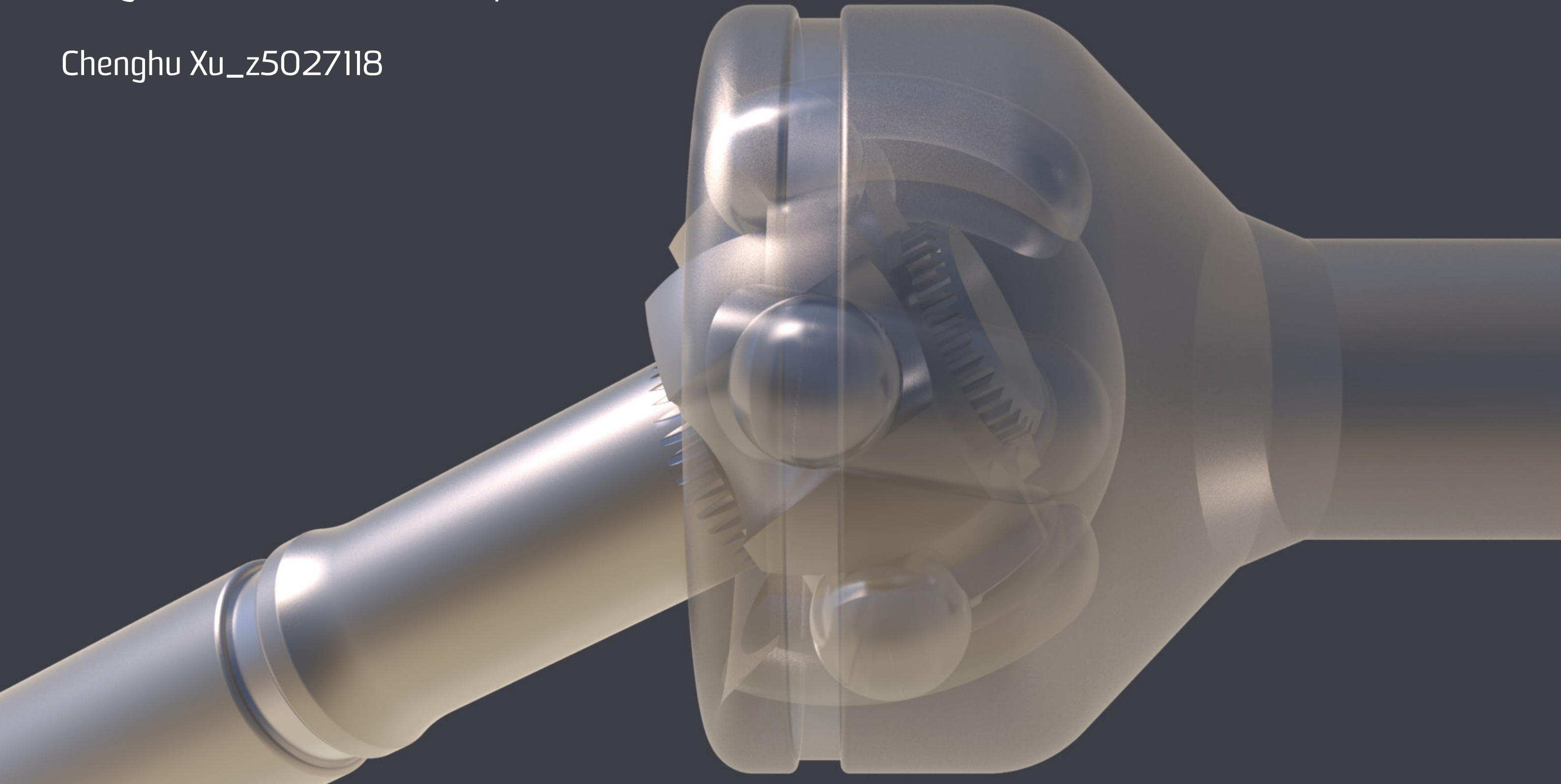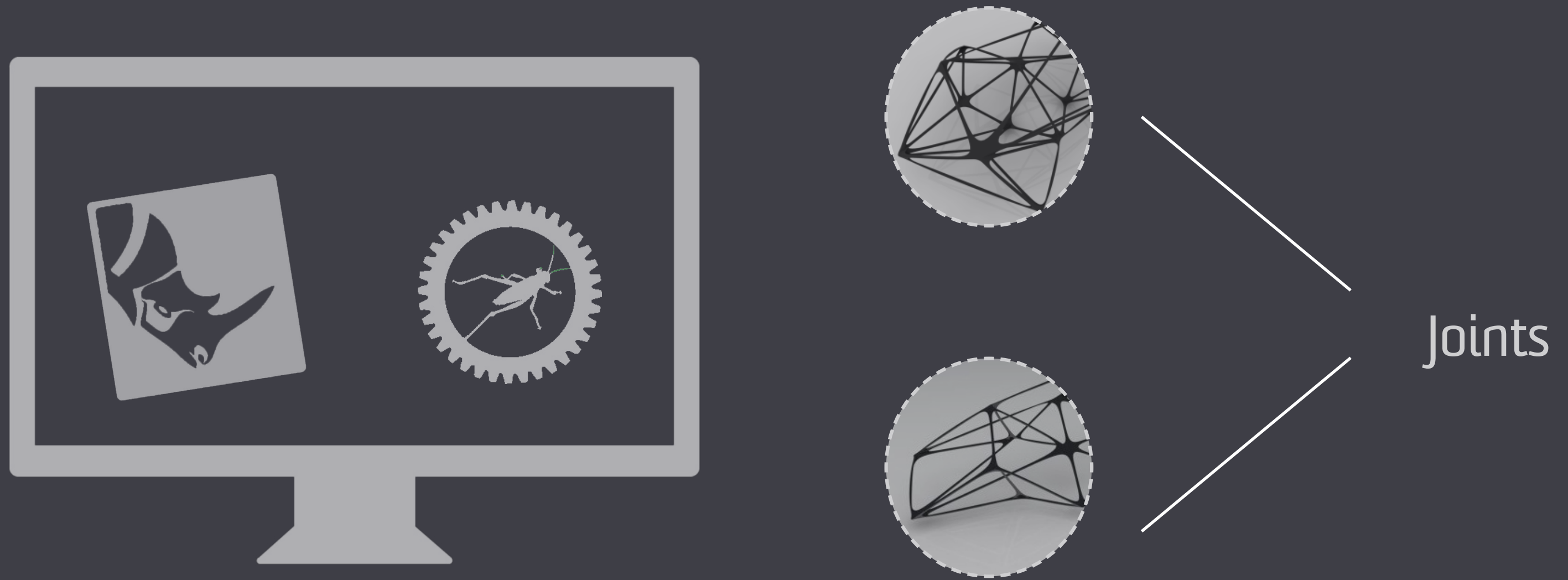Graduation Project - Practice

CODE 3202

Design Documentation / Thesis presentation

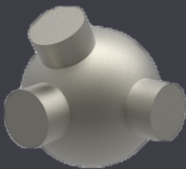Chenghu Xu_z5027118

Joints

How can we help designers make joints for scale models for free forms ?

Scope

A grasshopper workflow for joint creation

of prototype models through integrating a
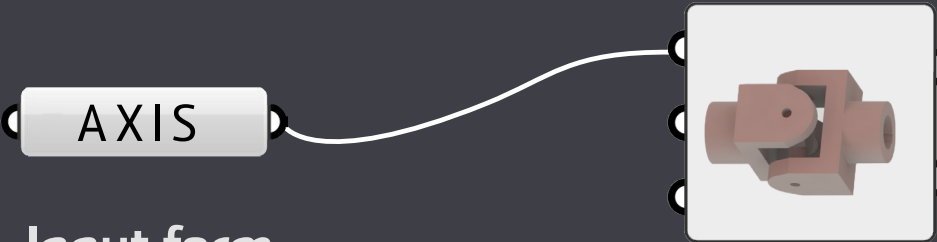
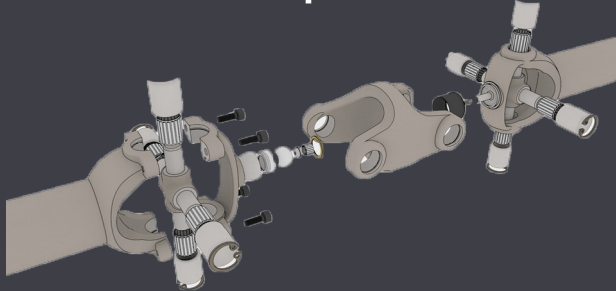set of scripts

Control Separately

Joint 1   Joint 2   Joint 3

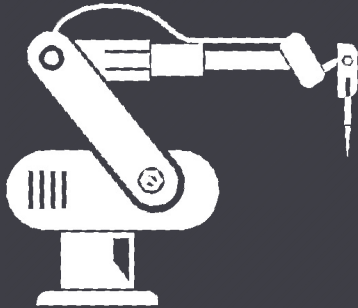| Radius | ○ 11.280 |
INNER SPHERE	○ 11.22
CYLINDER RADIUS	○ 2.54
OUTER OFFSET	5.34
SPINNER	842 ◇
TILT	○ −0.32

Variables

AXIS

Input form

" Node Generator "
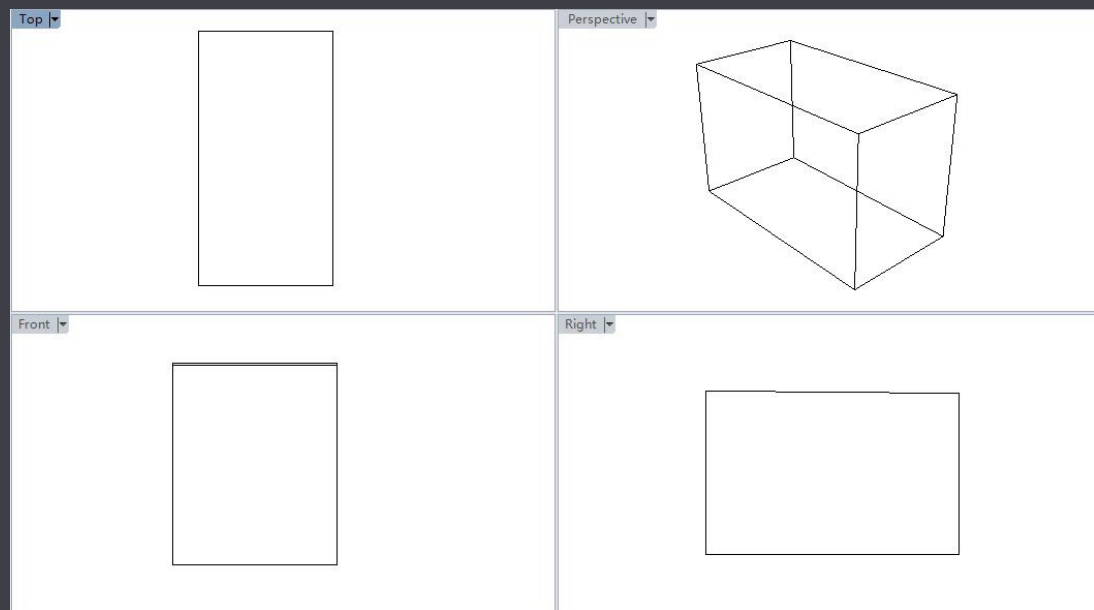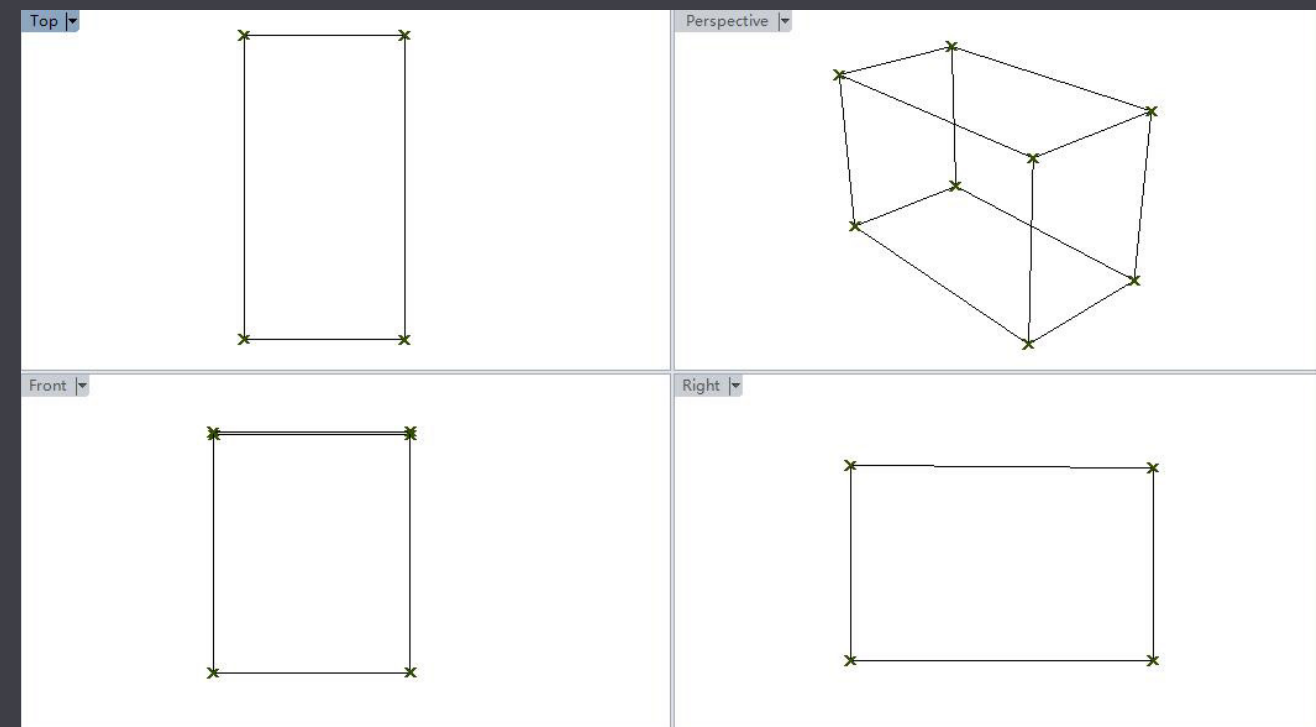
BREP

Form with nodes

RH
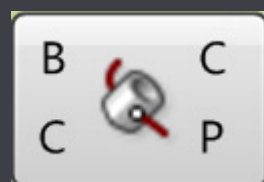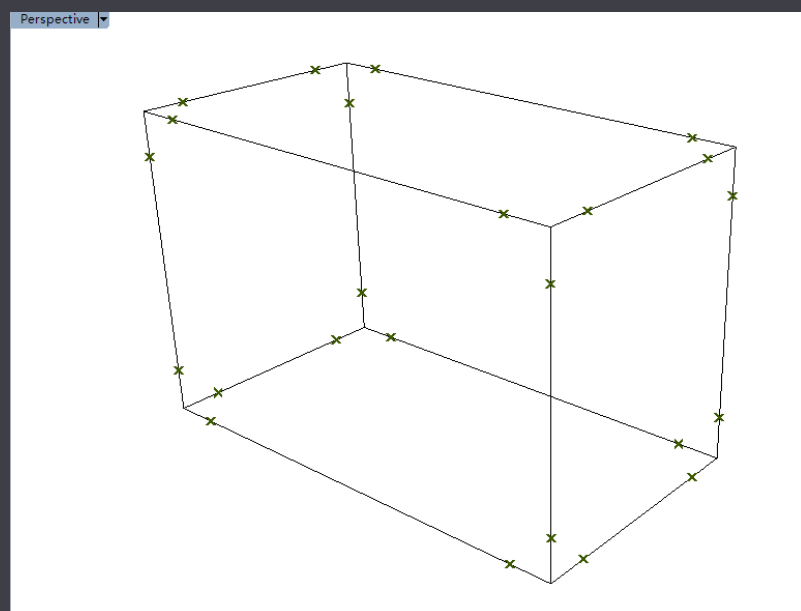
Small scale model (Rapid Prototyping)

G-CODE

Larger scale model

Input component #1

Confirm the intersecting points #2

## The RemoveDuplicateLines component

That is to say they are not part of a network and have no clue which lines they are connected to. The first part of the script sorts through the lines and intersection points and returns each point with the lines connected to it as vectors radiating away from the point.
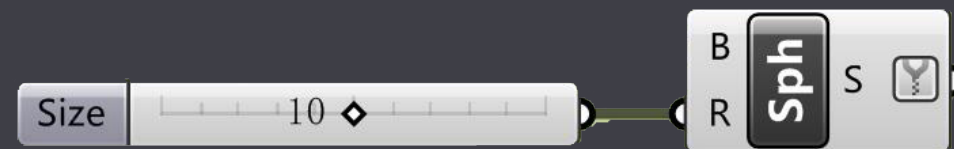

BCX component #3
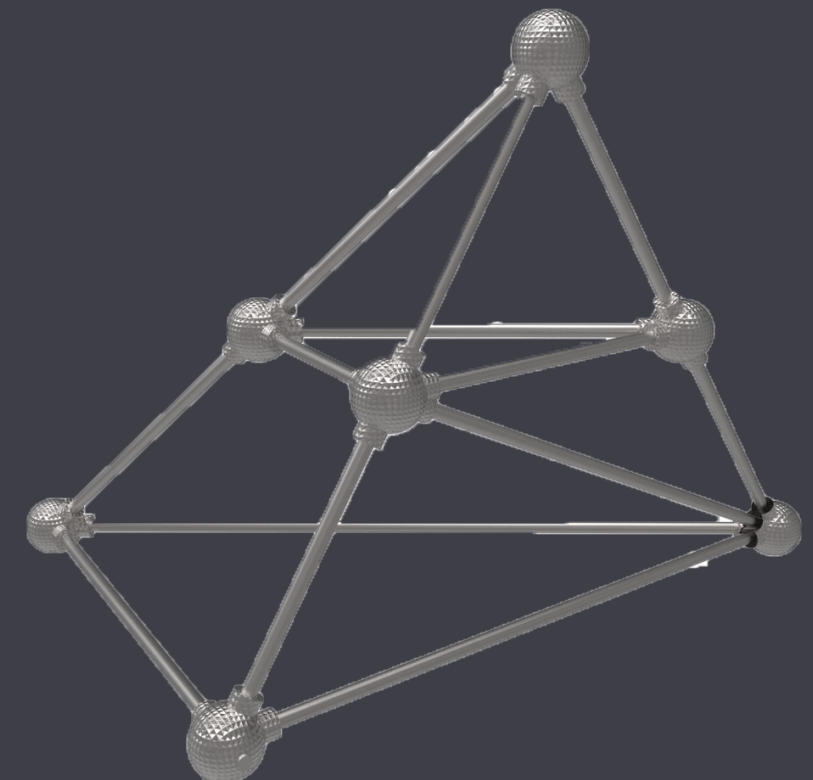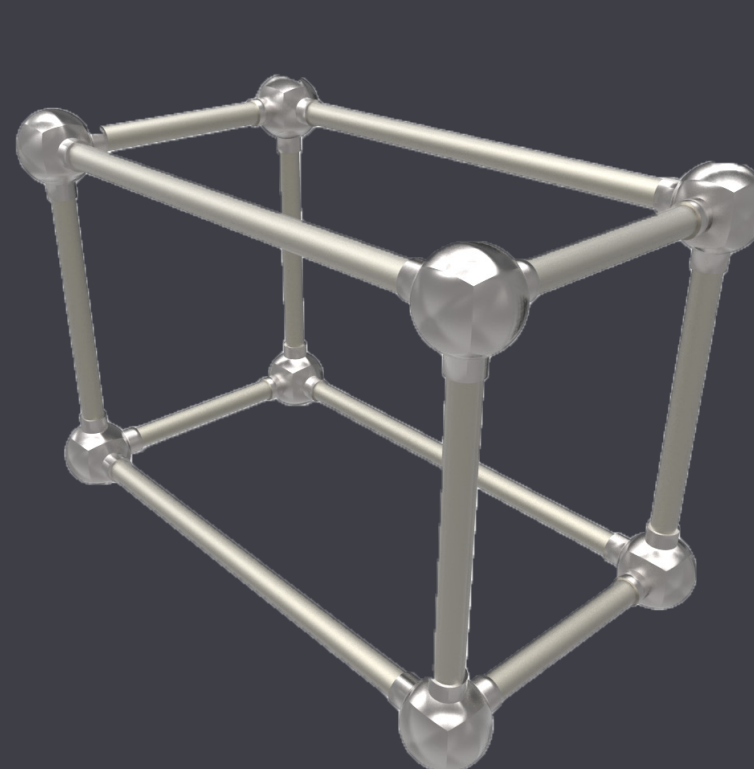
Solve the intersection events for a Brep or a curve
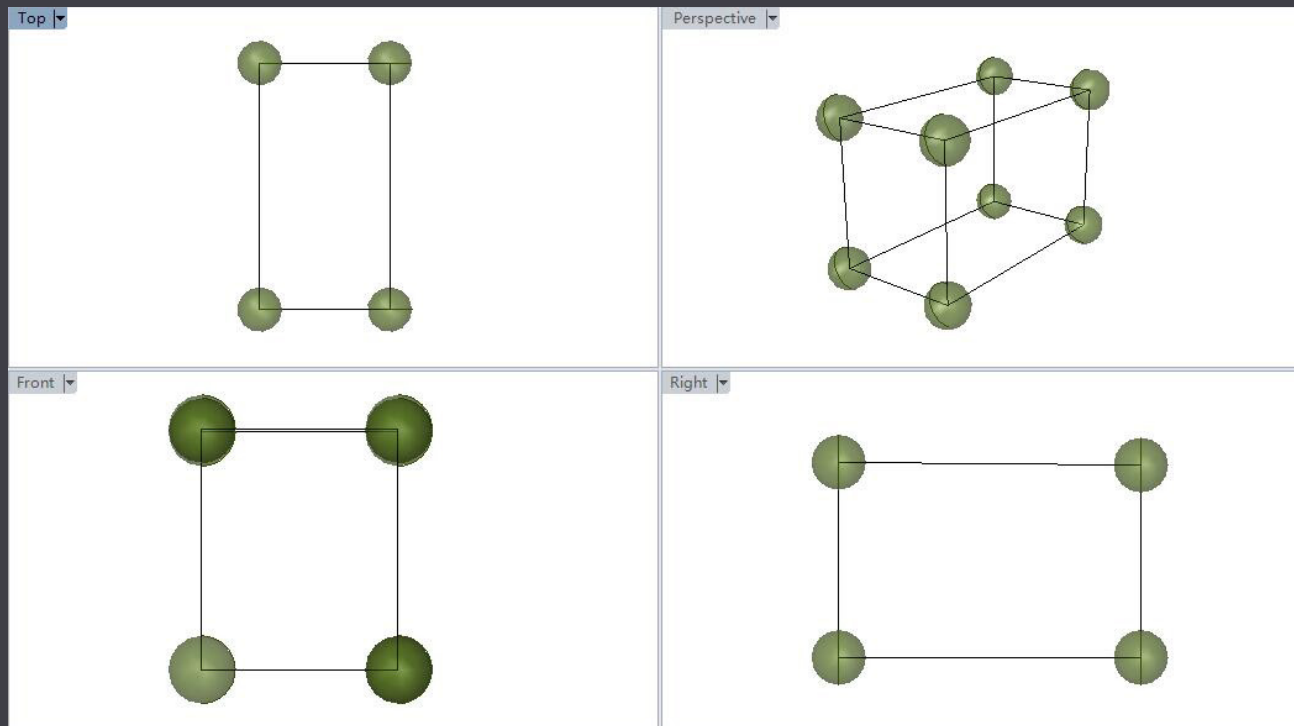
"A node joint having a plurality of threaded apertures"
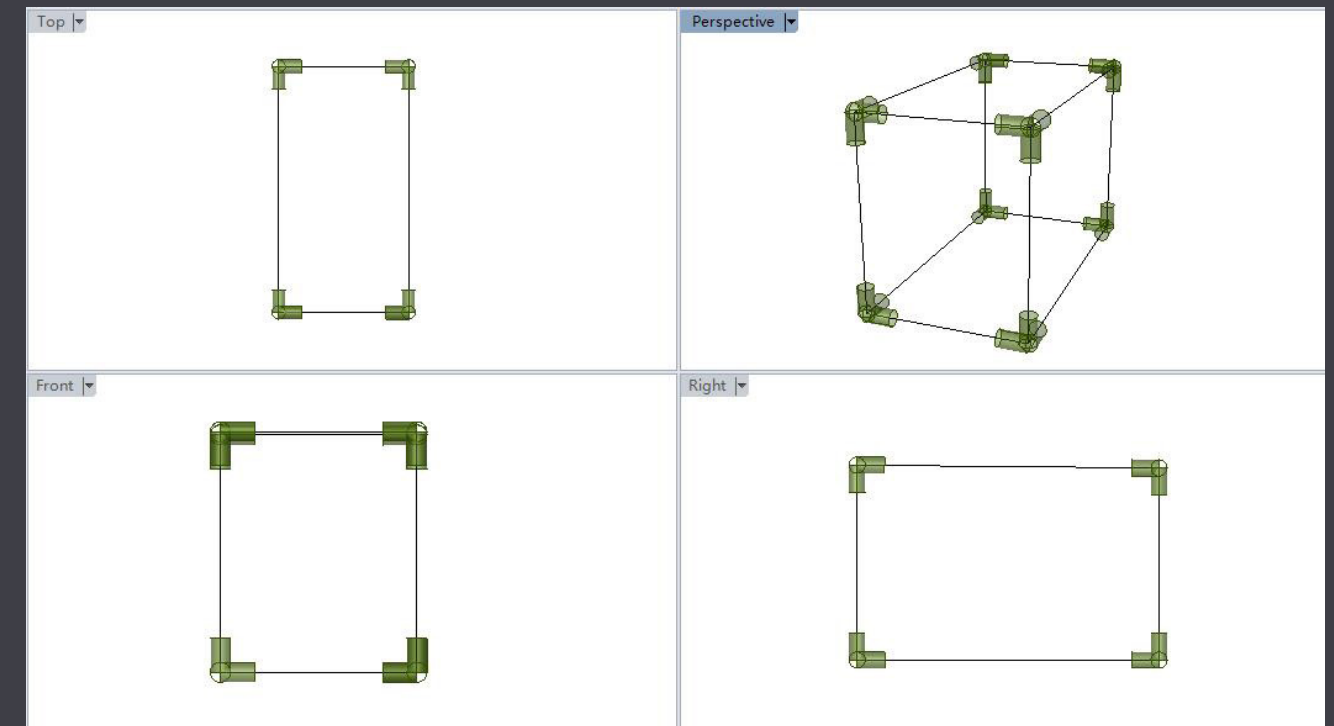
"A connecting member for connecting the threaded end section to one of the threaded node joint apertures"

Size ——— 10 ◇

Thickness radius tube ——— 2. 98 ◯

Transfer data from inputs to outputs

Metal Mate 10mm x 1m Galvanised Steel Round Solid

I/N: 1130453

$5.25

Price correct as at Sun 05 Nov 2017 8:08:26pm

Qty: 1 ▲▼   **Add to Wish List**

Not all products available in all stores   ?
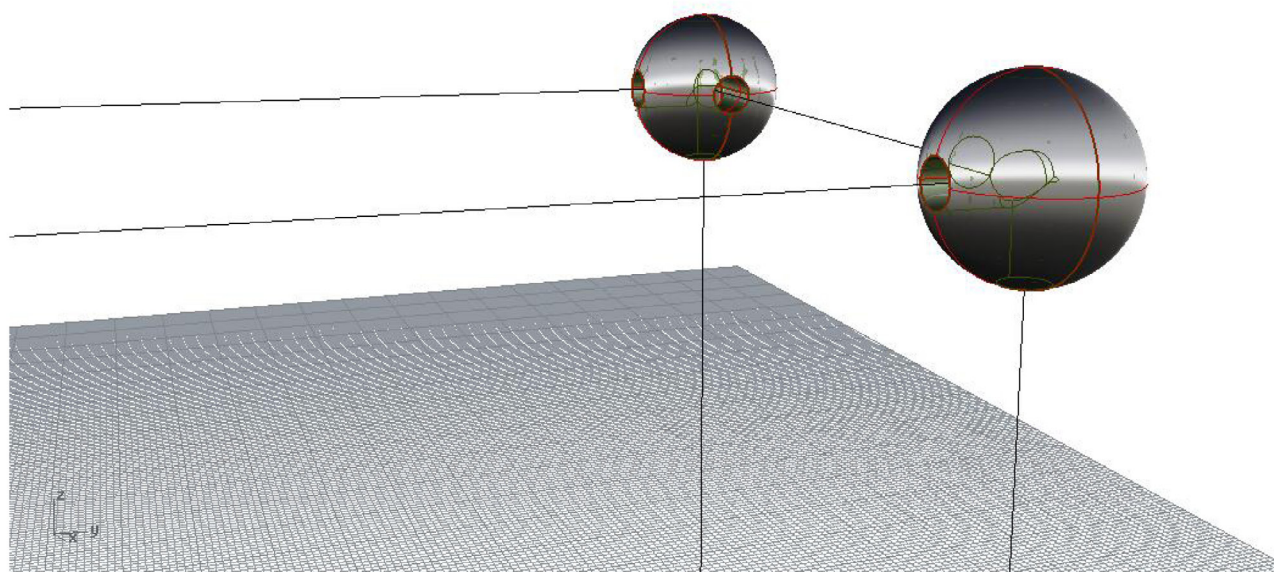
🚚 **Get It Home**
We can help you get it home

Solid tube

↓

Sphere with holes

Perspective ▾

Metal Mate 31.8 x 1.2 3m Galvanised Steel Round Tube

I/N: 1130458

$19.02

Price correct as at Sun 05 Nov 2017 7:49:14pm

Qty: 1 ▲▼   **Add to Wish List**

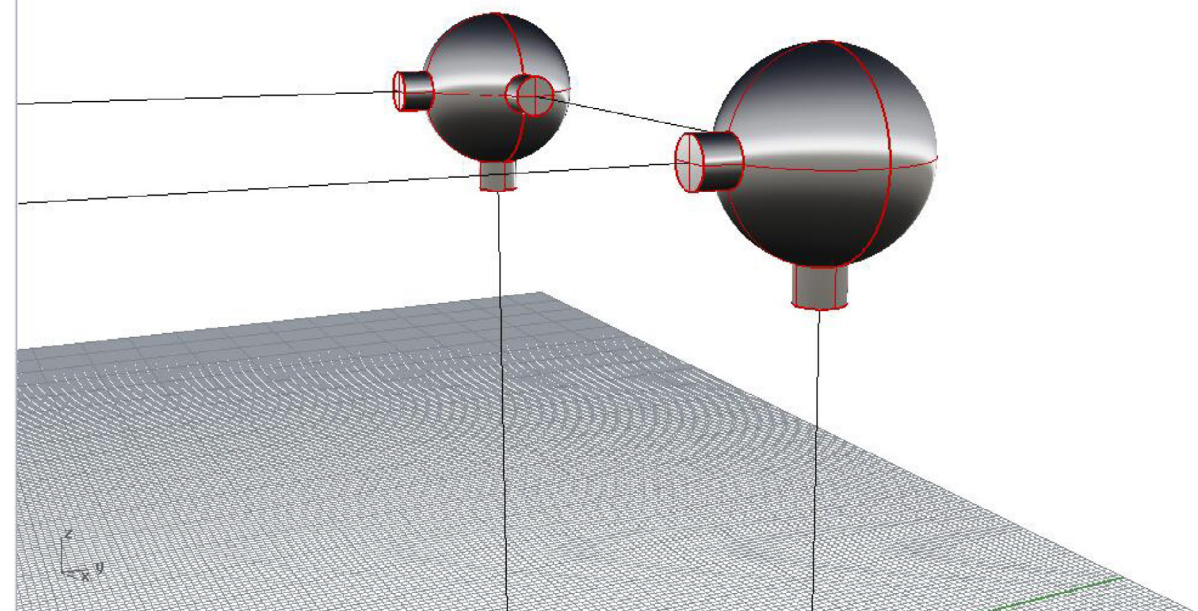Not all products available in all stores   ?
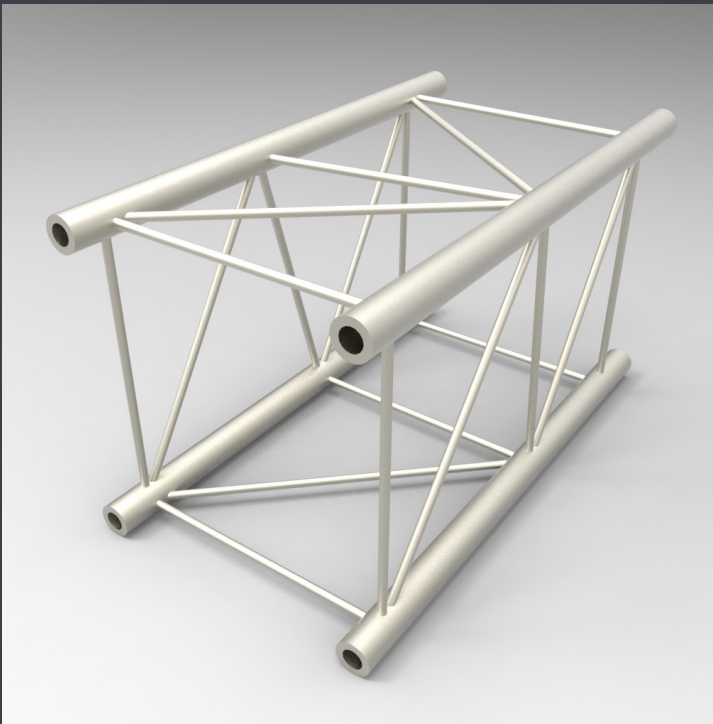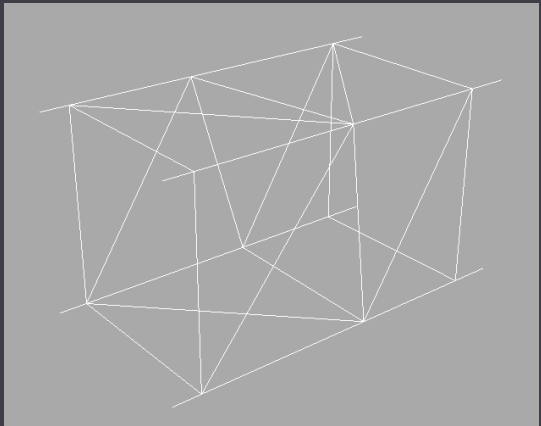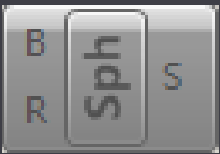
🚚 **Get It Home**
We can help you get it home

Hollow tube
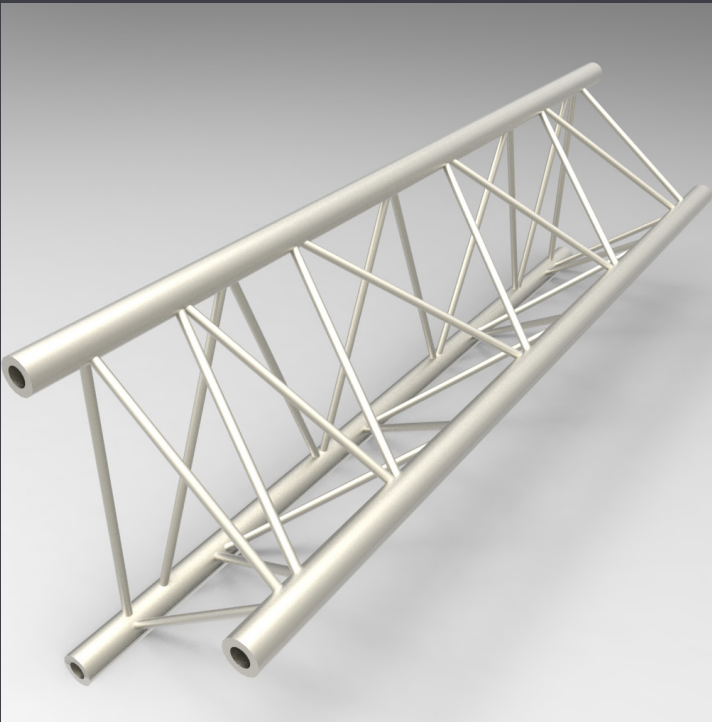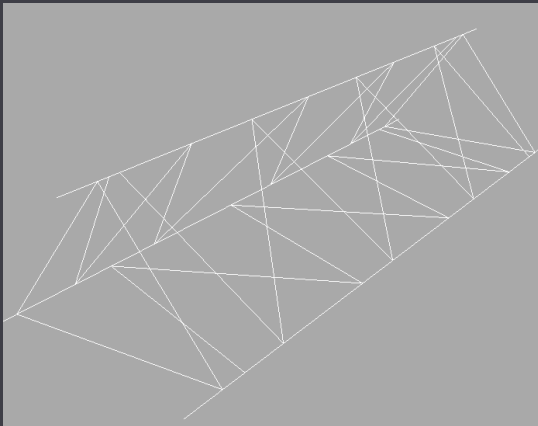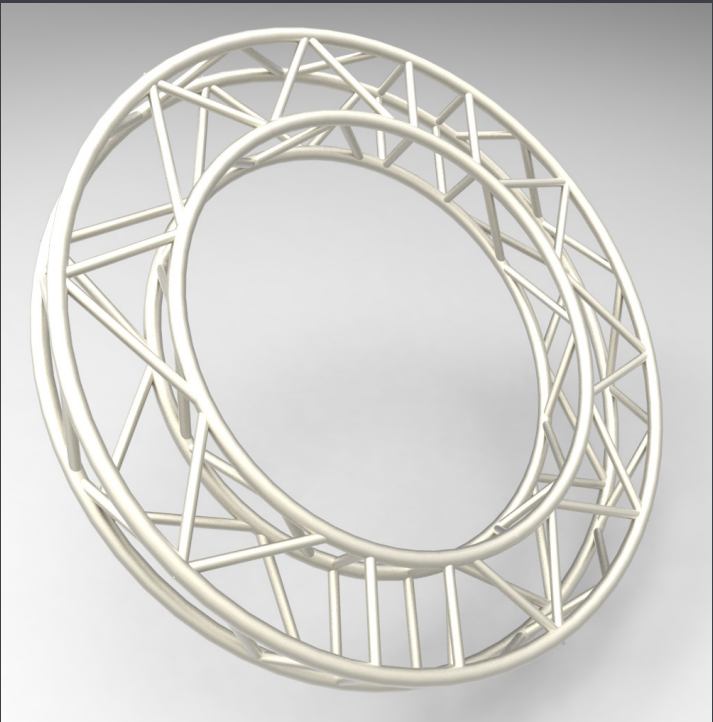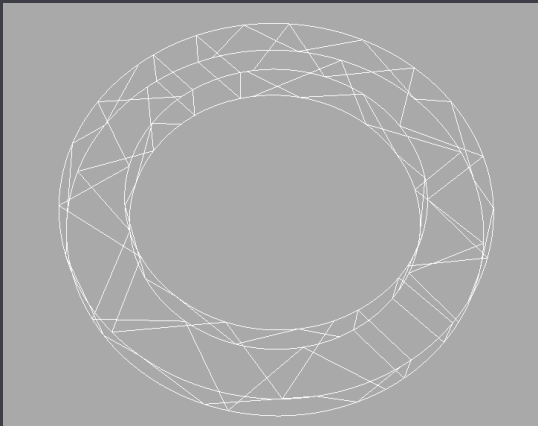
↓

Sphere with tubes

Perspective ▾

" A truss is a support member which combines one or more triangles to form the structure of a roof. Most conventional trusses are constructed using wood. If wood is not available, then perhaps you can substitute it for metal or another material. "
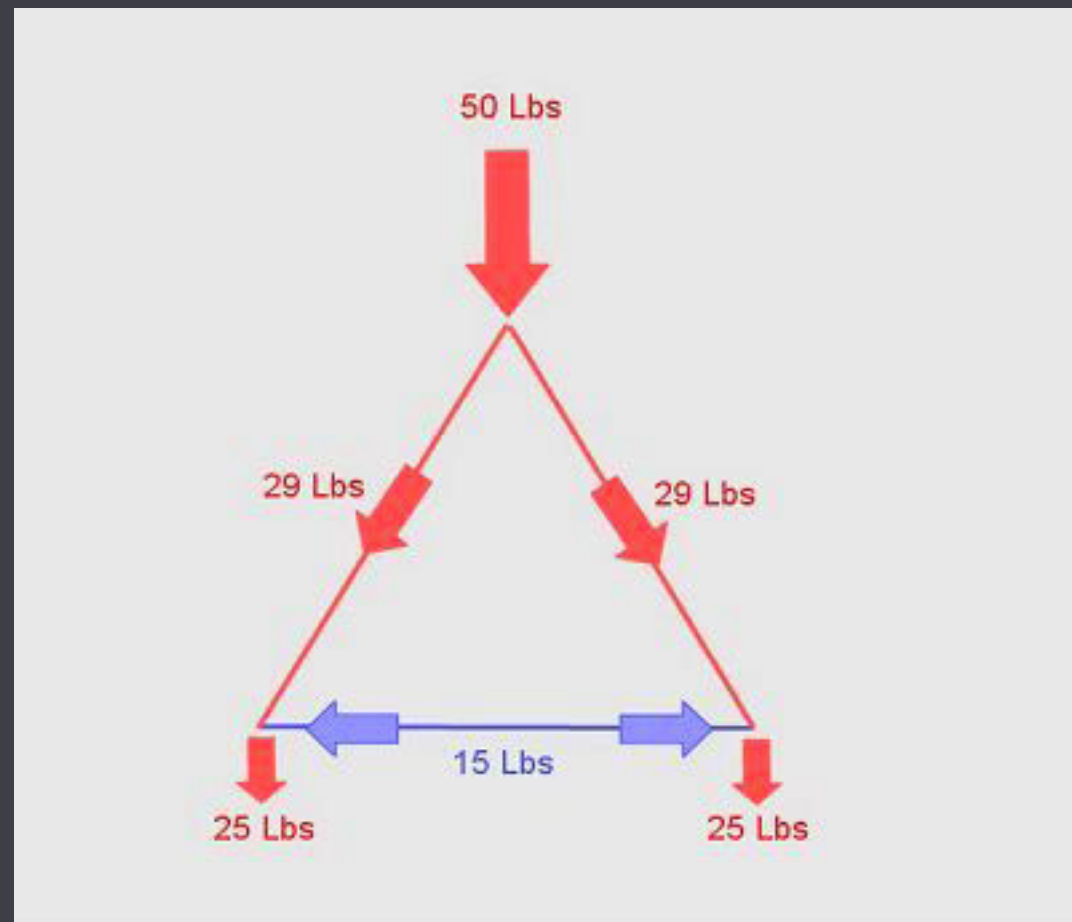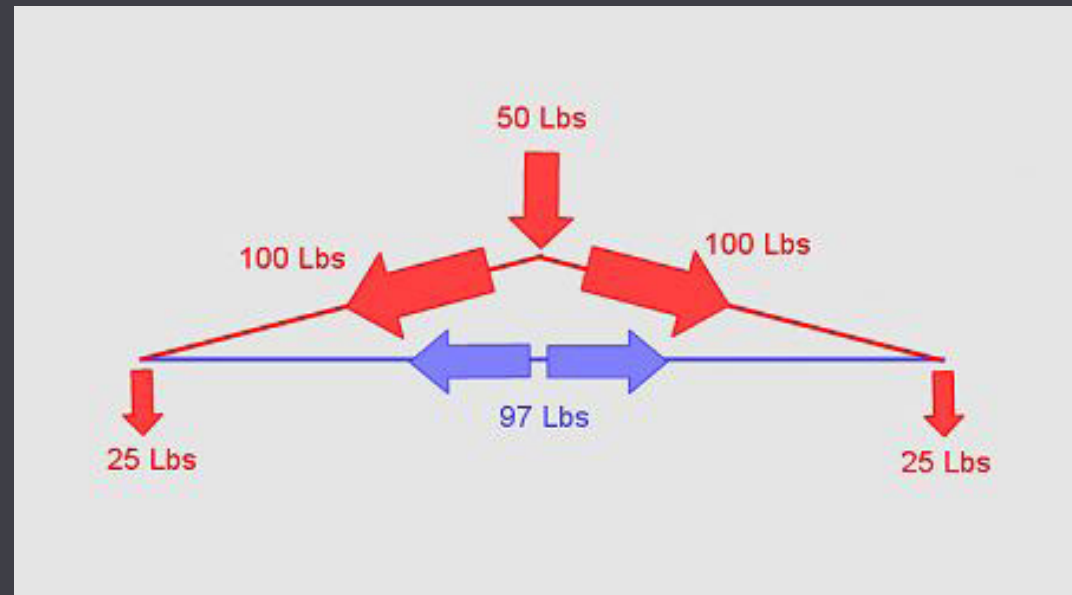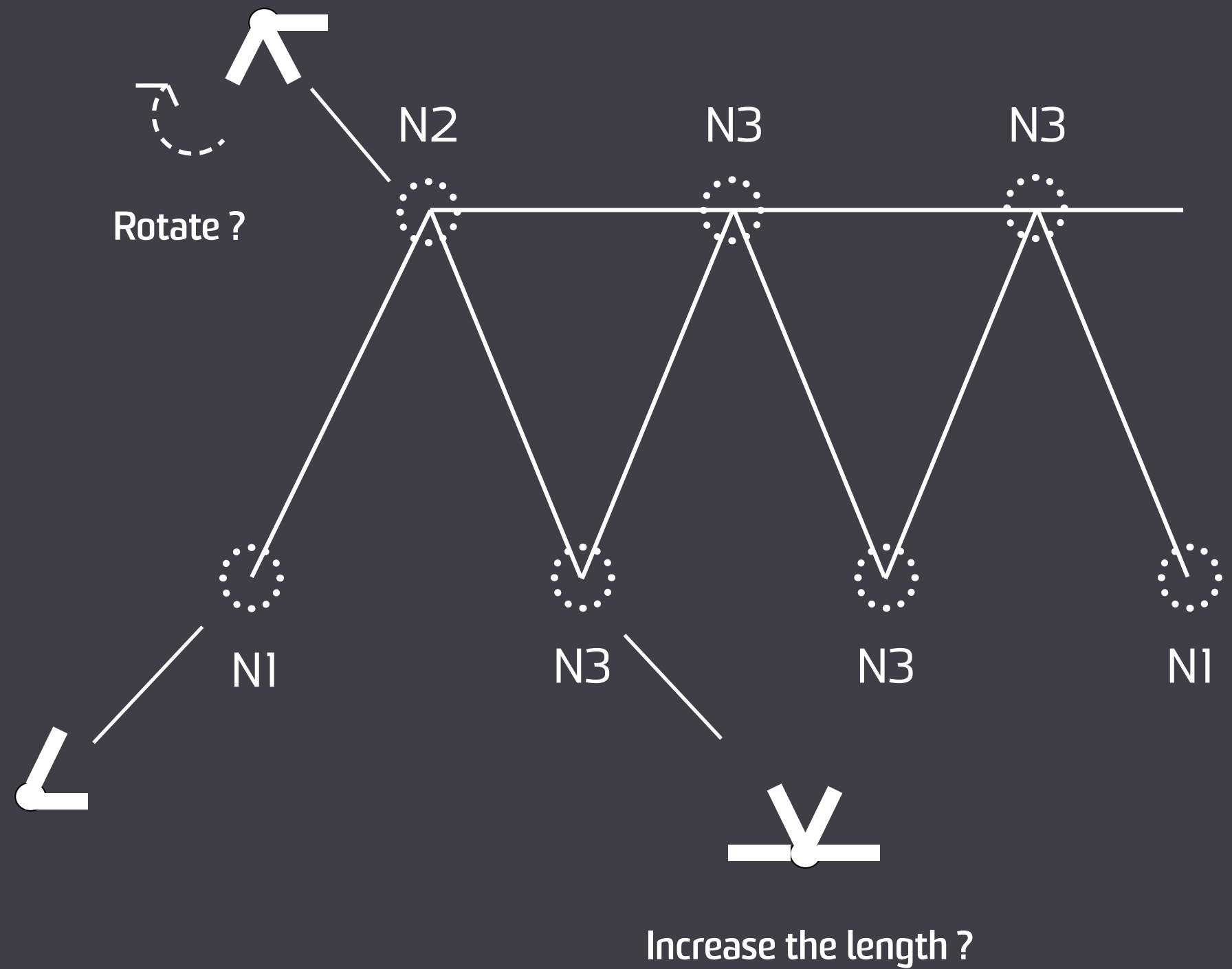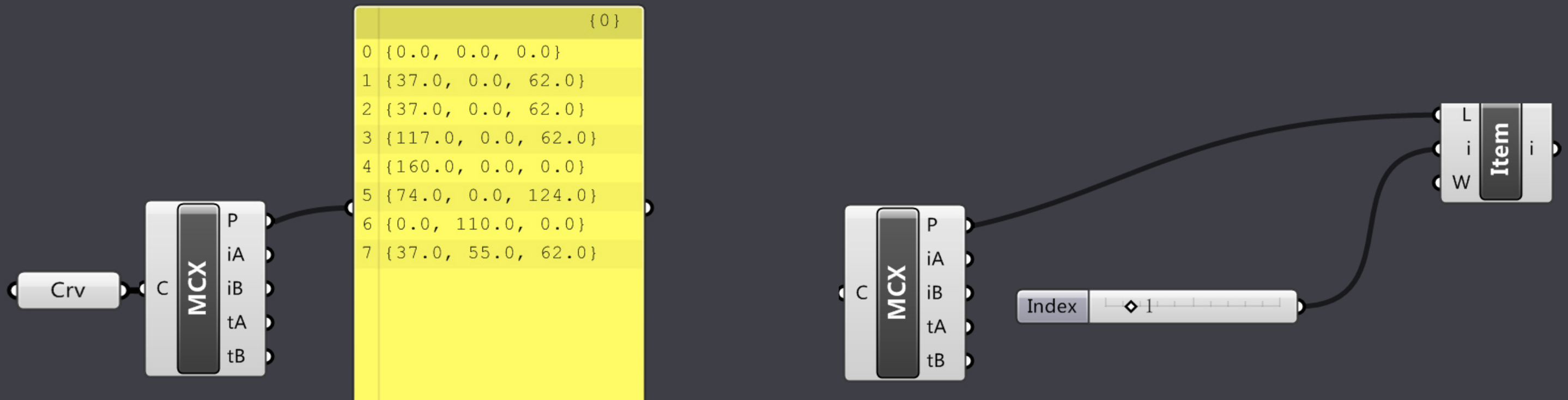
Square Truss

Triangular Truss

Circle Truss

Separately Control

50 Lbs

100 Lbs   100 Lbs
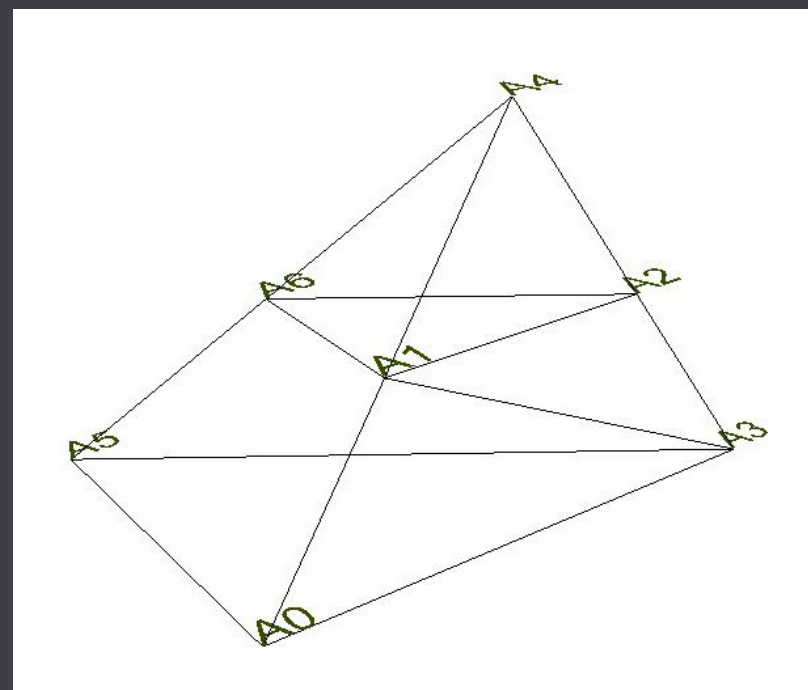
97 Lbs

25 Lbs   25 Lbs

50 Lbs

29 Lbs   29 Lbs

15 Lbs

25 Lbs   25 Lbs

Different loads in different structures

Rotate ?

N2   N3   N3

N1   N3   N3   N1

Increase the length ?

{0}
```
0 {0.0,   0.0,   0.0}
1 {37.0,  0.0,   62.0}
2 {37.0,  0.0,   62.0}
3 {117.0, 0.0,   62.0}
4 {160.0, 0.0,   0.0}
5 {74.0,  0.0,   124.0}
6 {0.0,   110.0, 0.0}
7 {37.0,  55.0,  62.0}
```

The amount of nodes and the coordinate of intersecting points

List Item

Node position

File   Edit   View   Display   Solution   Help

Params   Maths   Sets   Vector   Curve   Surfac

Geometry

100% ▾

Index   ◇2

Index   4 ◇

Ⓘ Autosave complete (34 seconds ago)

Gray   ☑
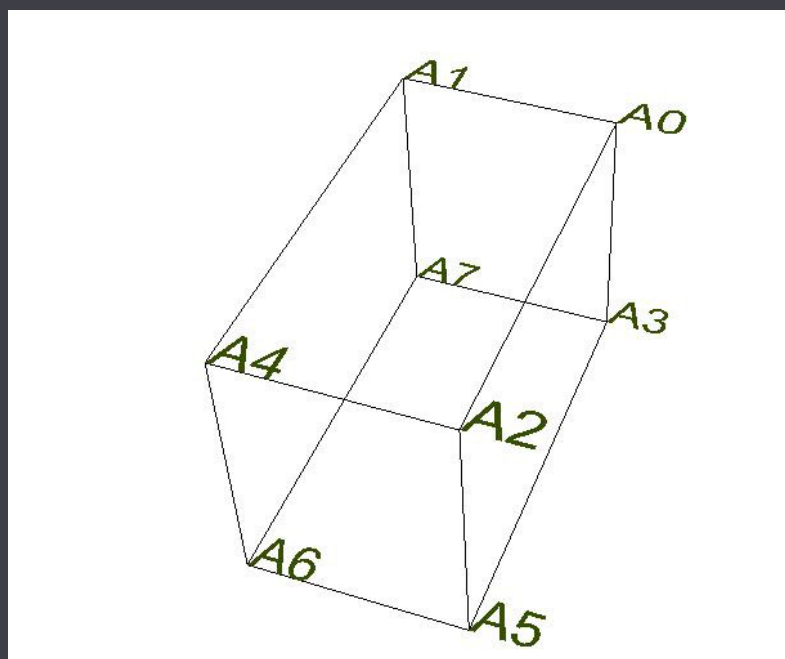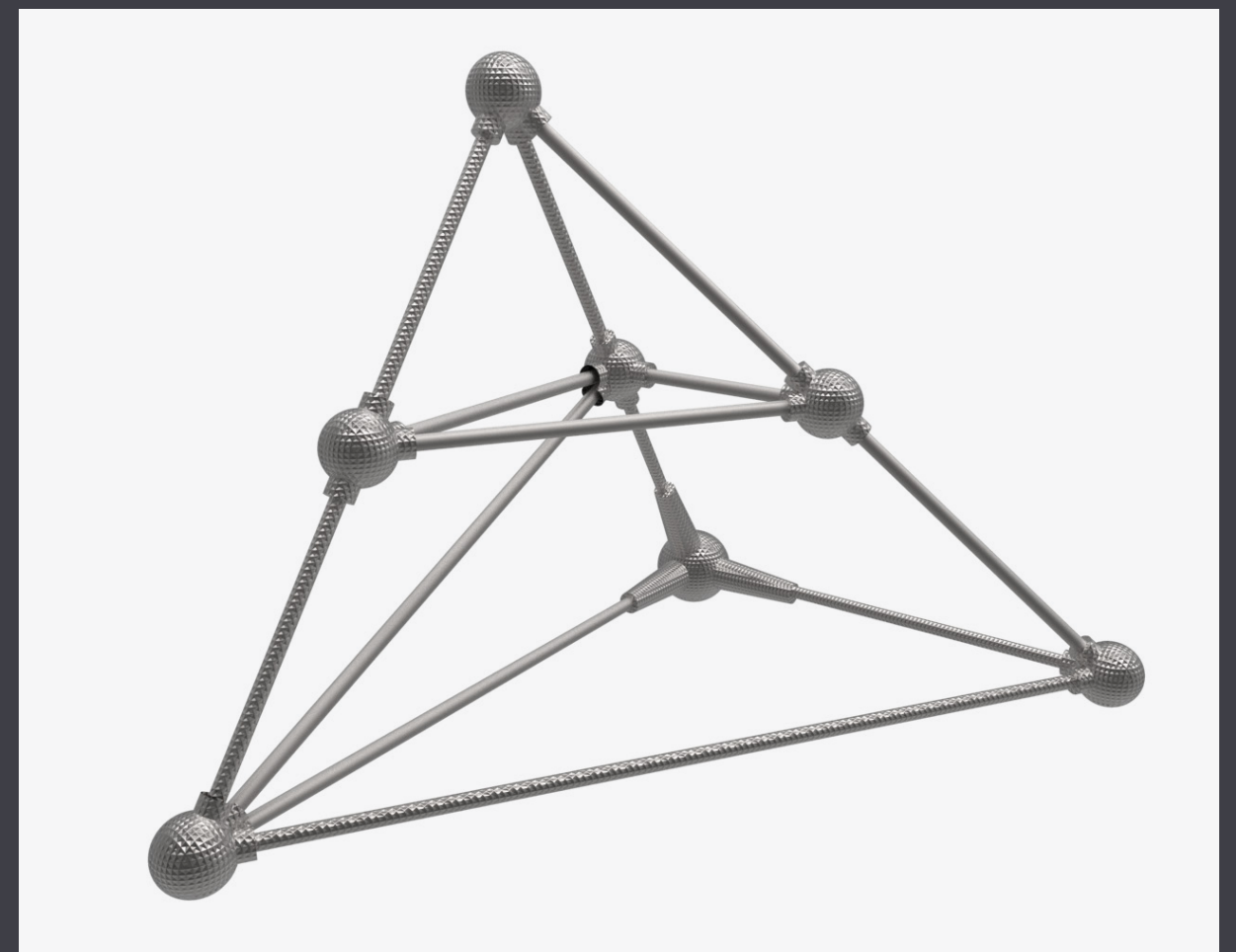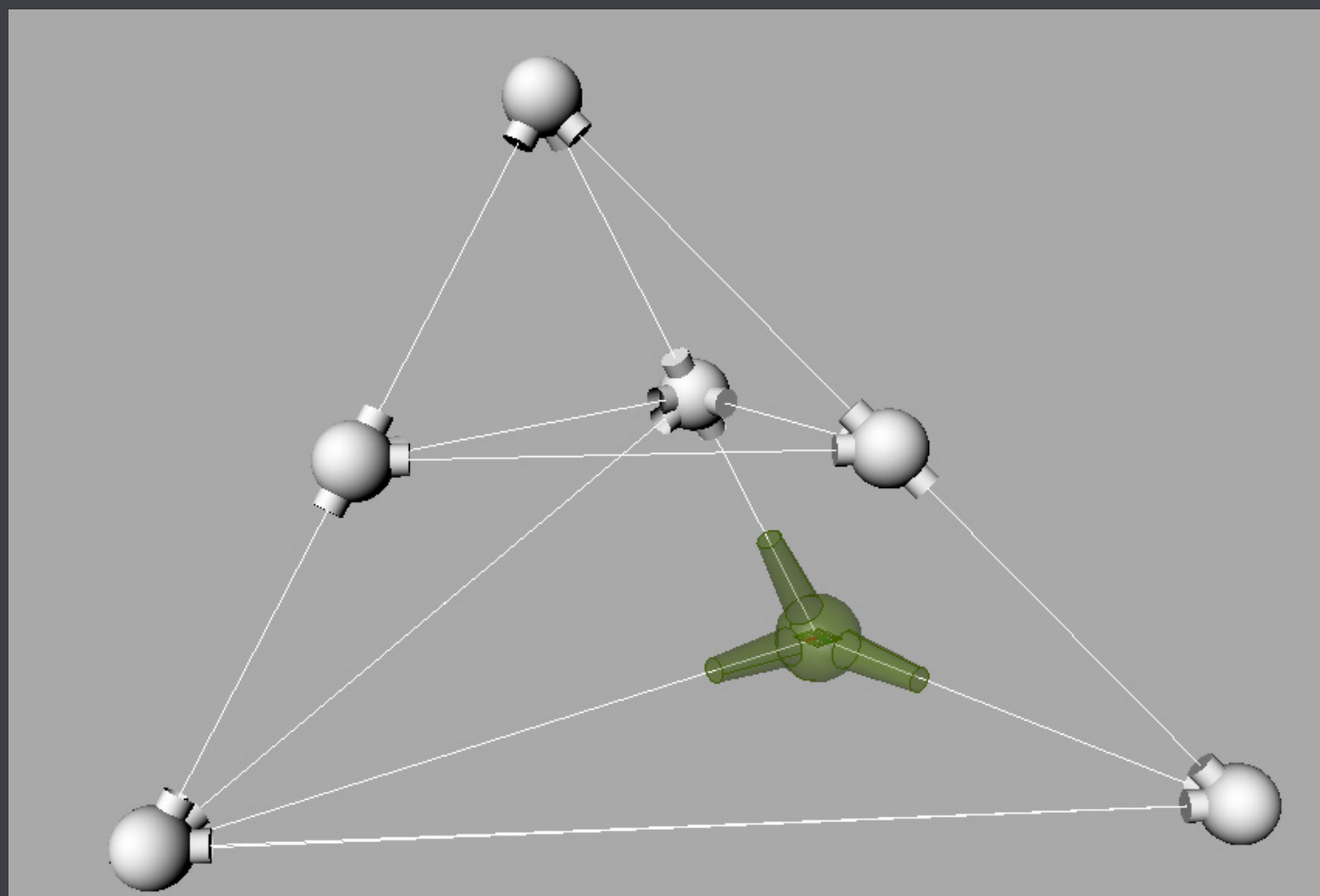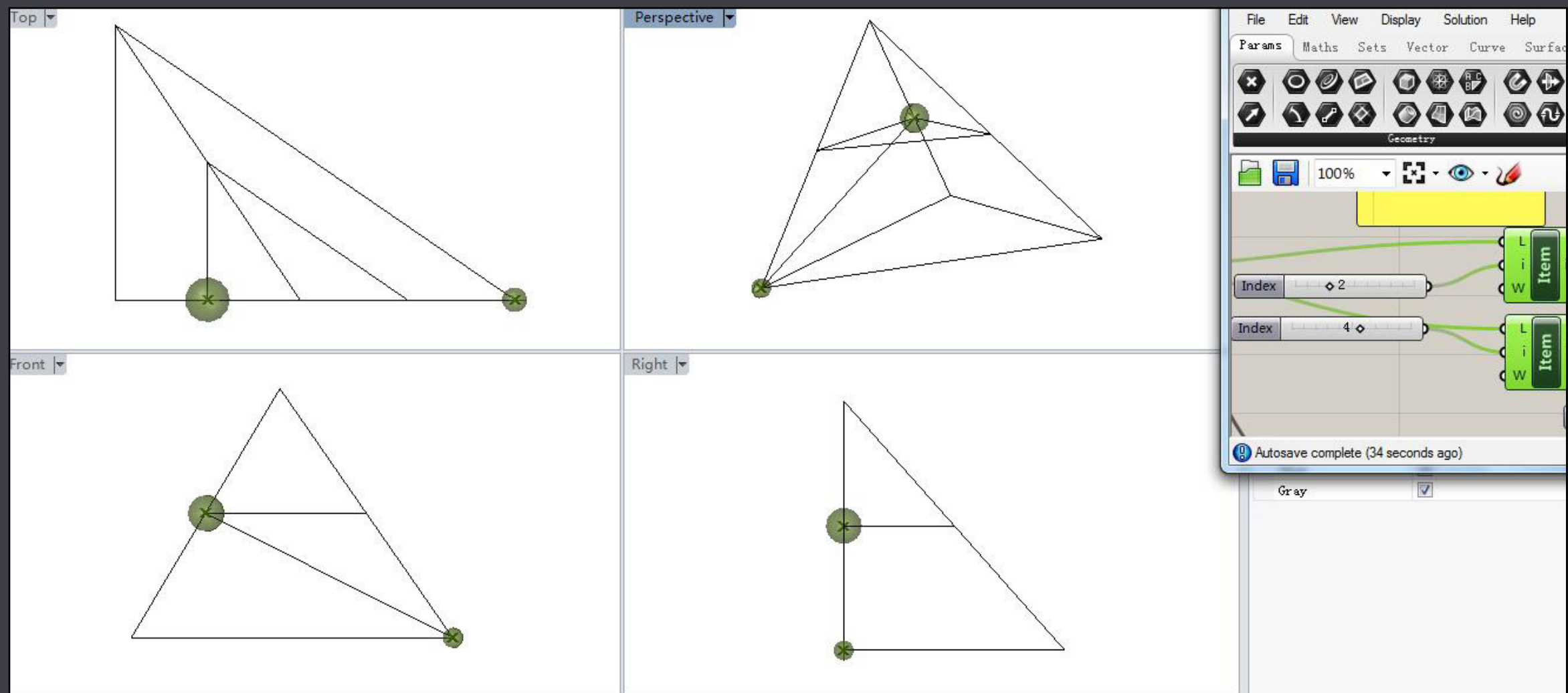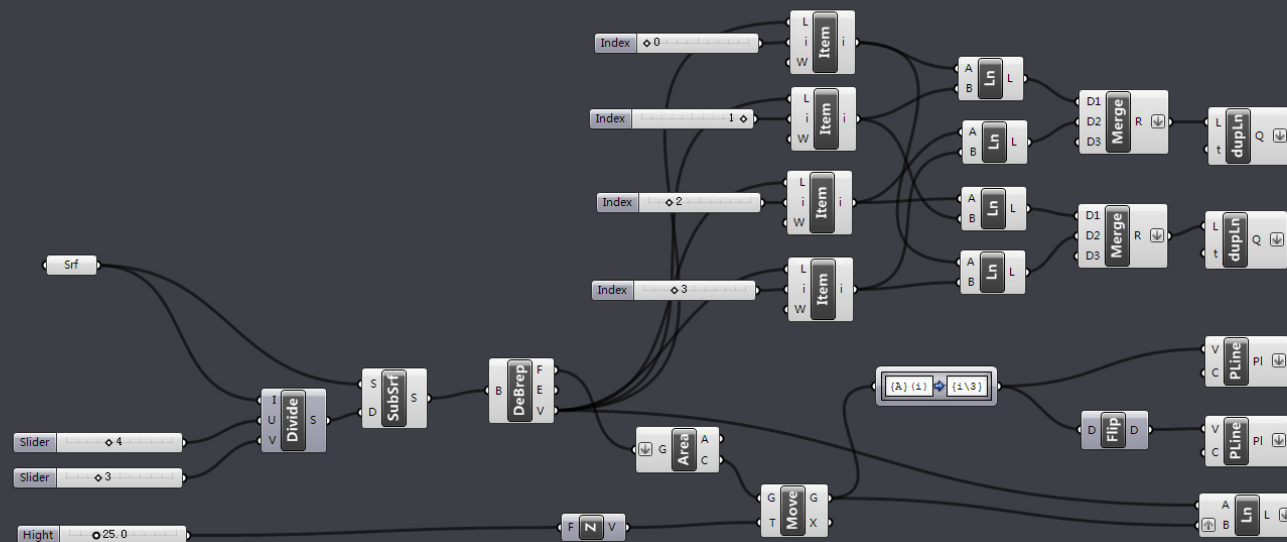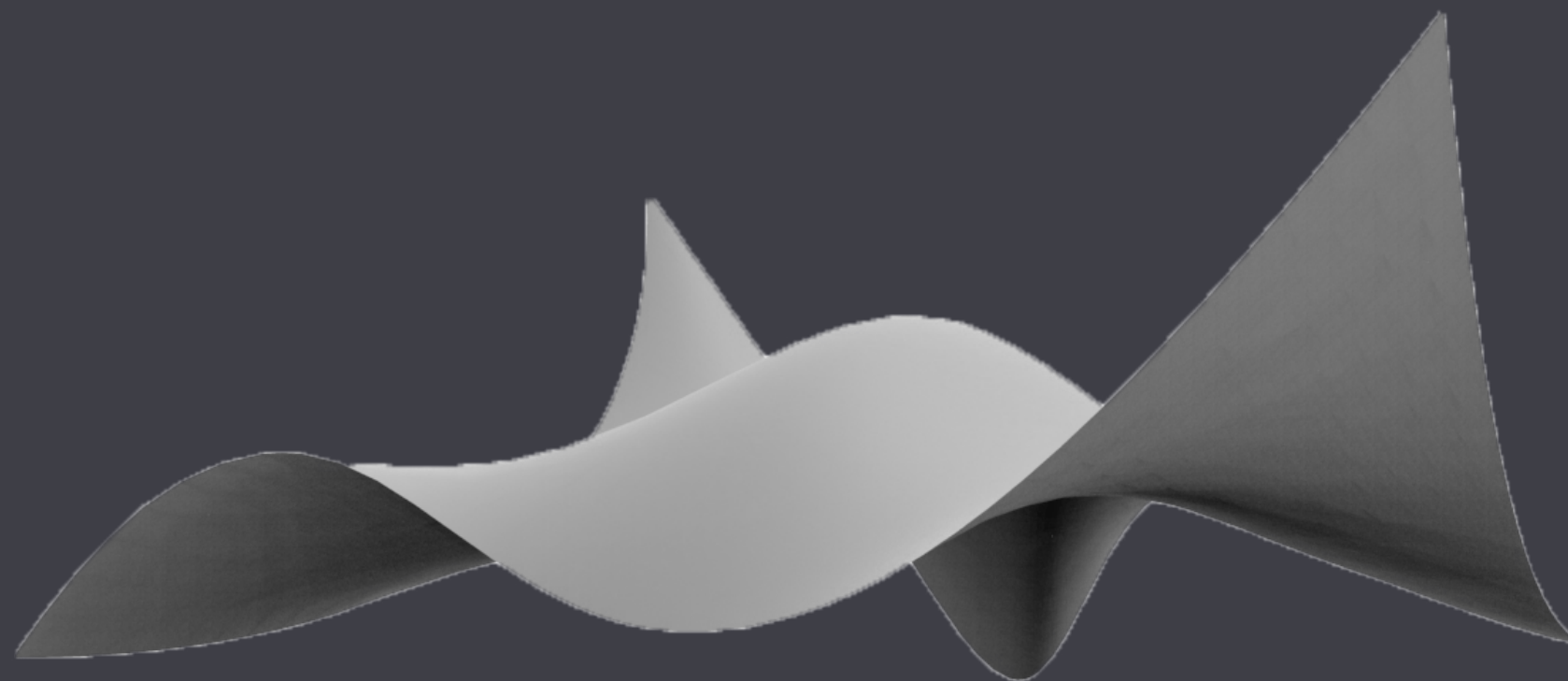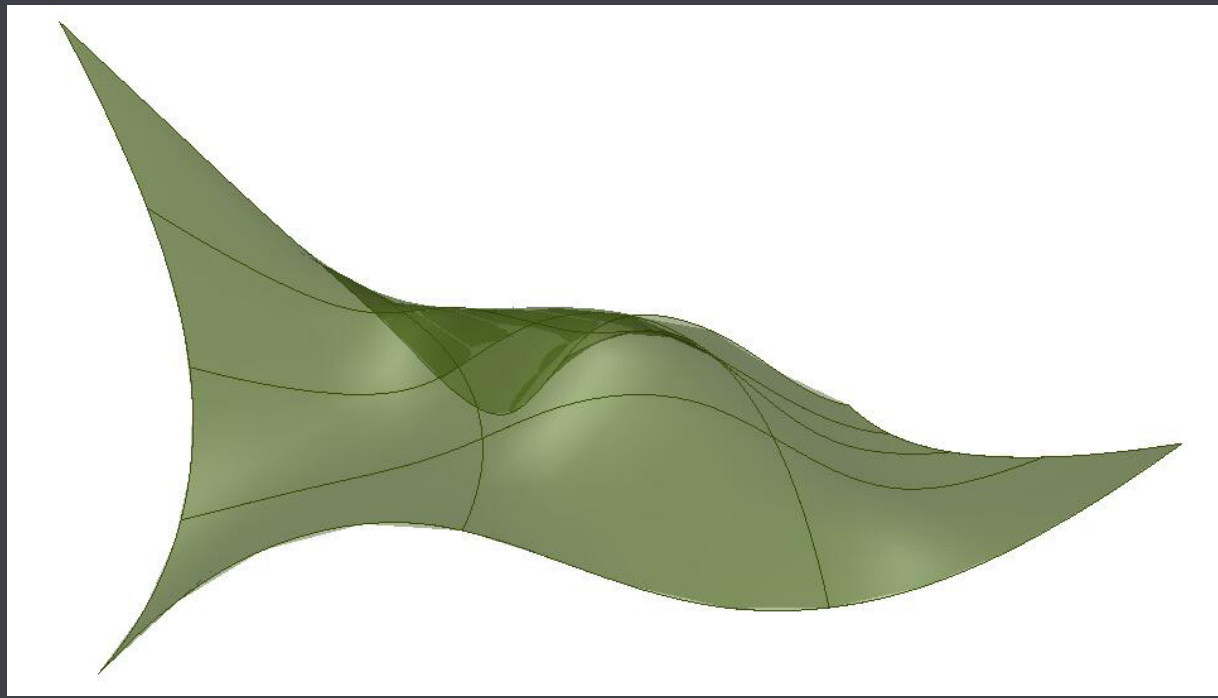
Shell -

"Space frame are akin to shells in structural behavior, indeed so much so that they may be described as 'sister under the skin'. "
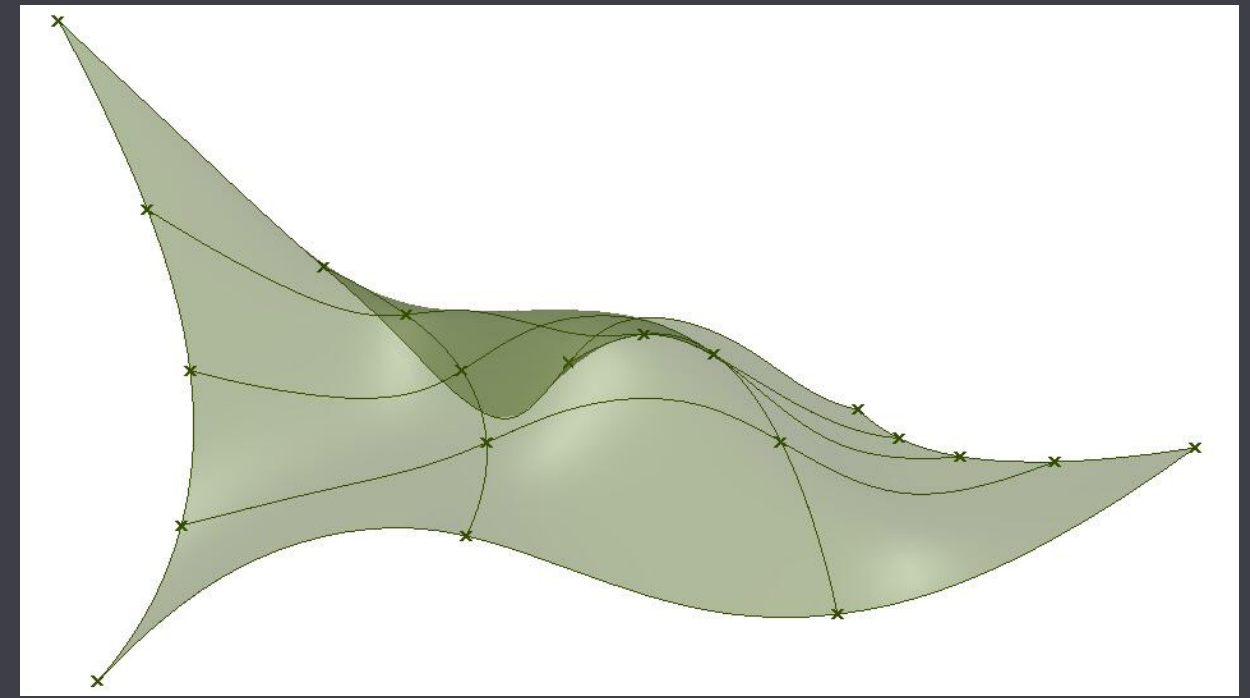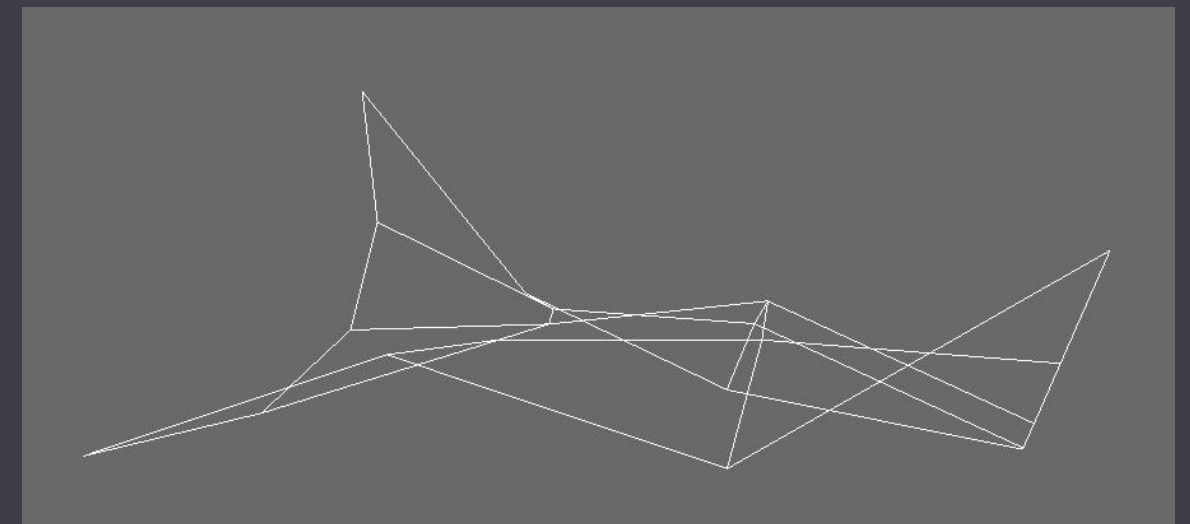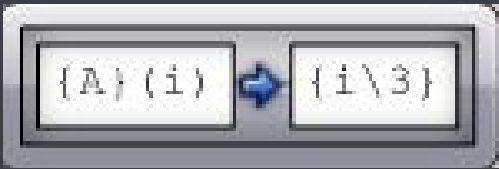
-Eekhout M; Ramaswamy,G,S. 2002

Extract script for shell

Extract an isoparametric subset of a surface.

Deconstruct a brep into its constituent parts.
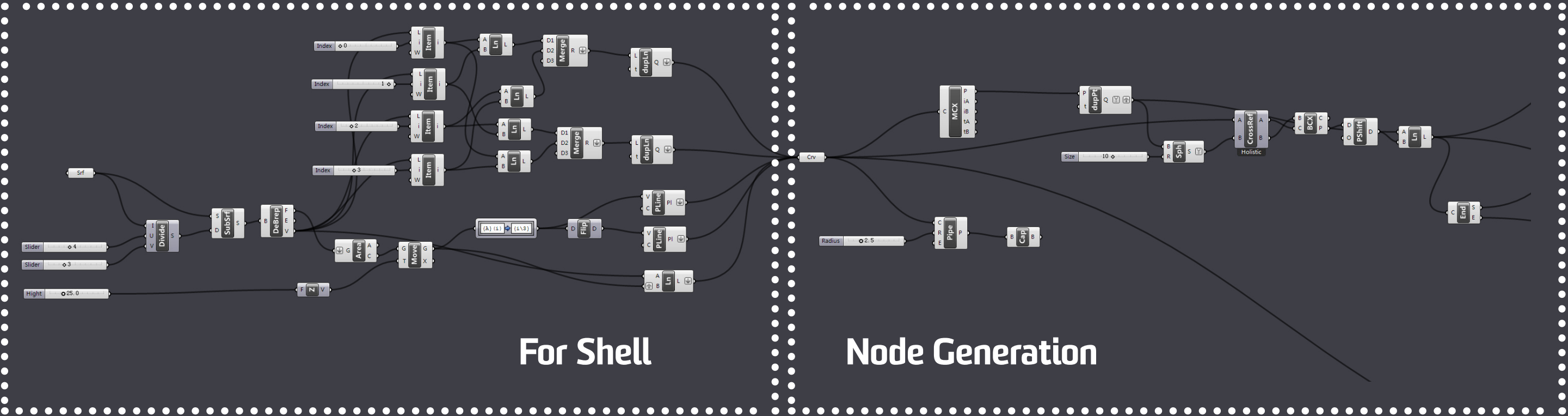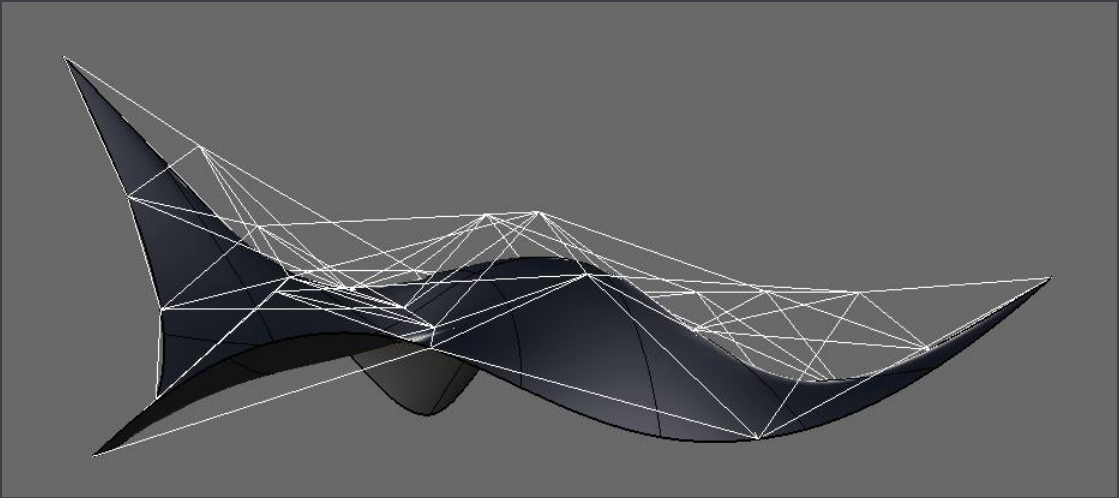
Path Mapper

Perform lexical operations on data trees
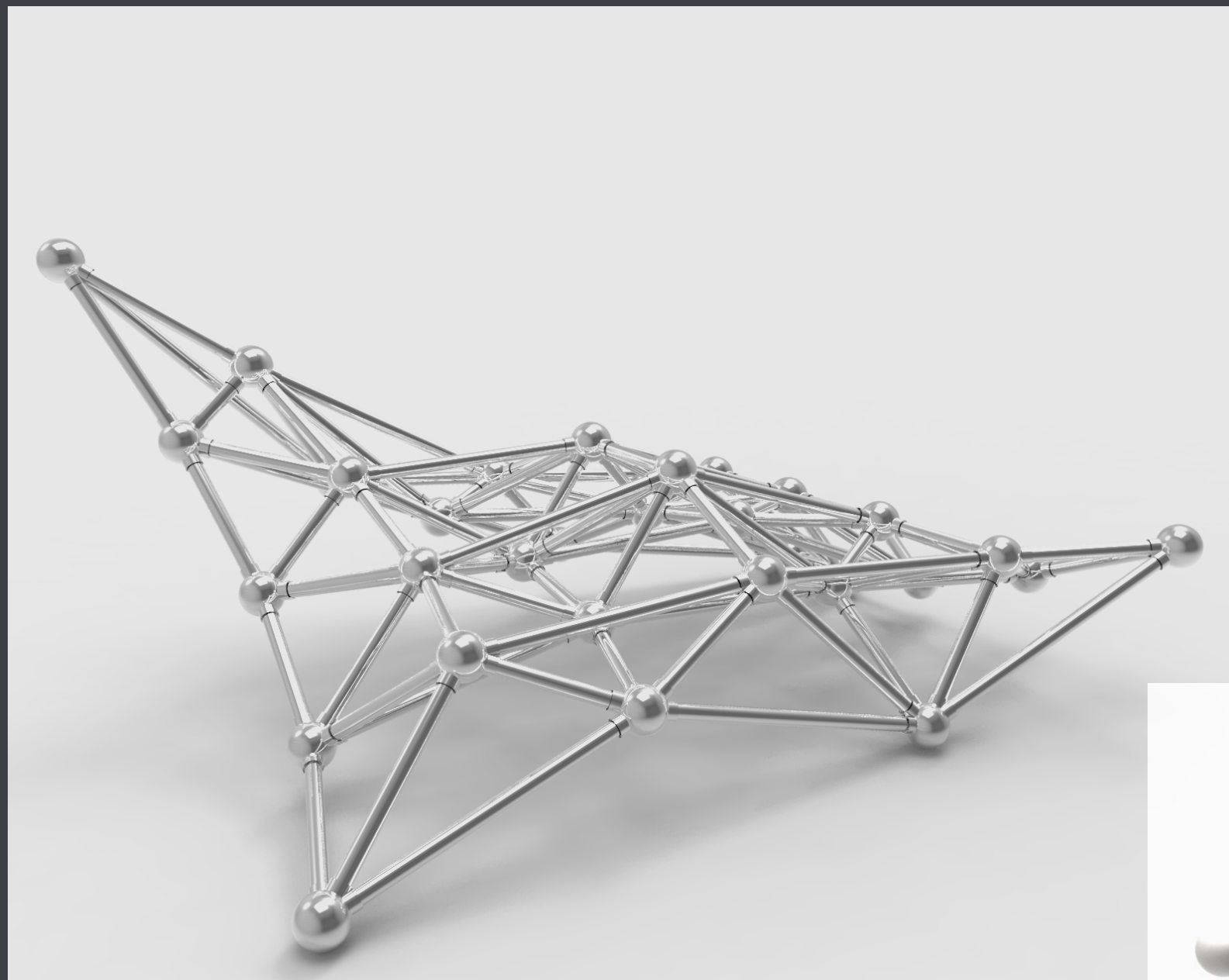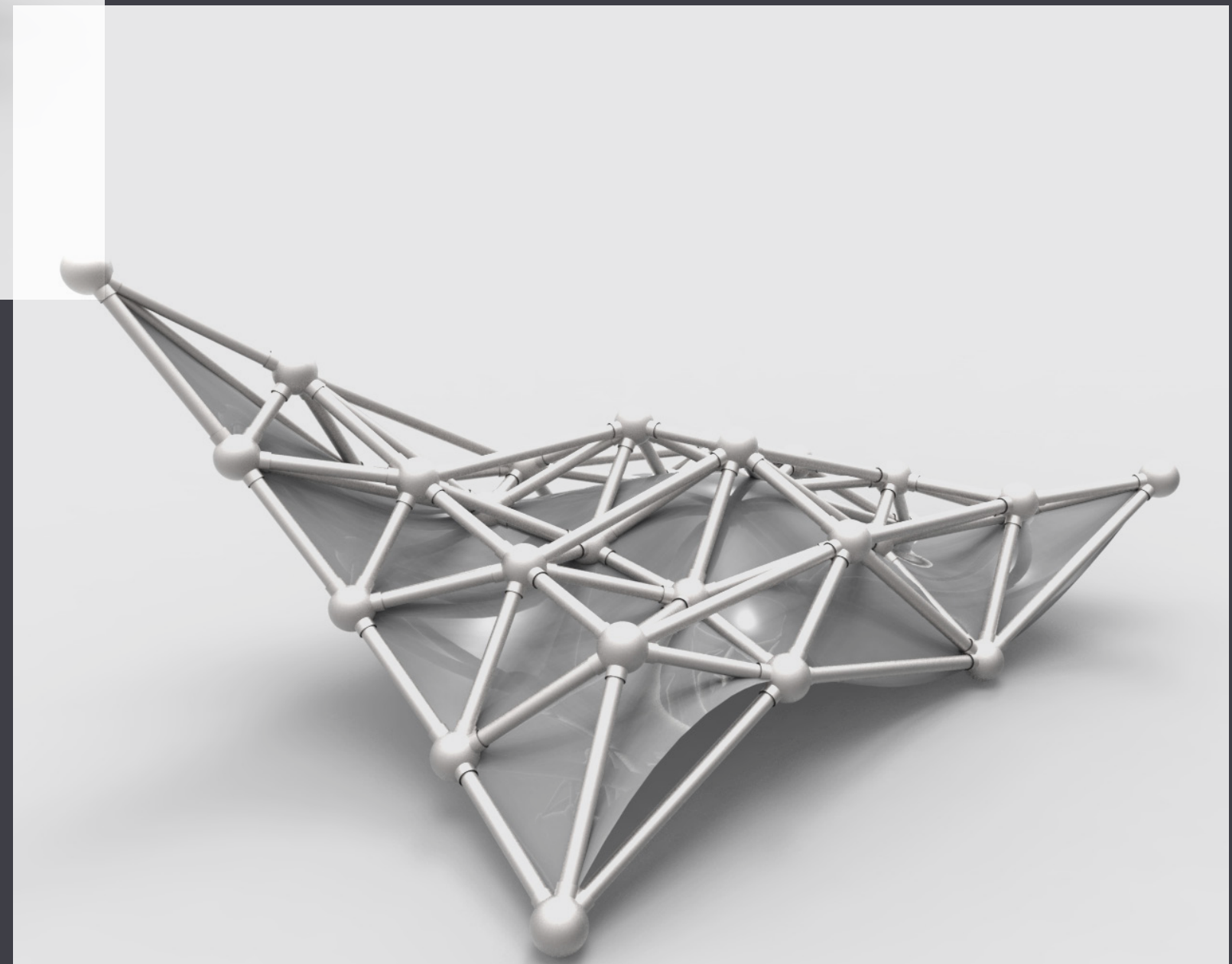
Path Mapper

Flip a data matrix by swapping rows and columns.
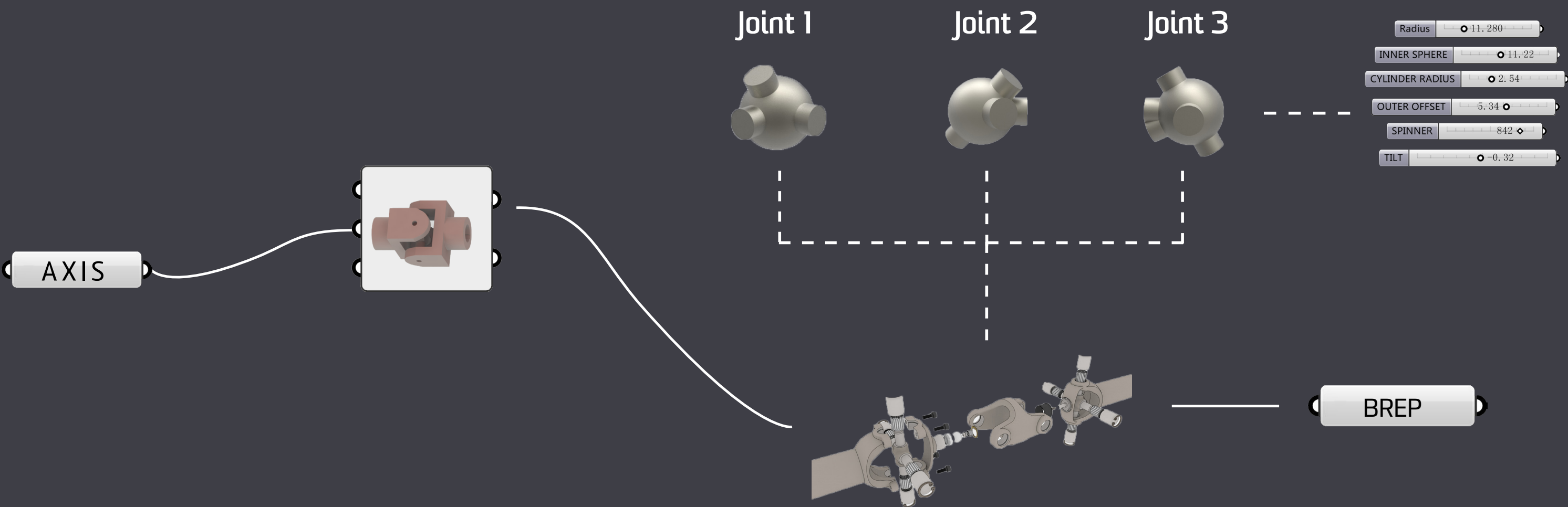

For Shell

Node Generation

The intersecting line should connect back to " Node generation" script

" Space frame " with CurveSurface

" Space frame"

Joint 1　　Joint 2　　Joint 3

Radius	⊙ 11. 280
INNER SPHERE	⊙ 11. 22
CYLINDER RADIUS	⊙ 2. 54
OUTER OFFSET	5. 34 ⊙
SPINNER	842 ◇
TILT	⊙ −0. 32

AXIS

BREP

Future

Small scale model（Rapidly Prototyping）

G-CODE

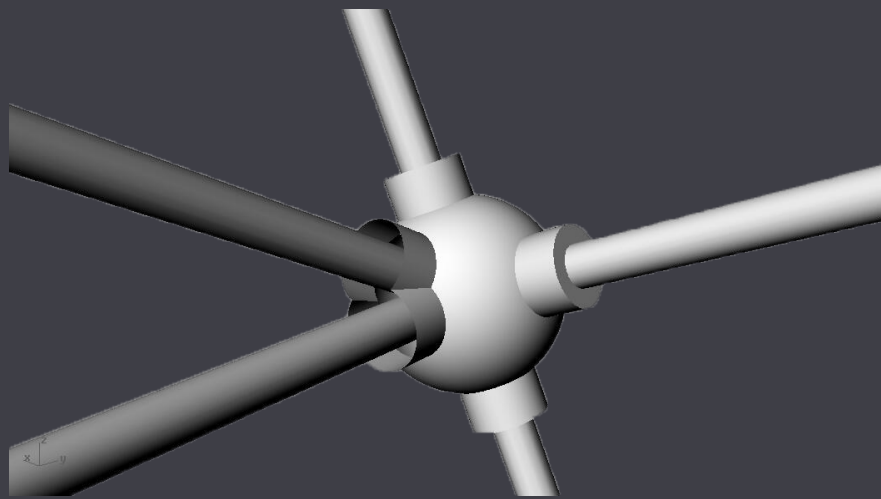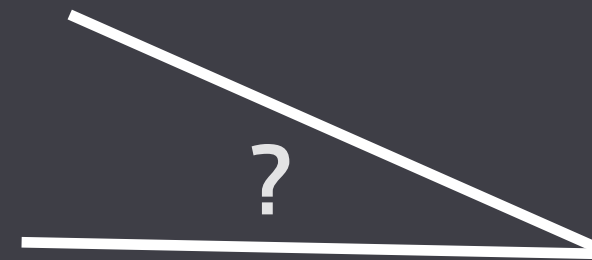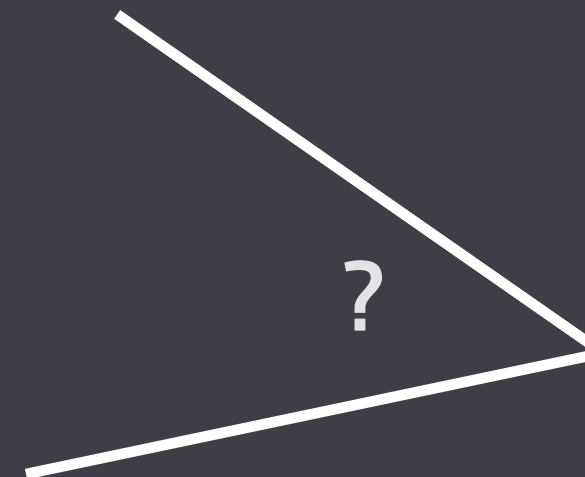Larger scale model
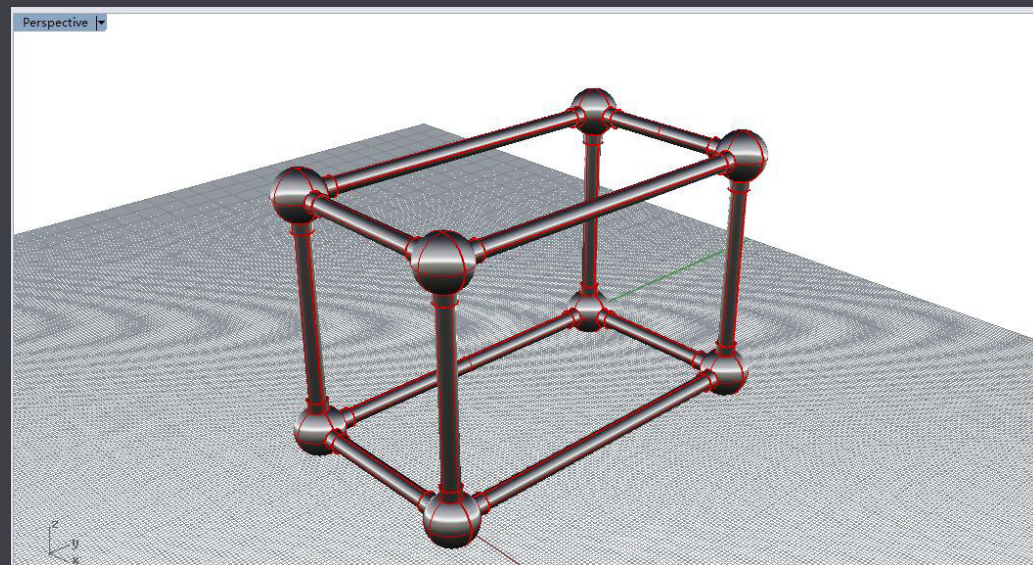
RH
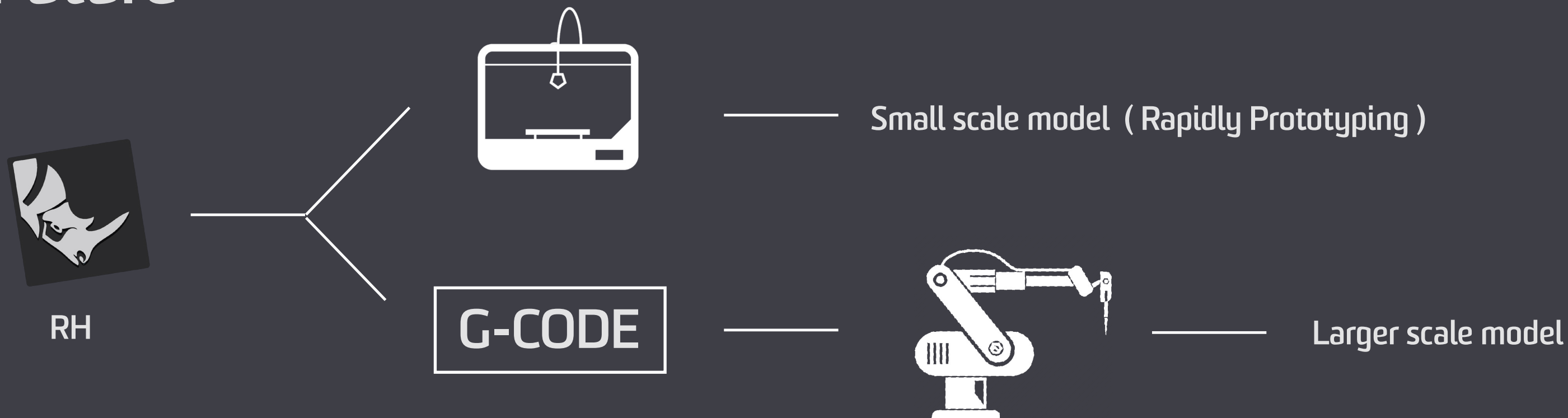
Optimisation - Error Check

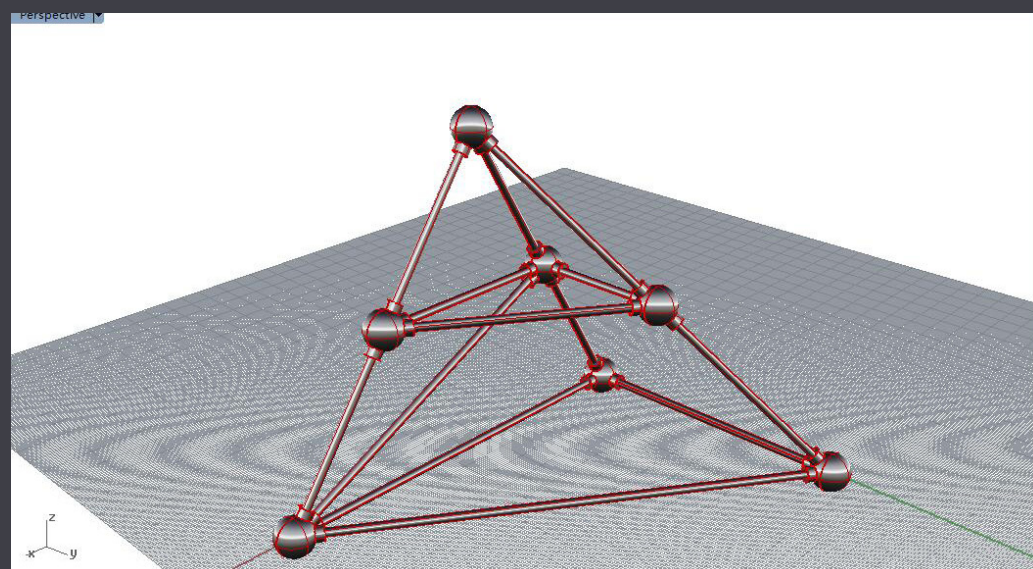Issue - the apertures join together because the
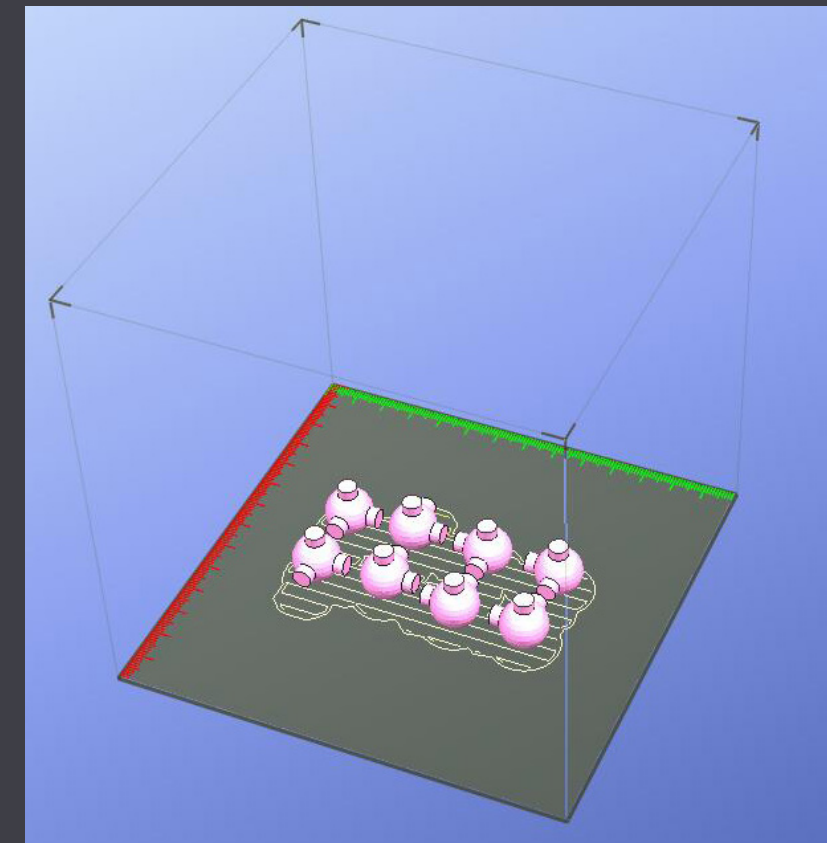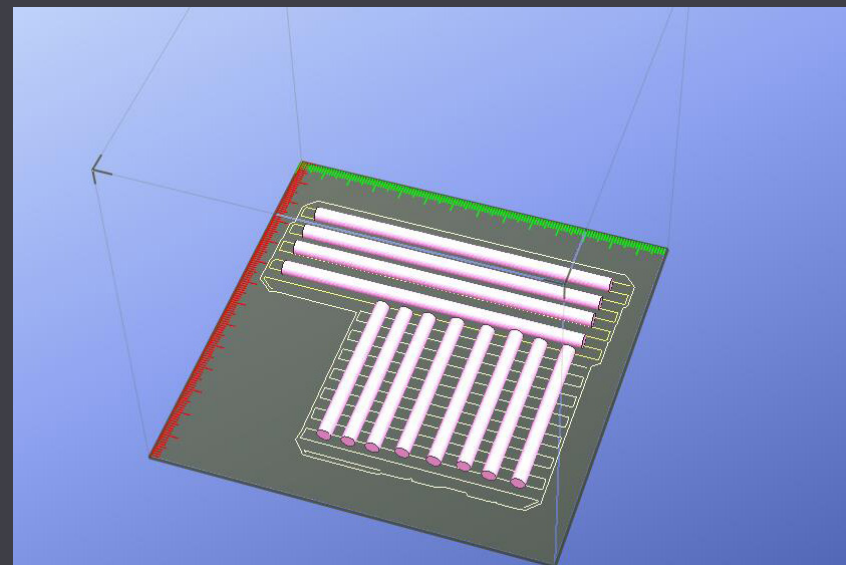
two intersecting lines are too close

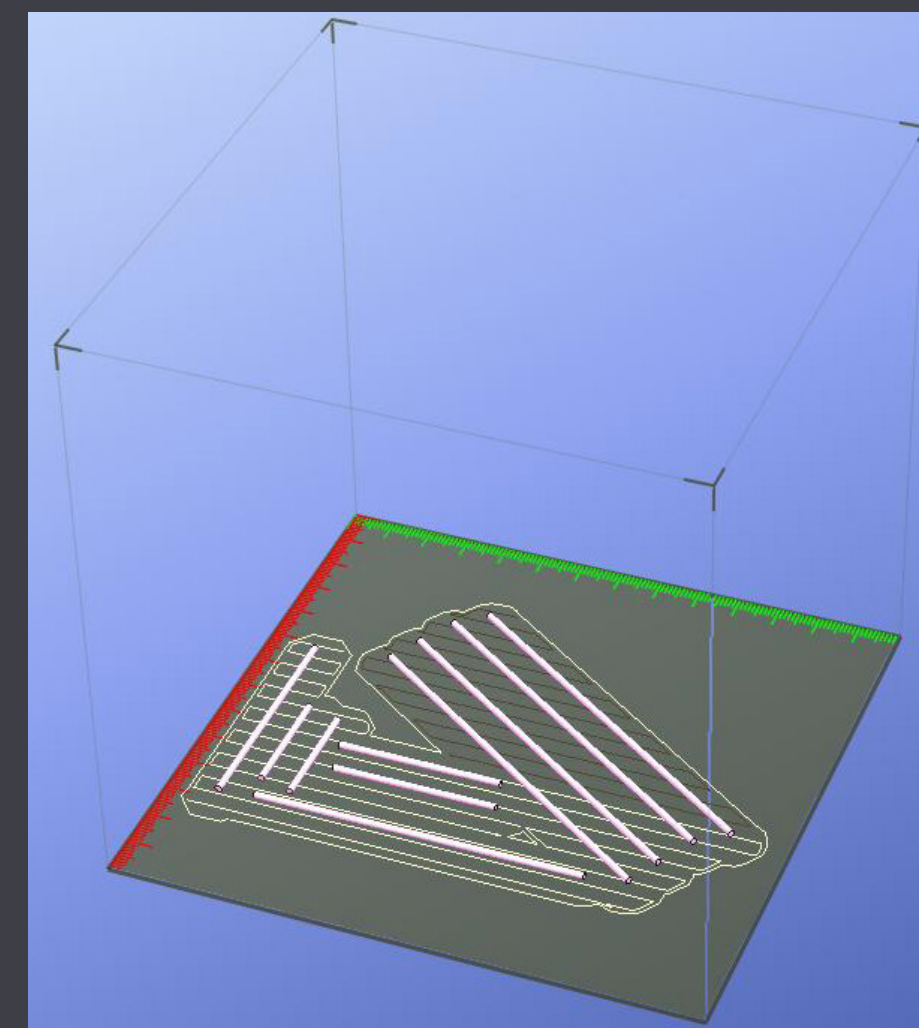The minimum angle between the two intersecting
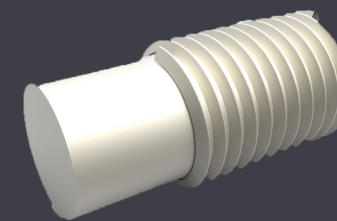
lines are ?

3D Print Experiments

Test 1

Test 2
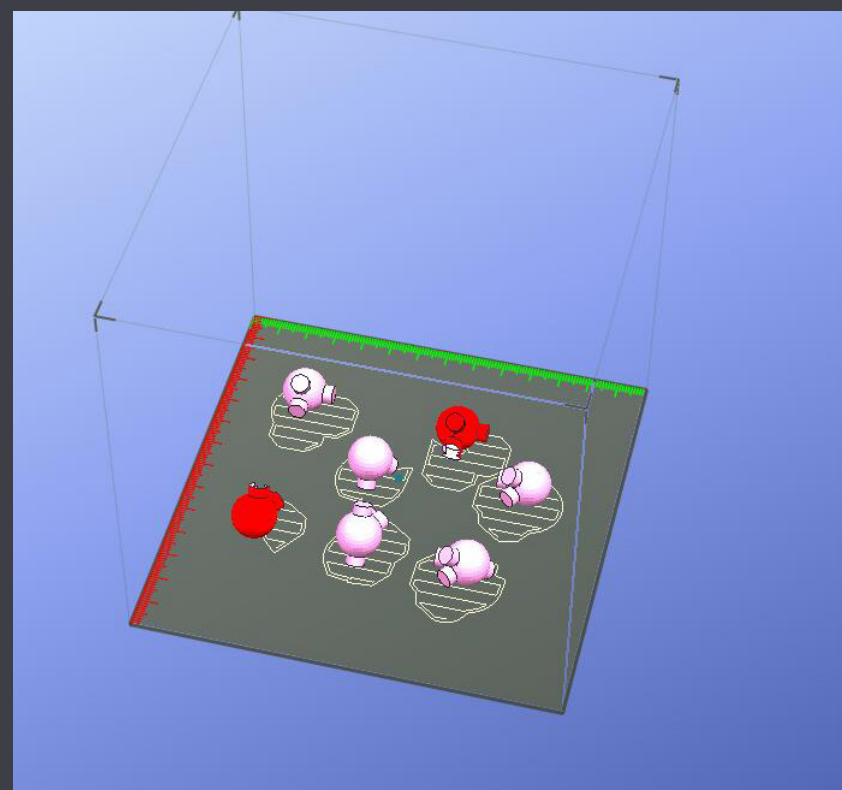
For Large Scale Model - Fabrication and Assemble

Construction details research

" A series of sockets each of which is formed into an inner and outer part, the inner part being screw-threaded for receiving a screw-threaded spigot portion of a connector"
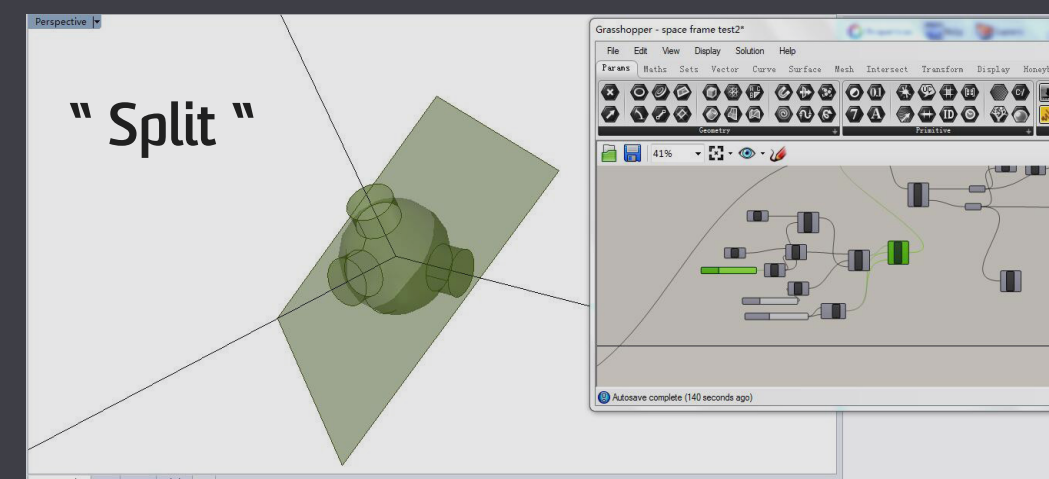
- Kohl Rainer A. (Space frame assembly)

Screw threaded script

" If desired, the spherical member may comprise two hemispheres which are joined together, such as by bolting, or may comprise a substantially unitary sphere. "

- Gugliotta Paul F (Pipe-and-ball truss array)

" Split "