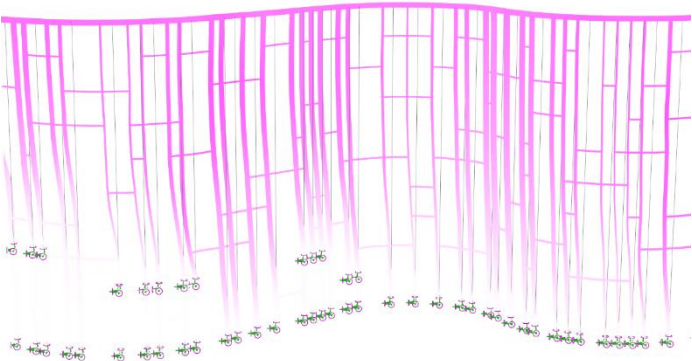


Utilisation of the Roof Members

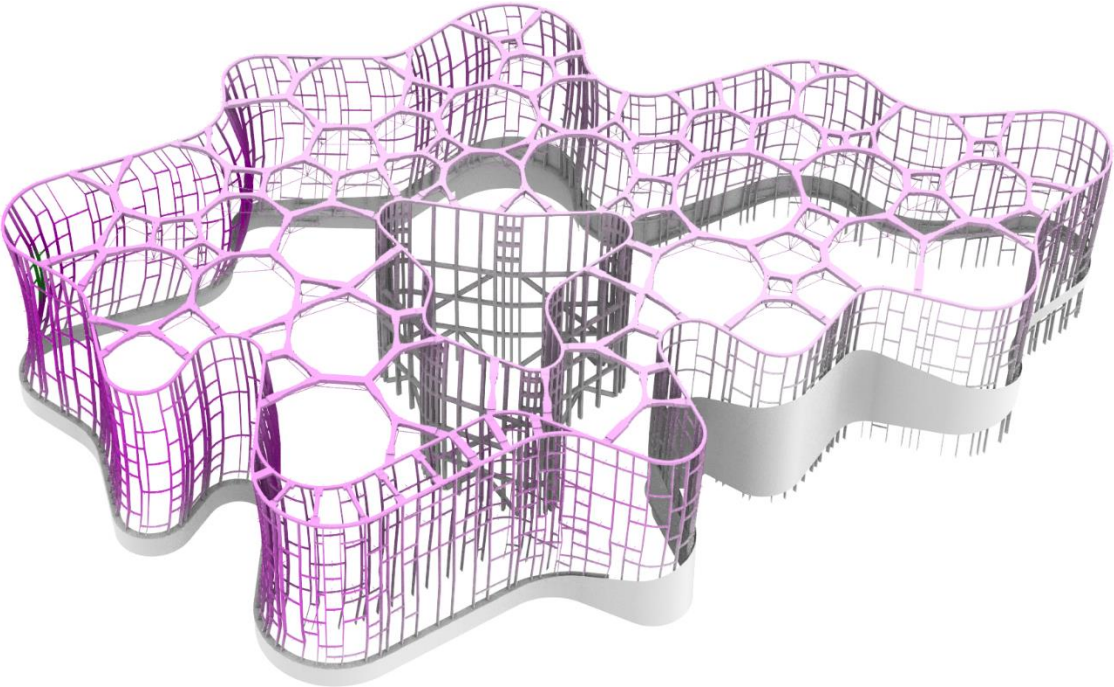


Displacement of the Roof under Gravity

Facade



Utilisation of the Facade Columns



Buckling Analysis of the Columns





Twist Pavilion

ARCHITECTURE

Institute of Architecture & Media
Technical University Graz

ENGINEERING

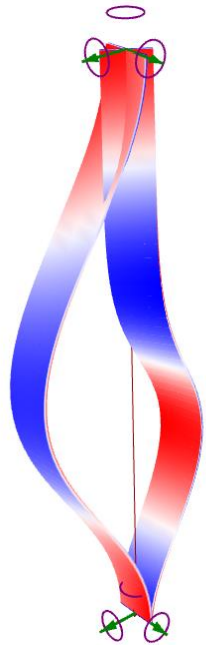
Bollinger+Grohmann

LOCATION

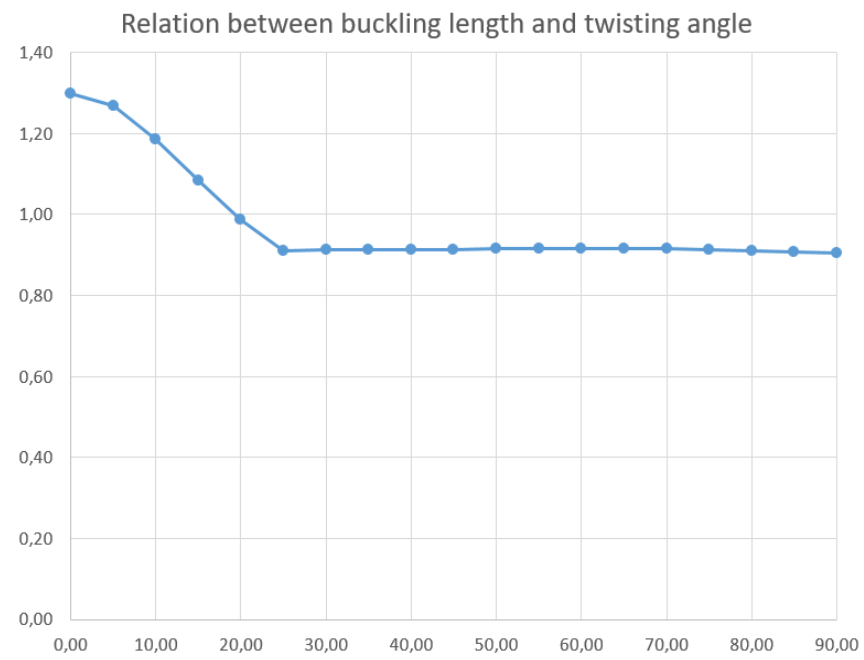
Murau, Austria

STATUS

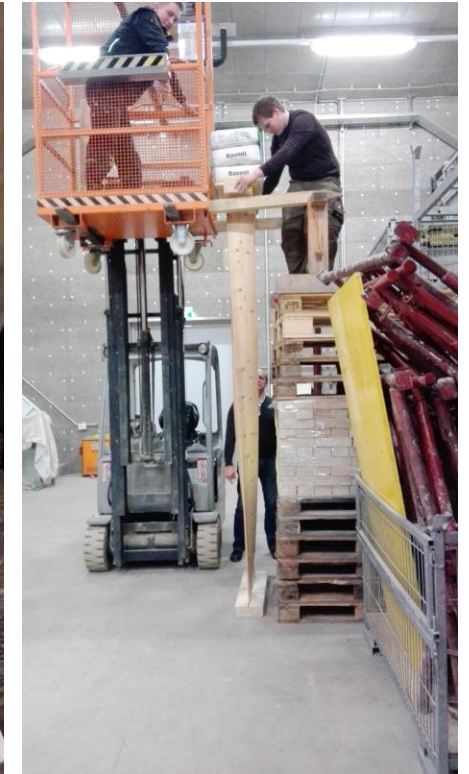
Completed
2021

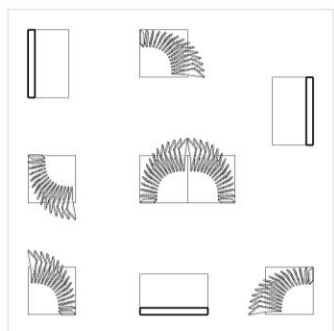
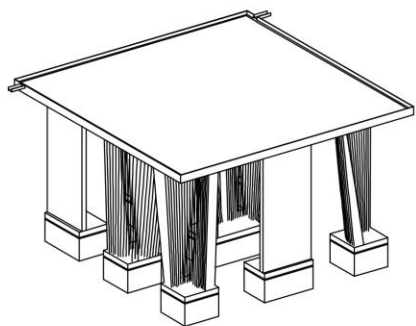


© Bollinger+Grohmann

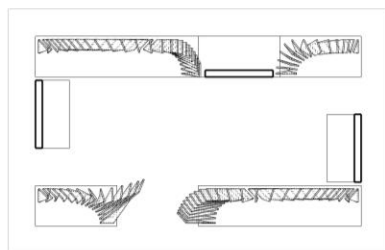
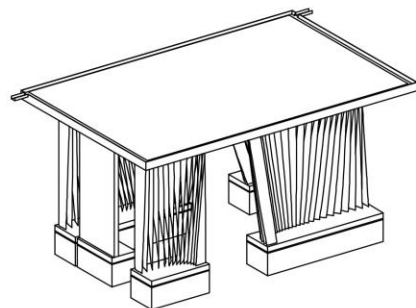


© LBS Murau/IAM TU Graz

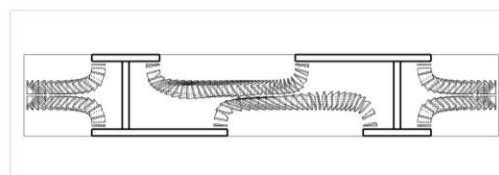
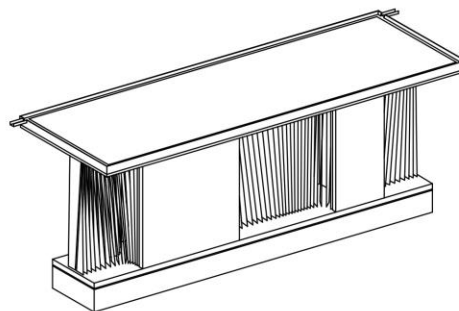




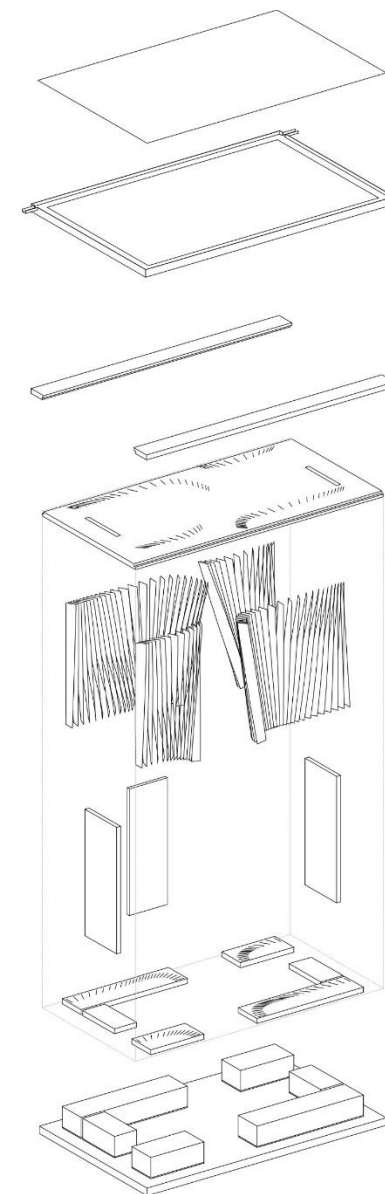
Type 1: Square



Type 2: Rectangular



Type 3: Narrow



Dachabdichtung EPDM Folie
auf Gefälledämmung 2%

Tropfblech od. Regenrinne lt. Detail

Vordach
Brettsper Holz C30 KLH 5S 100mm
Fichte mit Untersicht Lärche

Decke
Brettsper Holz C30 KLH 5S 100mm
Fichte mit Lärchen Untersicht
Schlitze für Lärchenbretter
CNC gefräst

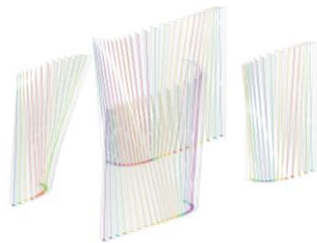
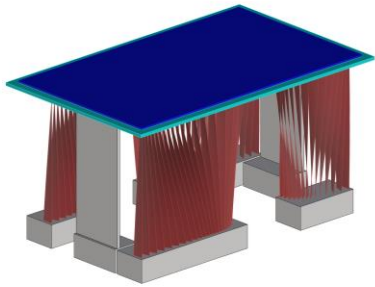
Lamellen - 80 Stk
Lärchenbretter C30, t=14mm
AA Qualität
Keine Äste im Randbereich!
verdrehen und beidseitig eingespannt

Wand 3X
GL24H Lärche
Lärche

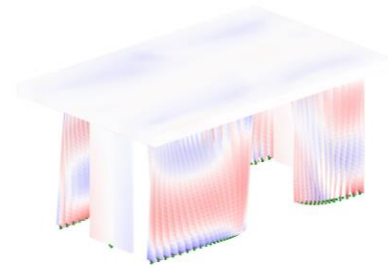
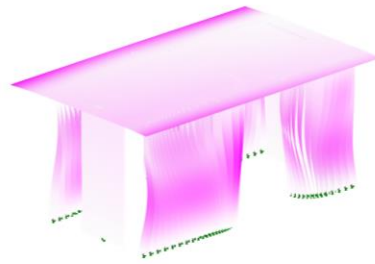
Sockel
GL24H Lärche
Taschen für Lärchenbretter CNC gefräst

Sockel
Beton Fertigteile
C25/30/B7
Mindestbewehrung gegen Rissbildung
Fundament in abh. vom Standort

Rhino model & Parametric Setup



Karamba3D initial structural analysis



Detailed code checks in RFEM

