



# Orthogonal Asymptotic Gridshell

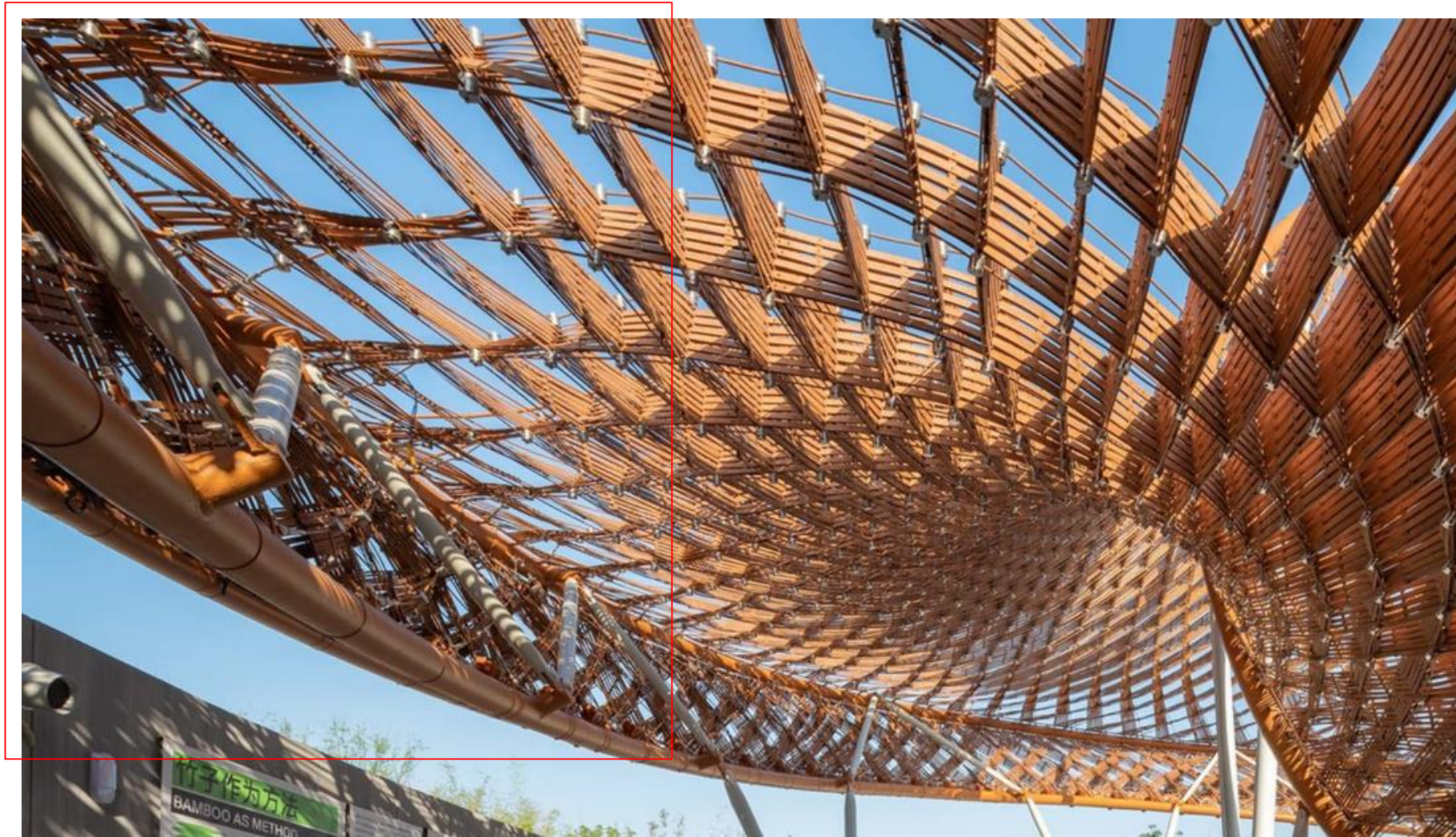
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Hui Wang



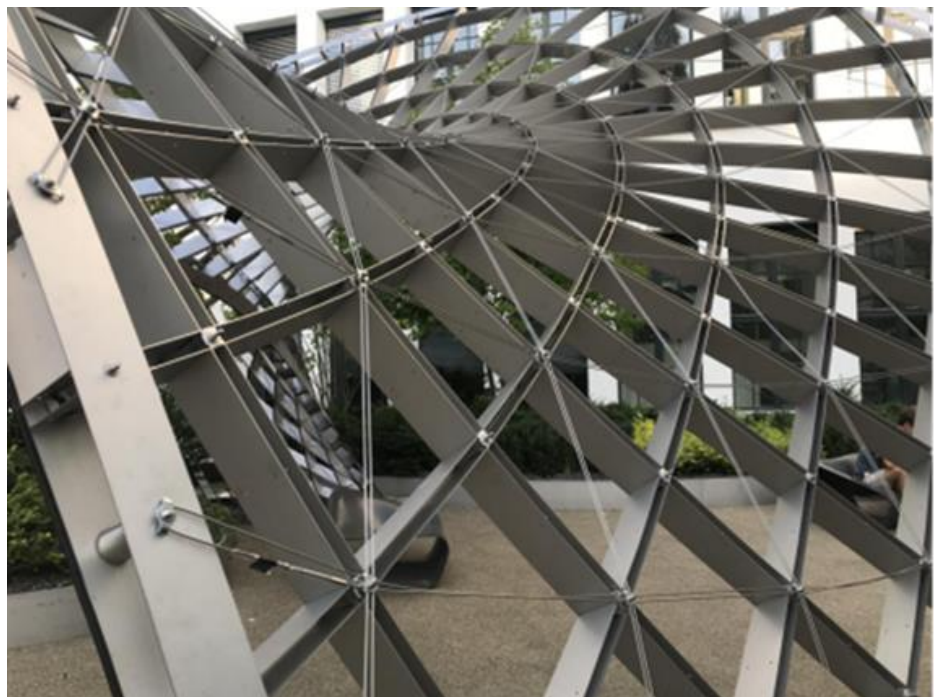


## Example Geometry Optimization Simulation





## Example Geometry Optimization Simulation

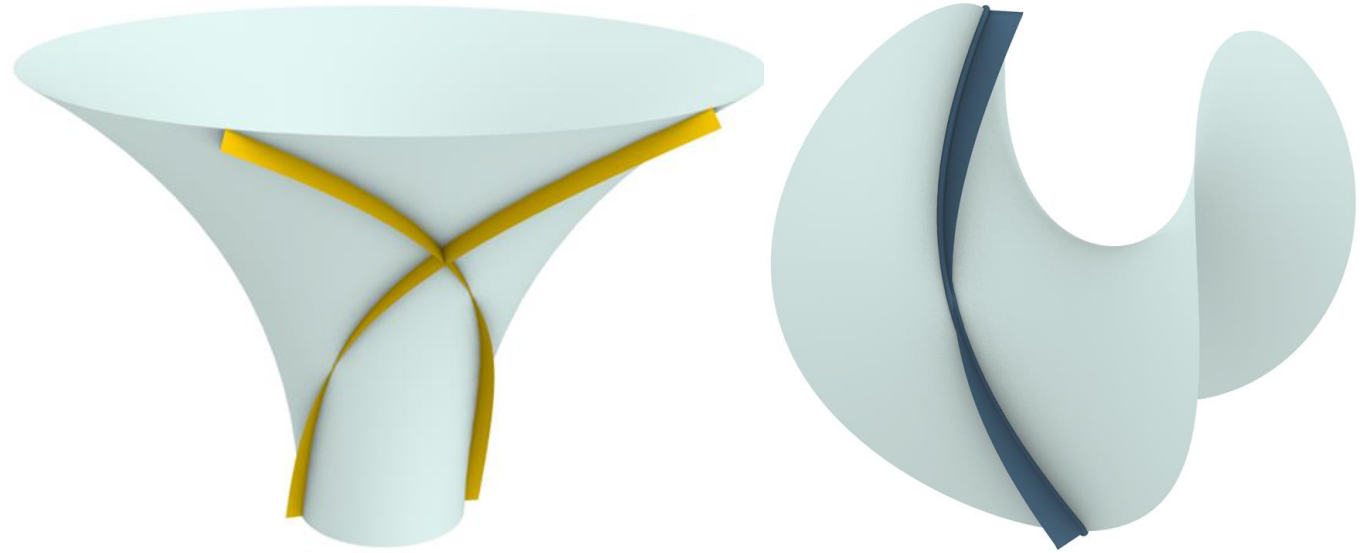


## Example **Geometry** Optimization Simulation



geodesic curves on surfaces

- **shortest path** between two points on the surface
- **tangentially** align along GEODESIC curve
- exist on **any** (positively/negatively) curved surfaces

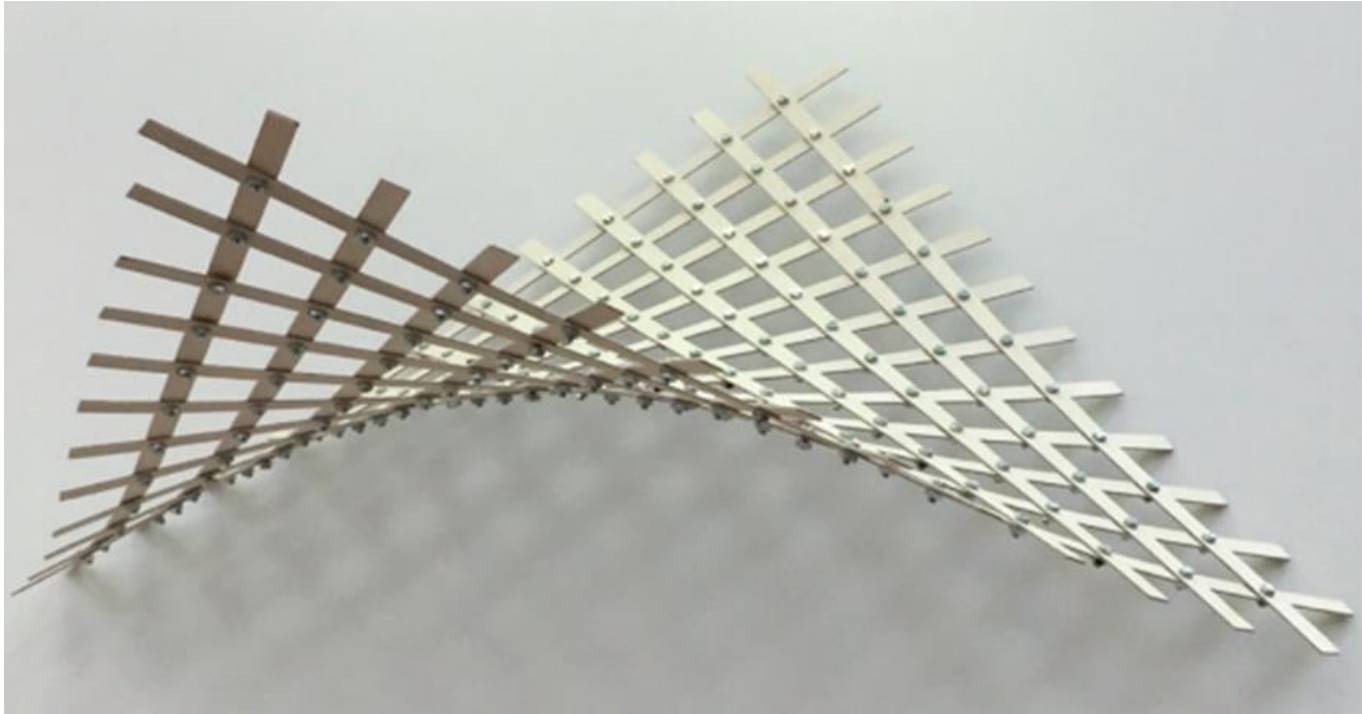


asymptotic curves on surfaces

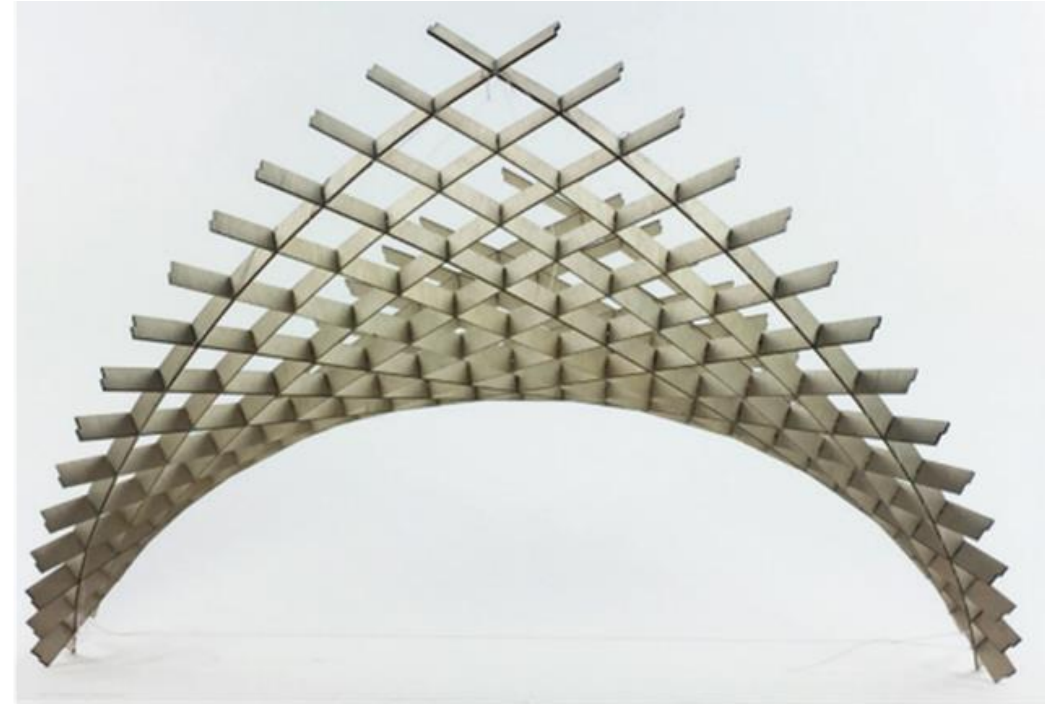
- not the shortest path, except a straight line
- **orthogonally** align along ASYMPTOTIC curve
- exist ONLY on **negatively** curved surfaces



## Example **Geometry** Optimization Simulation

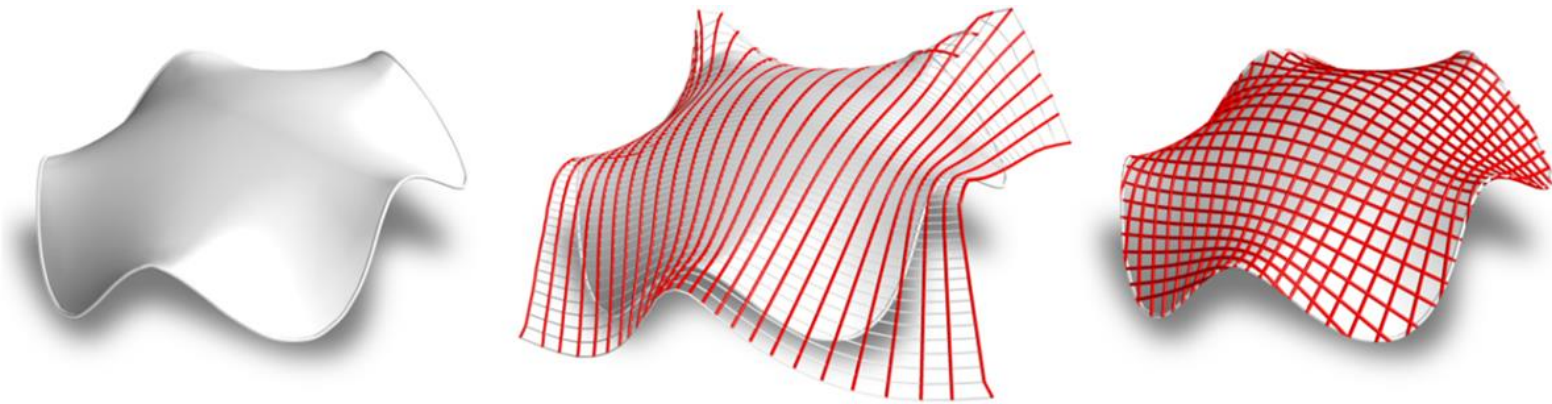


geodesic gridshell



asymptotic gridshell

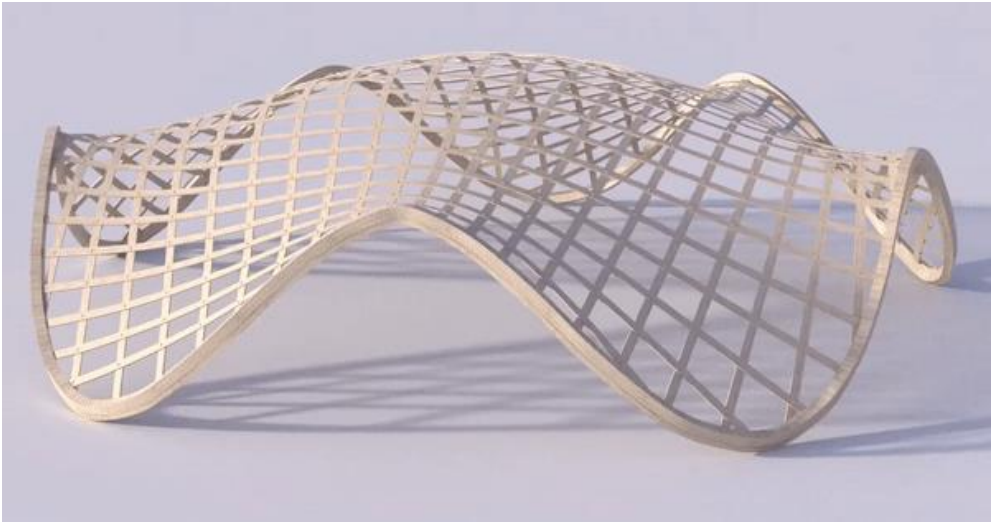
# Example Geometry Optimization Simulation



(a)

(b)

(c)



(a)

(b)

(c)

(d)



(e)

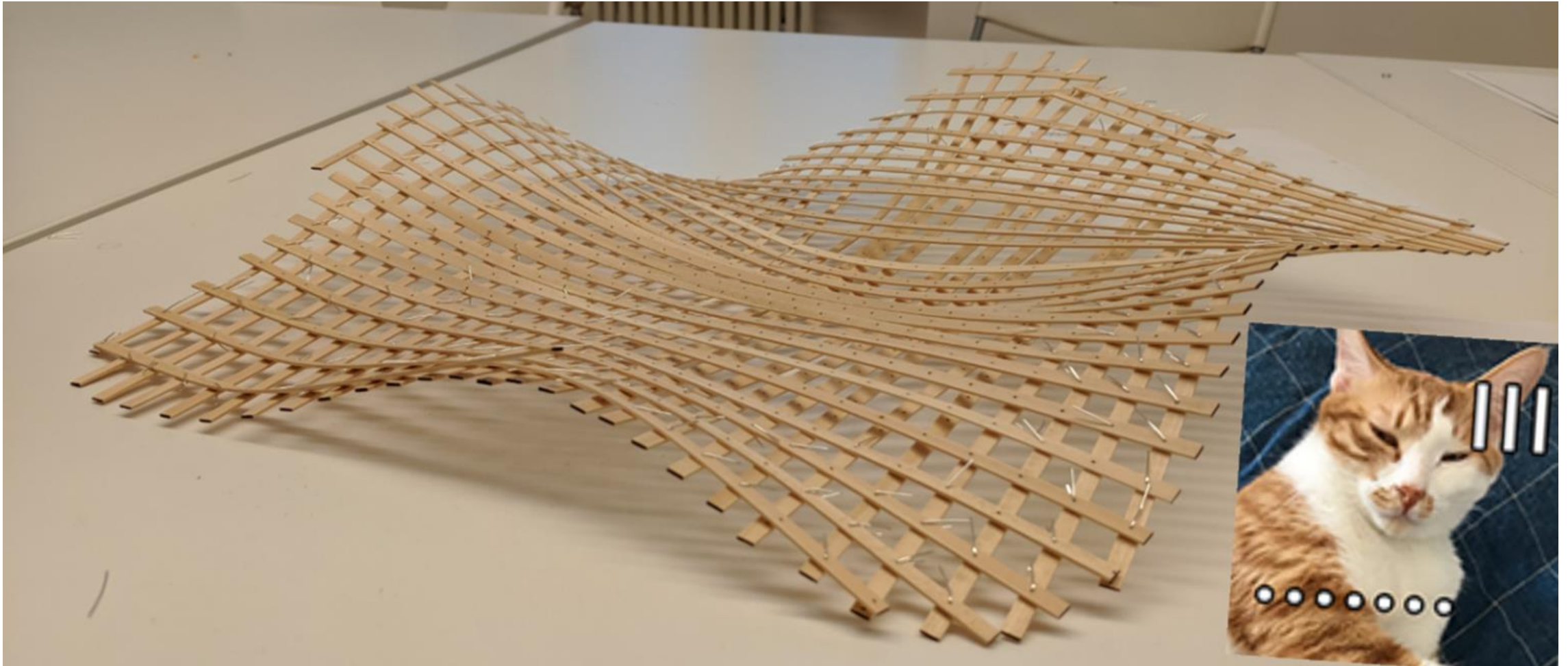
(f)

(g)

(h)



## Example Geometry Optimization Simulation



# Example Geometry Optimization Simulation

Input mesh



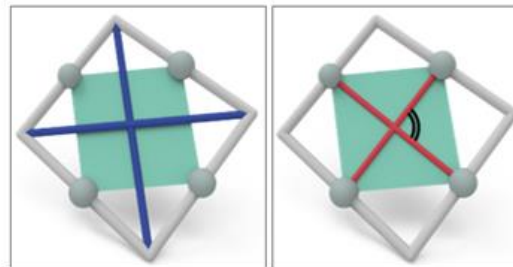
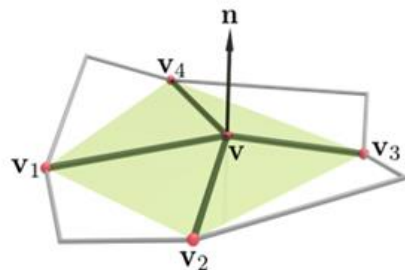
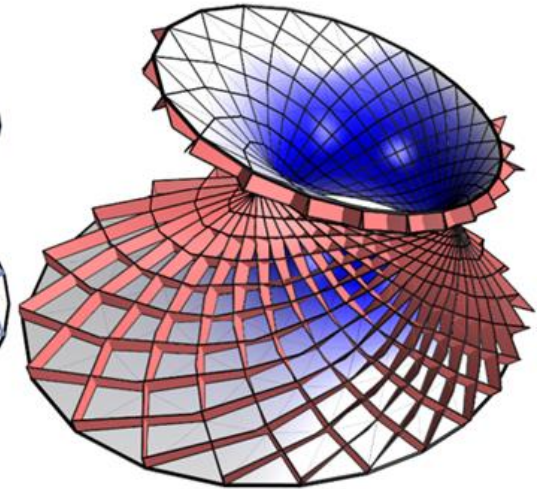
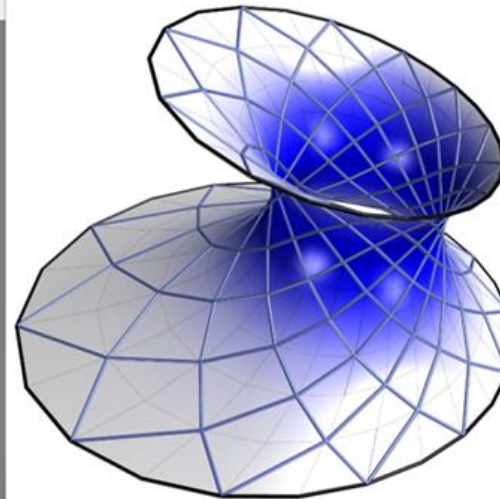
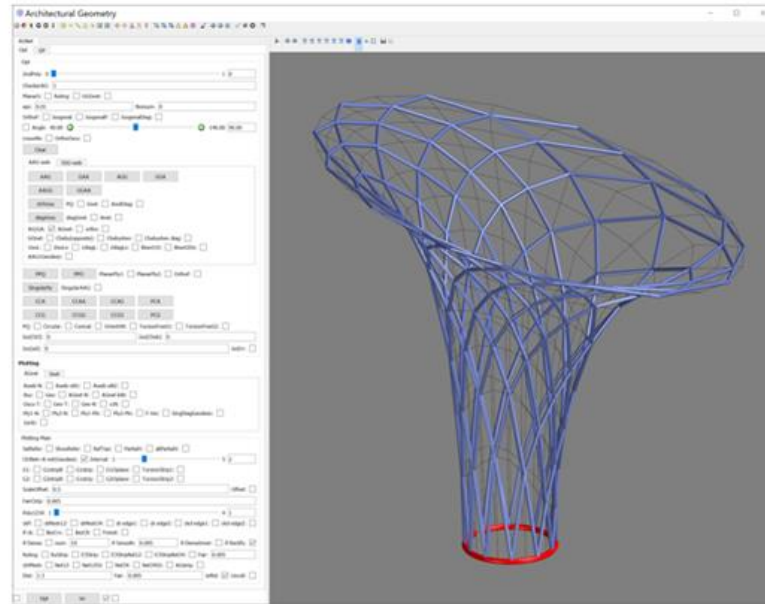
Optimization



Orthogonal A-net  
(minimal surface)

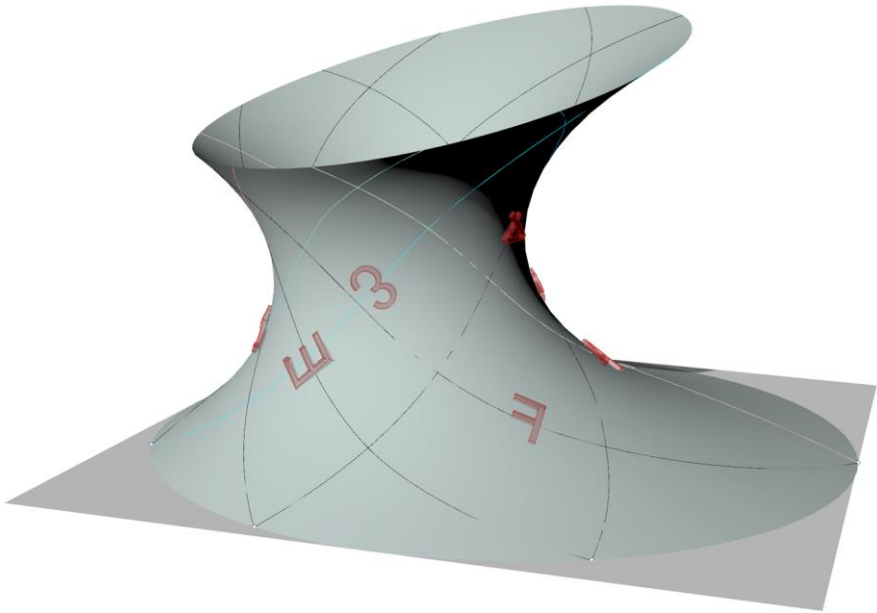
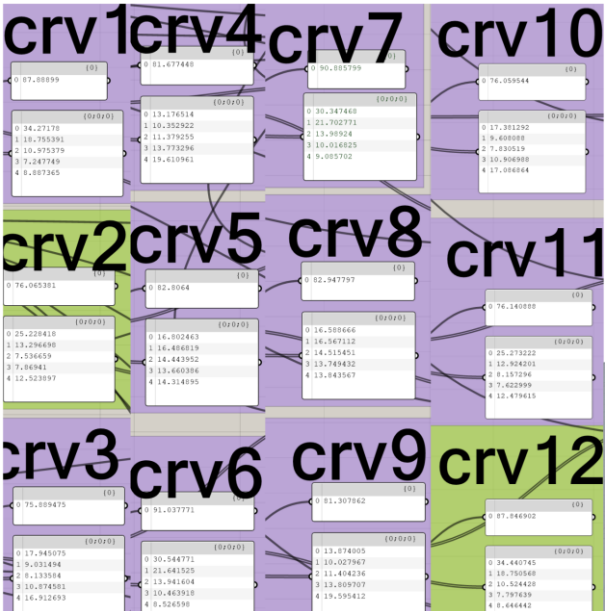
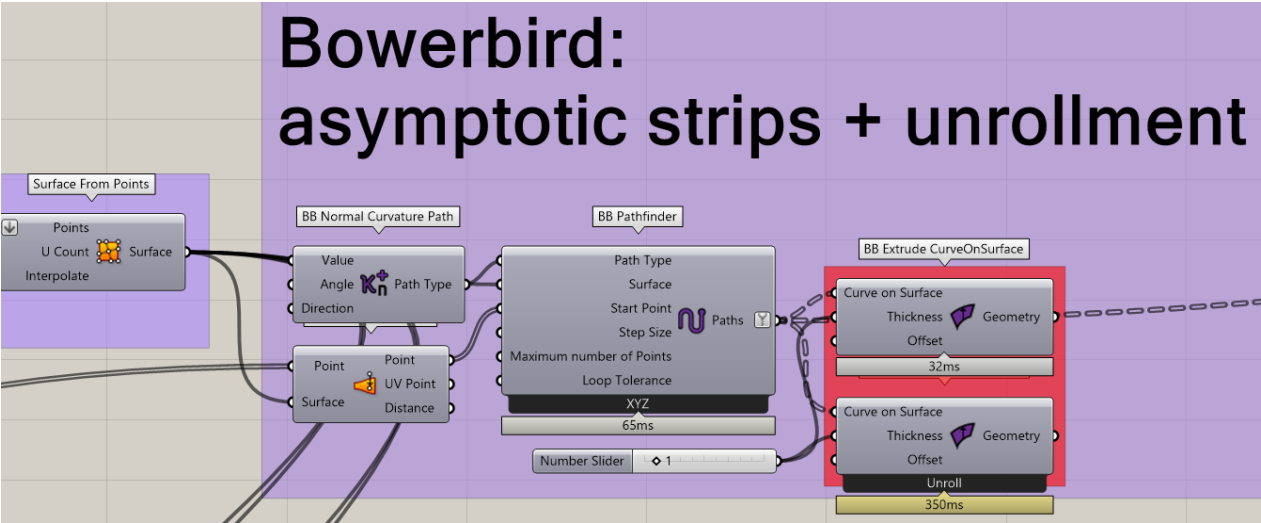
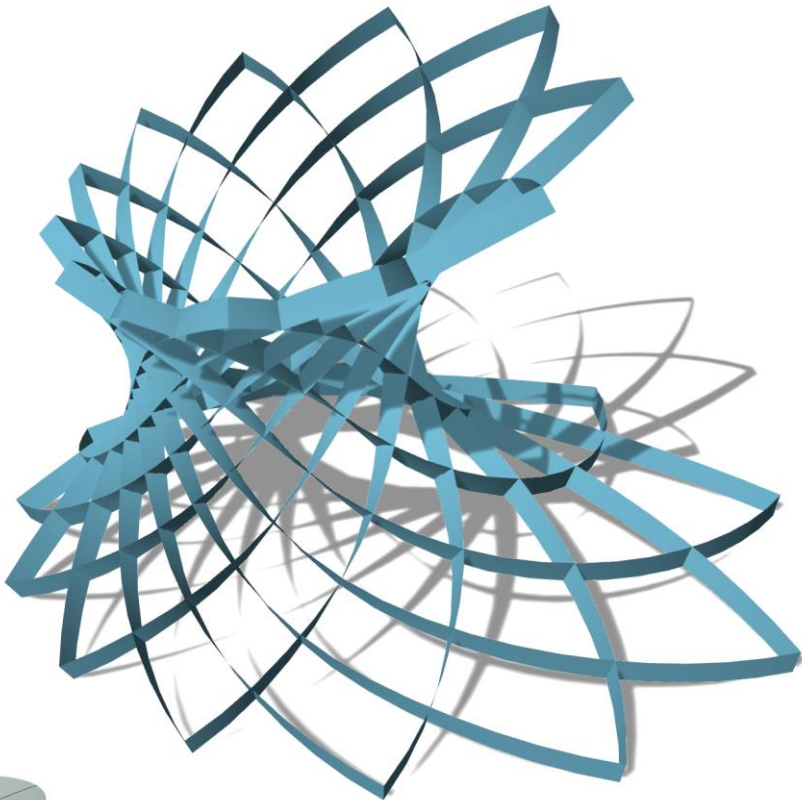


Asymptotic  
Gridshell

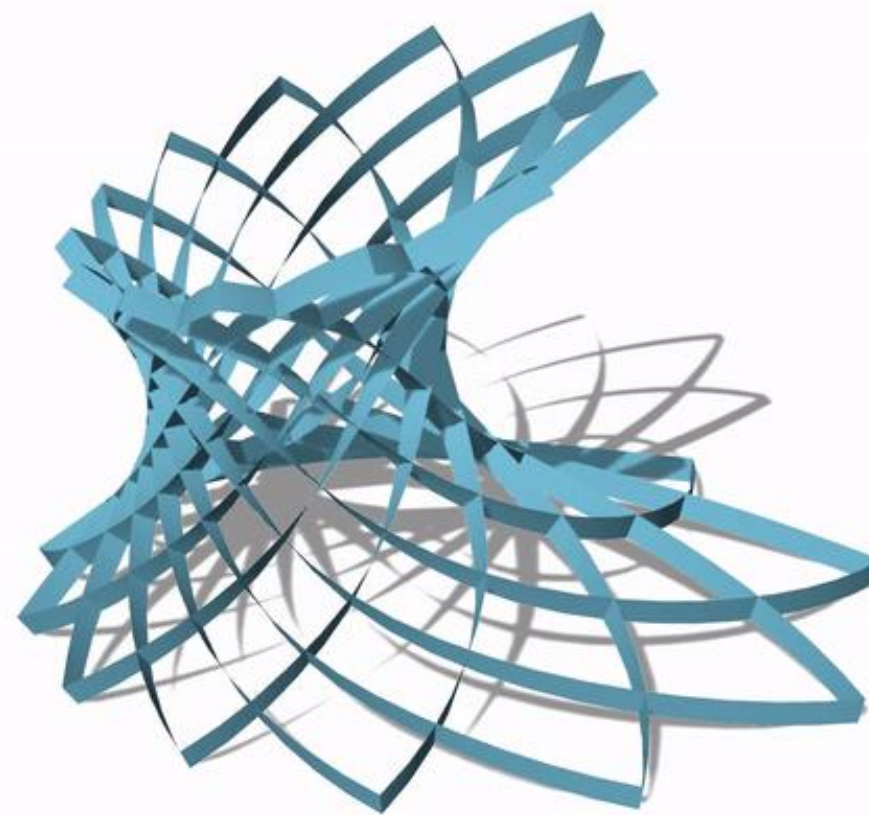
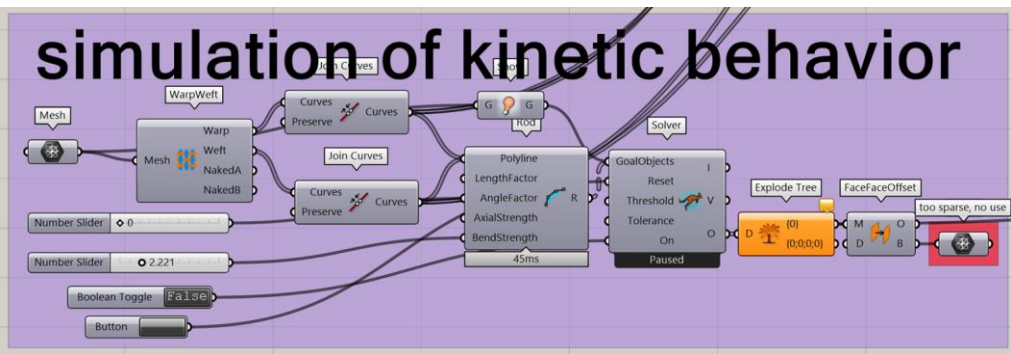




# Example Geometry Optimization Simulation



# Example Geometry Optimization Simulation



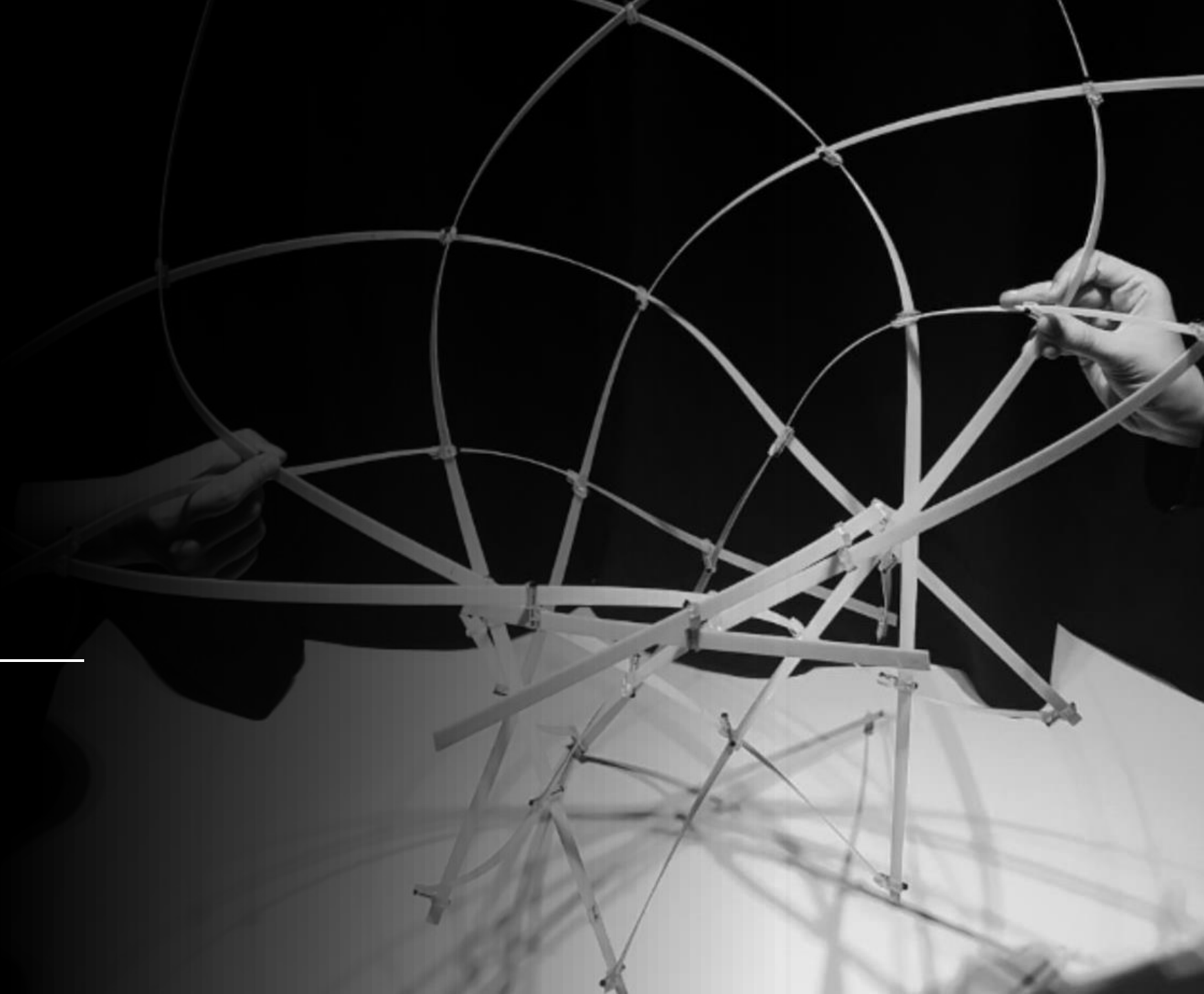




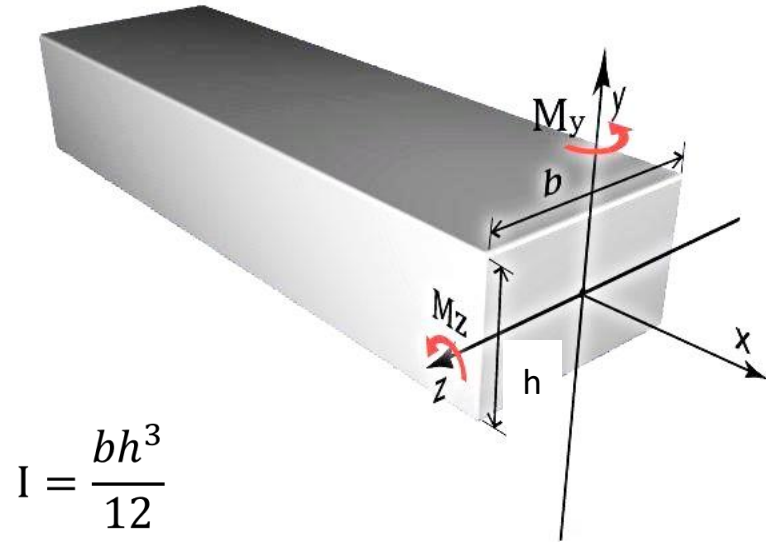
# Orthogonal Asymptotic Gridshell

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Xinye Li

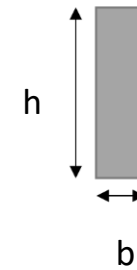
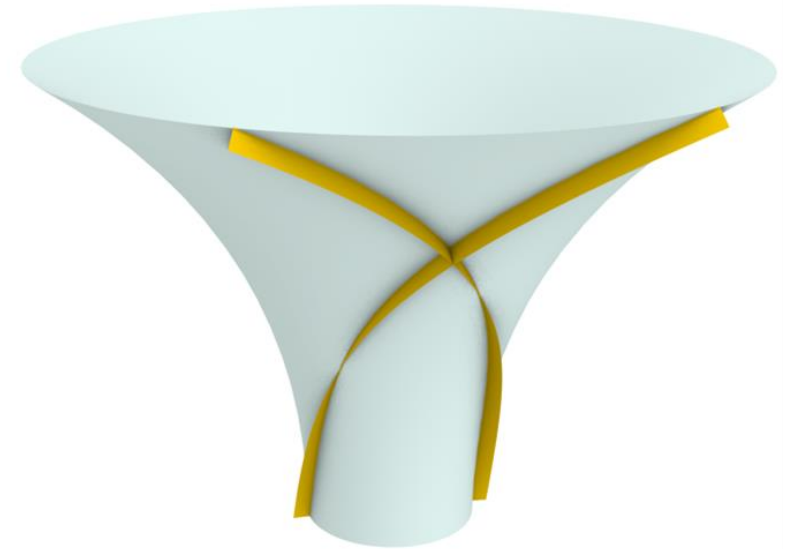
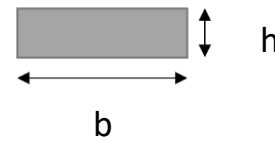


# Material Joint Construction Multi-stable Result



$$I = \frac{bh^3}{12}$$

$$y = \frac{Fl^3}{EI} = \frac{12Fl^3}{Ebh^3}$$





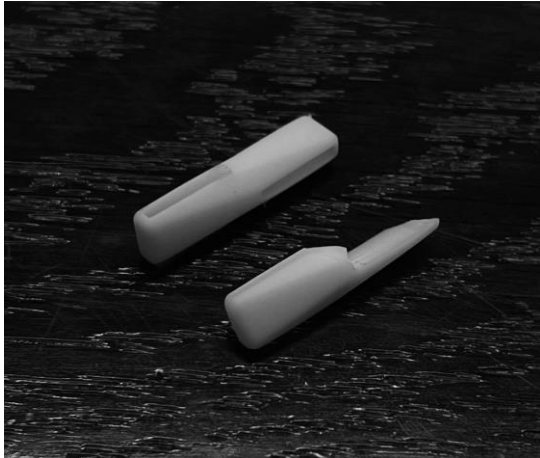
## Material Joint Construction Multi-stable Result



**Timber** : have better behaviour in tensile state

**FRP** (Fiber Reinforced Plastic) : better toughness, higher strength

## Material Joint Construction Multi-stable Result



**brittle**  
**inflexible**  
orthogonal



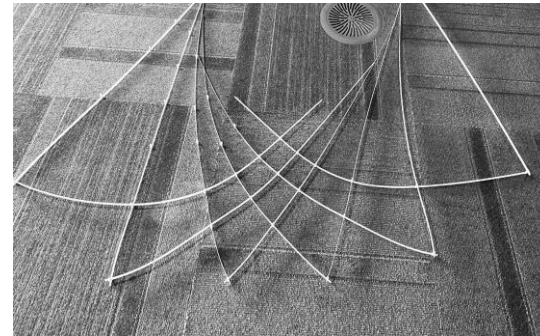
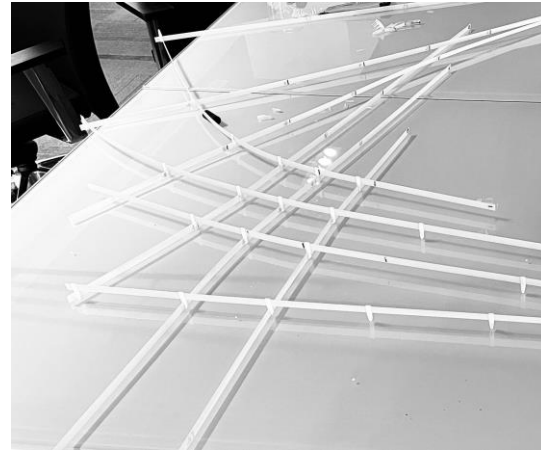
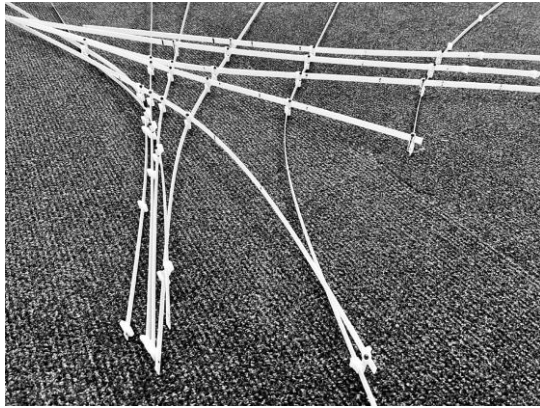
**brittle**  
flexible  
orthogonal



tough  
flexible  
**can't be fixed as orthogonal**



# Material Joint Construction Multi-stable Result

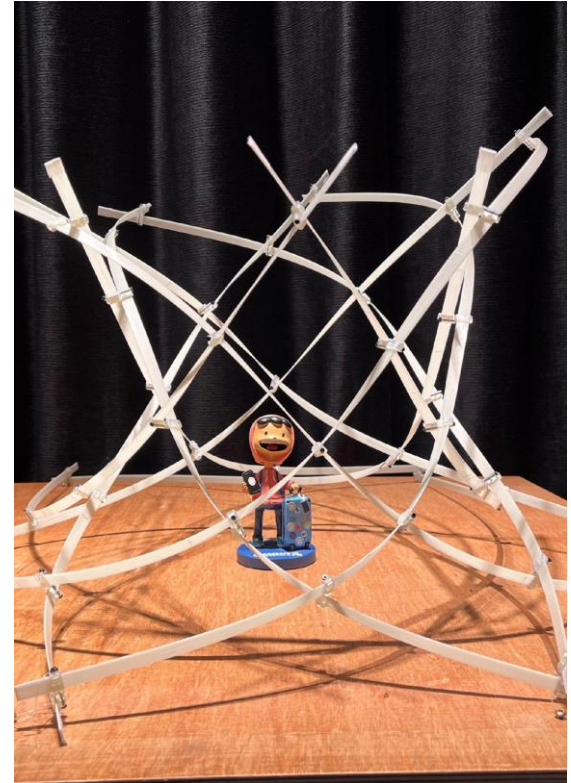
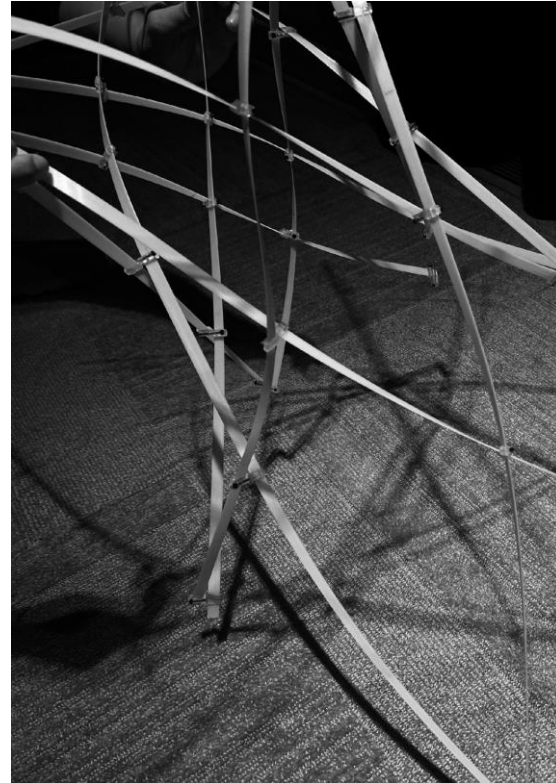


## Material Joint Construction **Multi-stable** Result





## Material Joint Construction Multi-stable Result



## Material Joint Construction Multi-stable Result

