

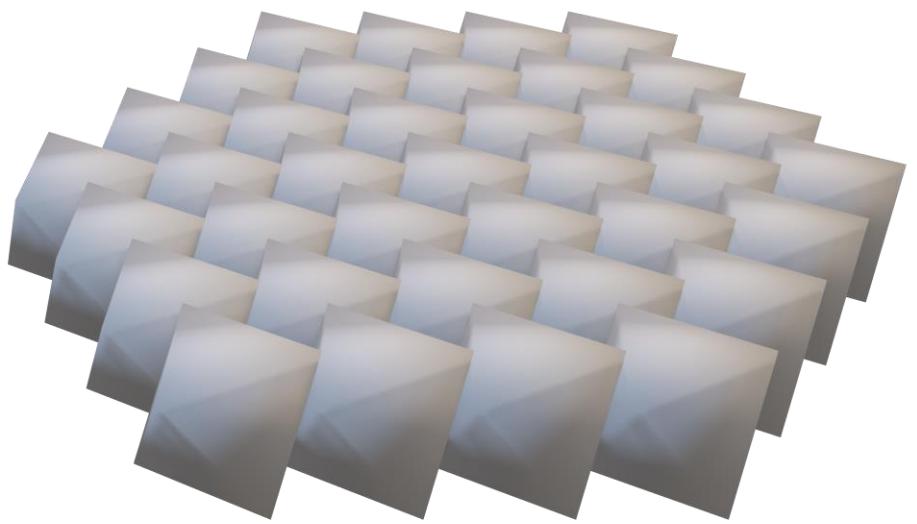
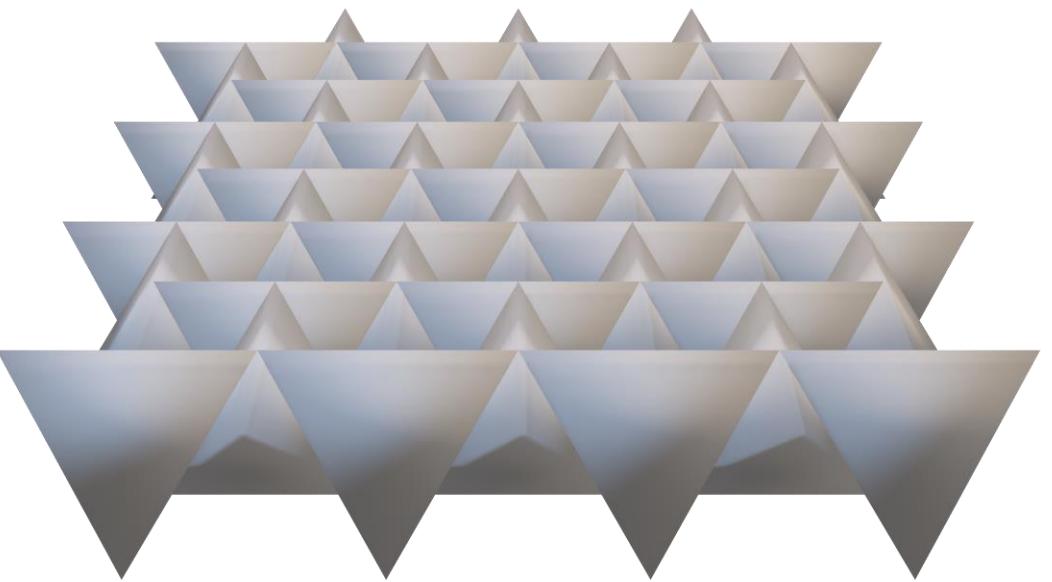


TIGER: Topological Interlocking GEneratoR

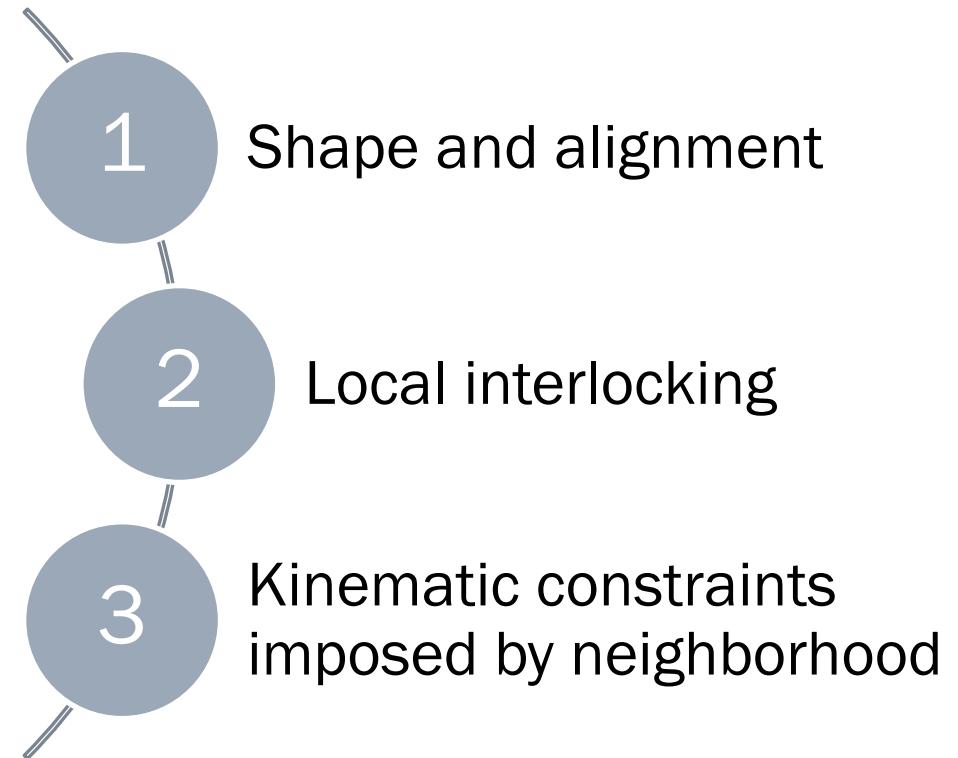
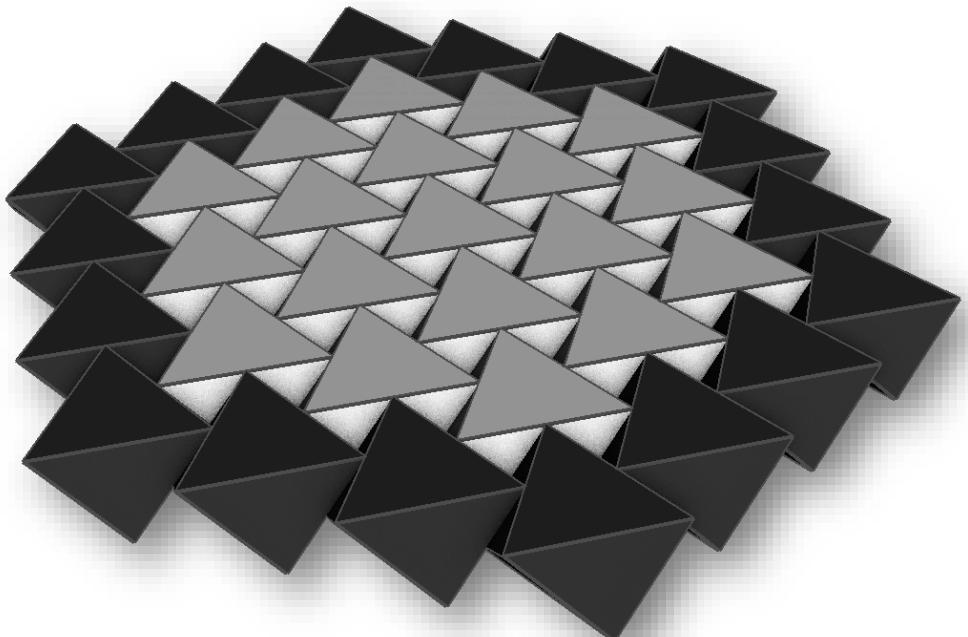
ANDRES BEJARANO AND CHRISTOPH HOFFMANN

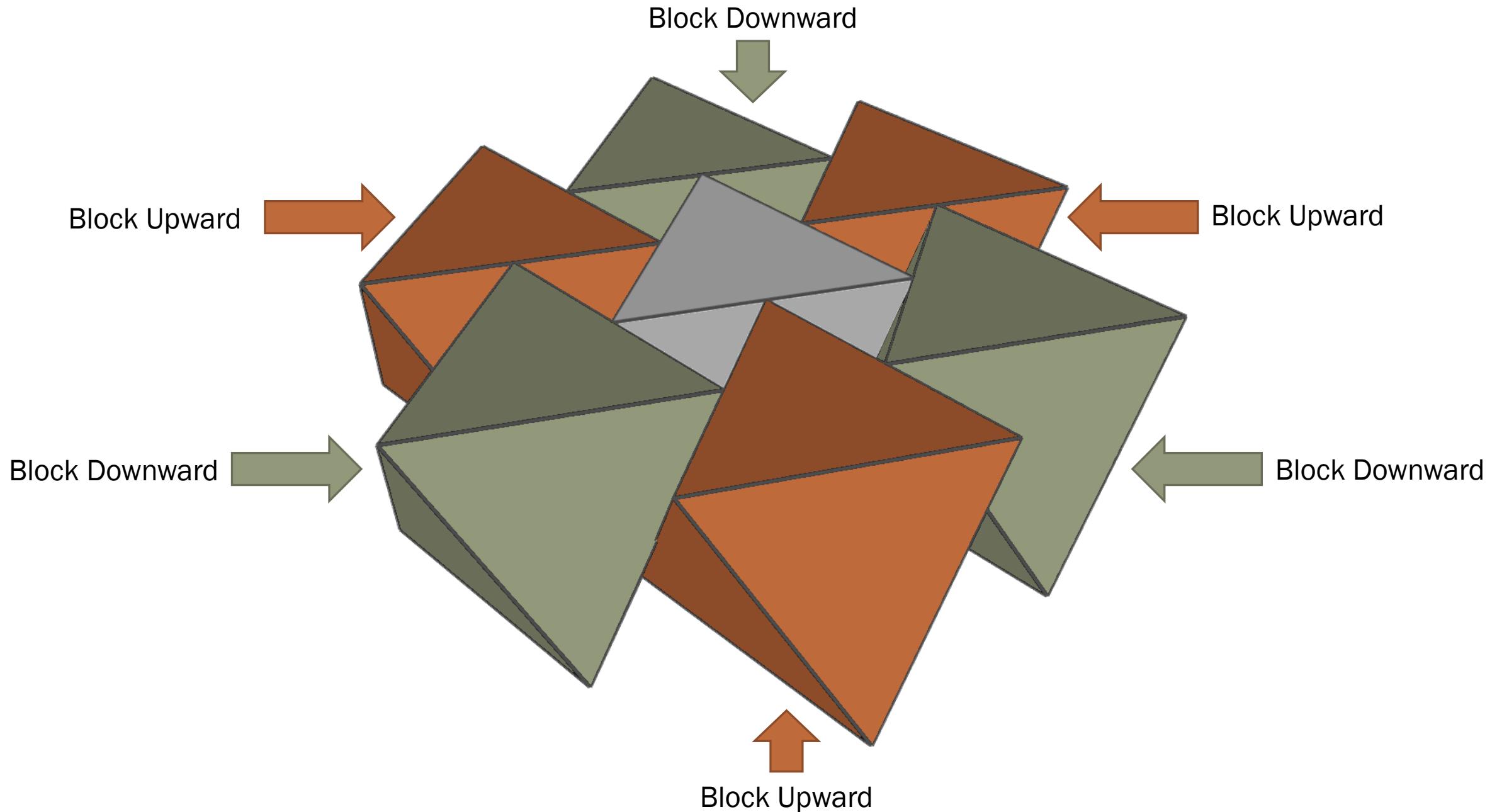
DEPARTMENT OF COMPUTER SCIENCE, PURDUE UNIVERSITY

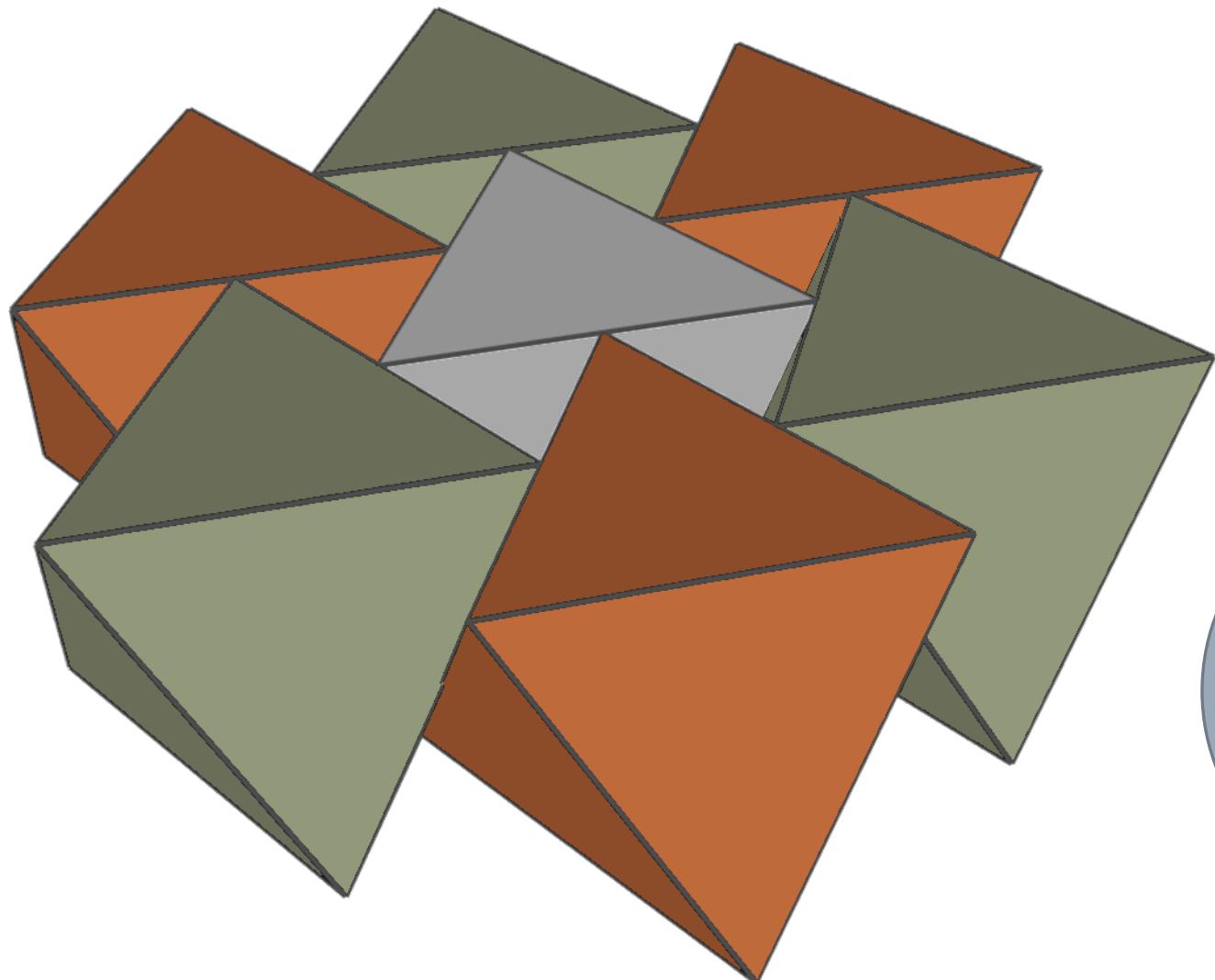
IEEE GMAX 2020 - 09/18/2020

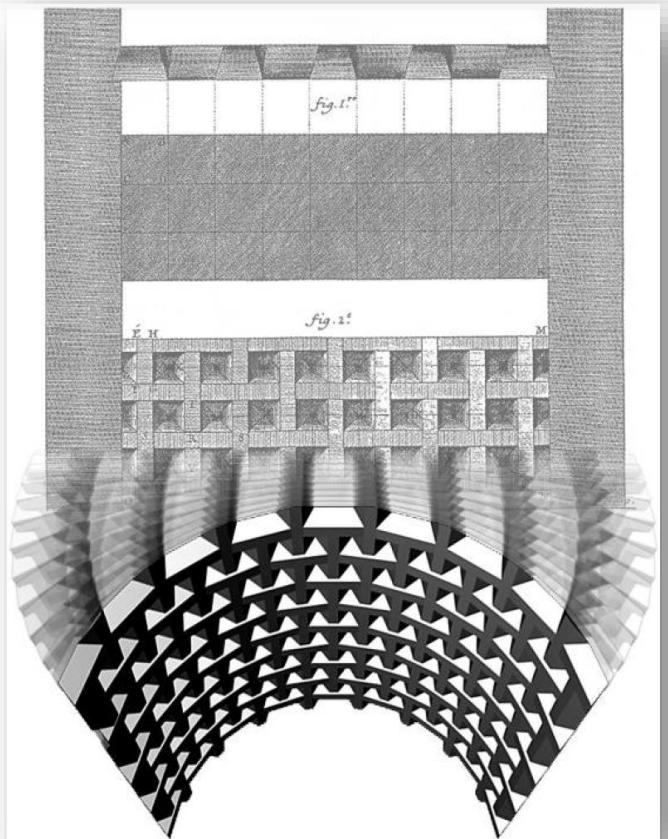
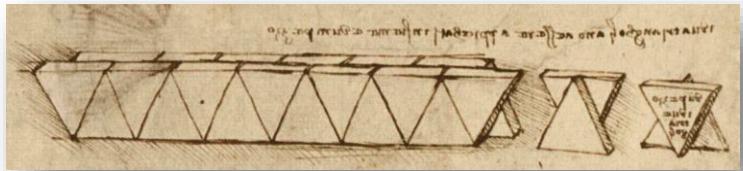


Topological Interlocking Configuration (TIC)

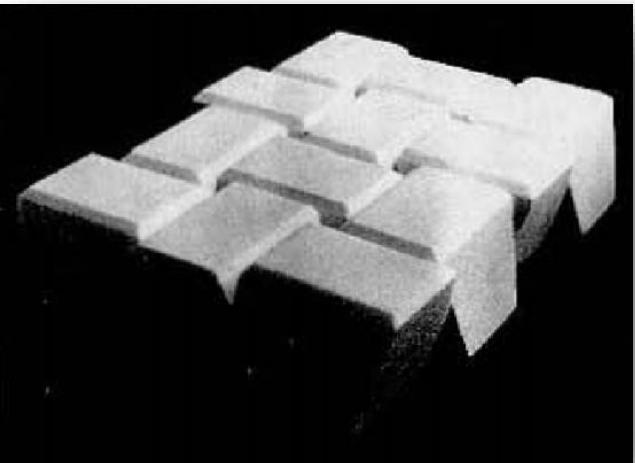




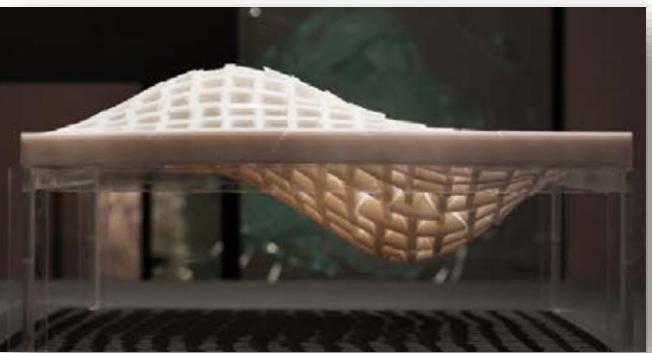
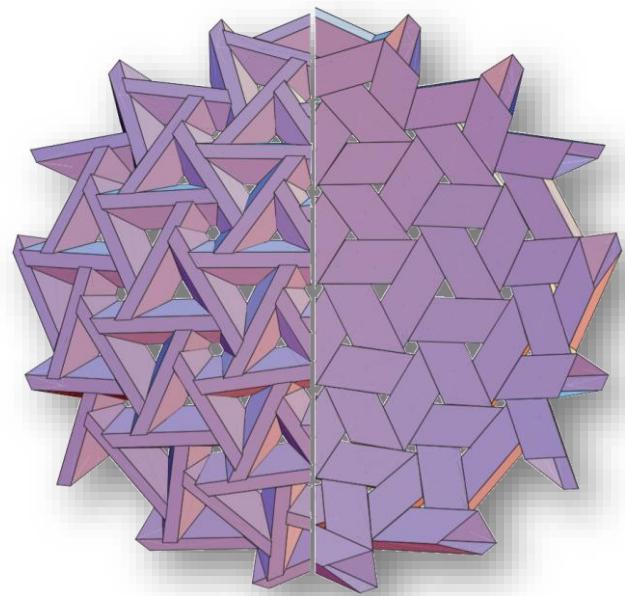




Middle Ages - Renaissance

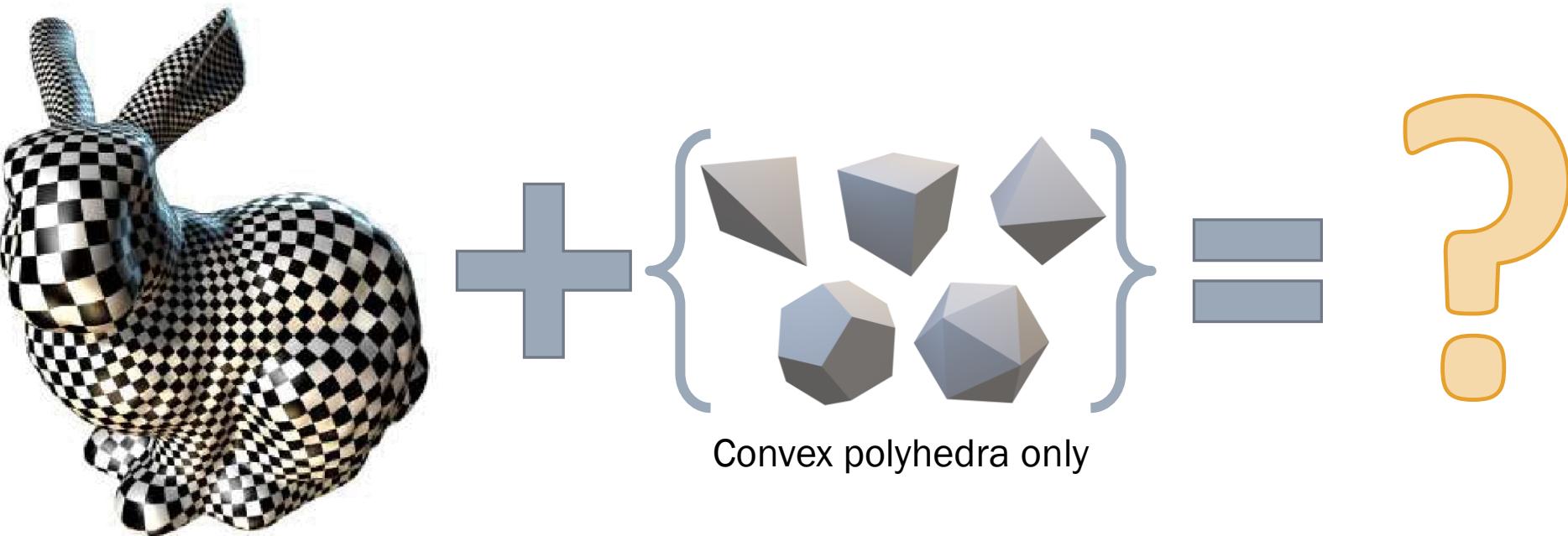


1980s – Mid 2000s

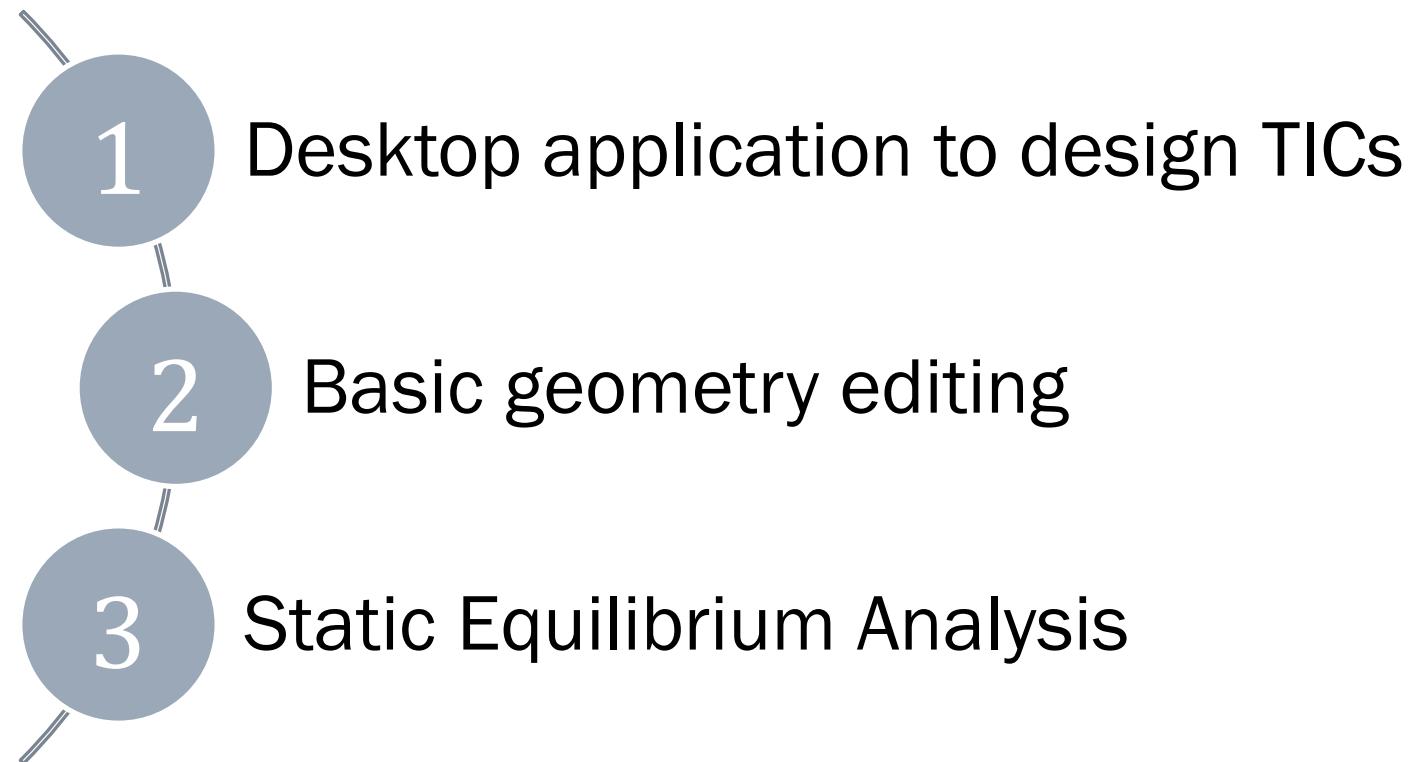


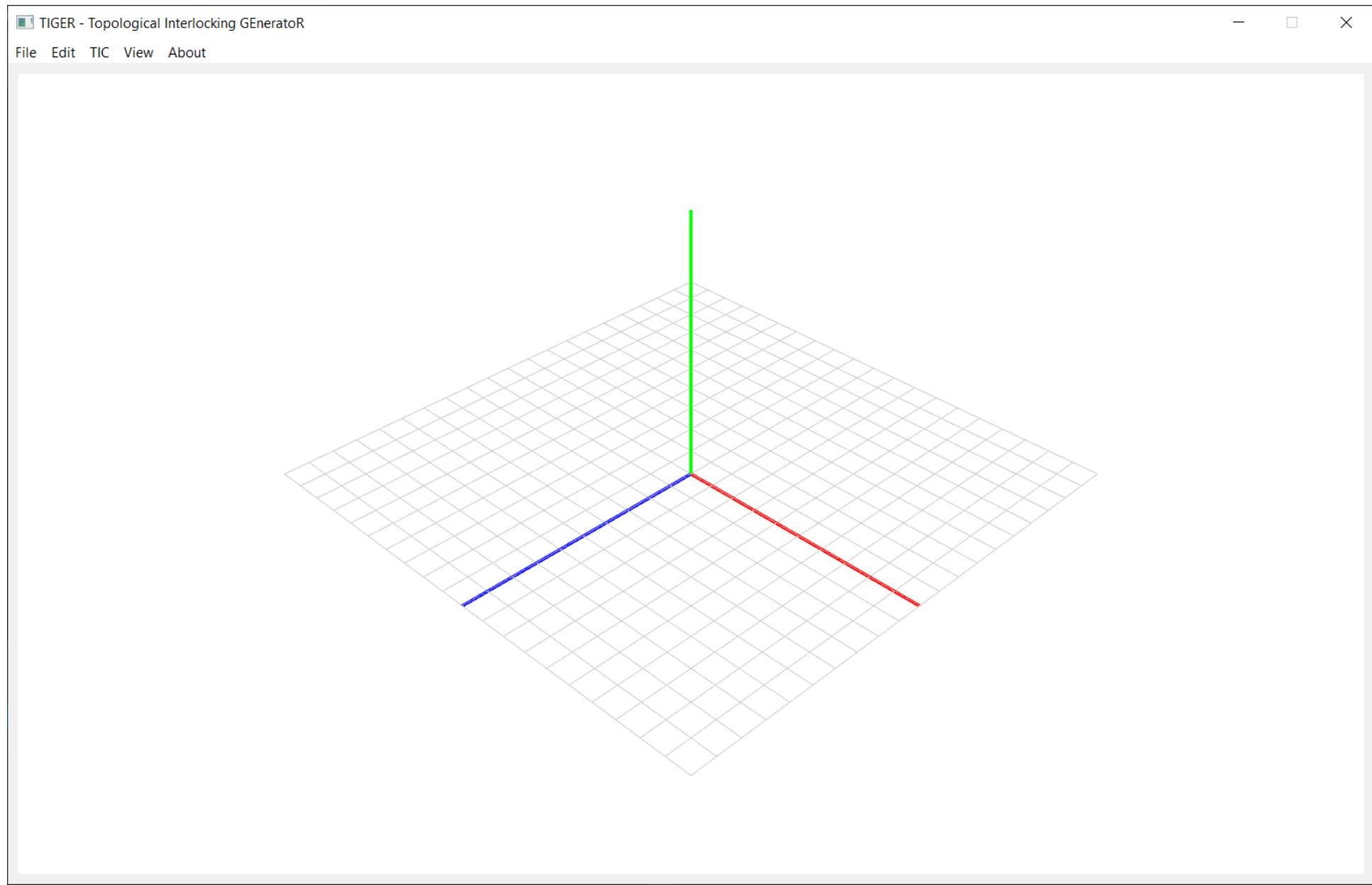
Late 2000s – Today

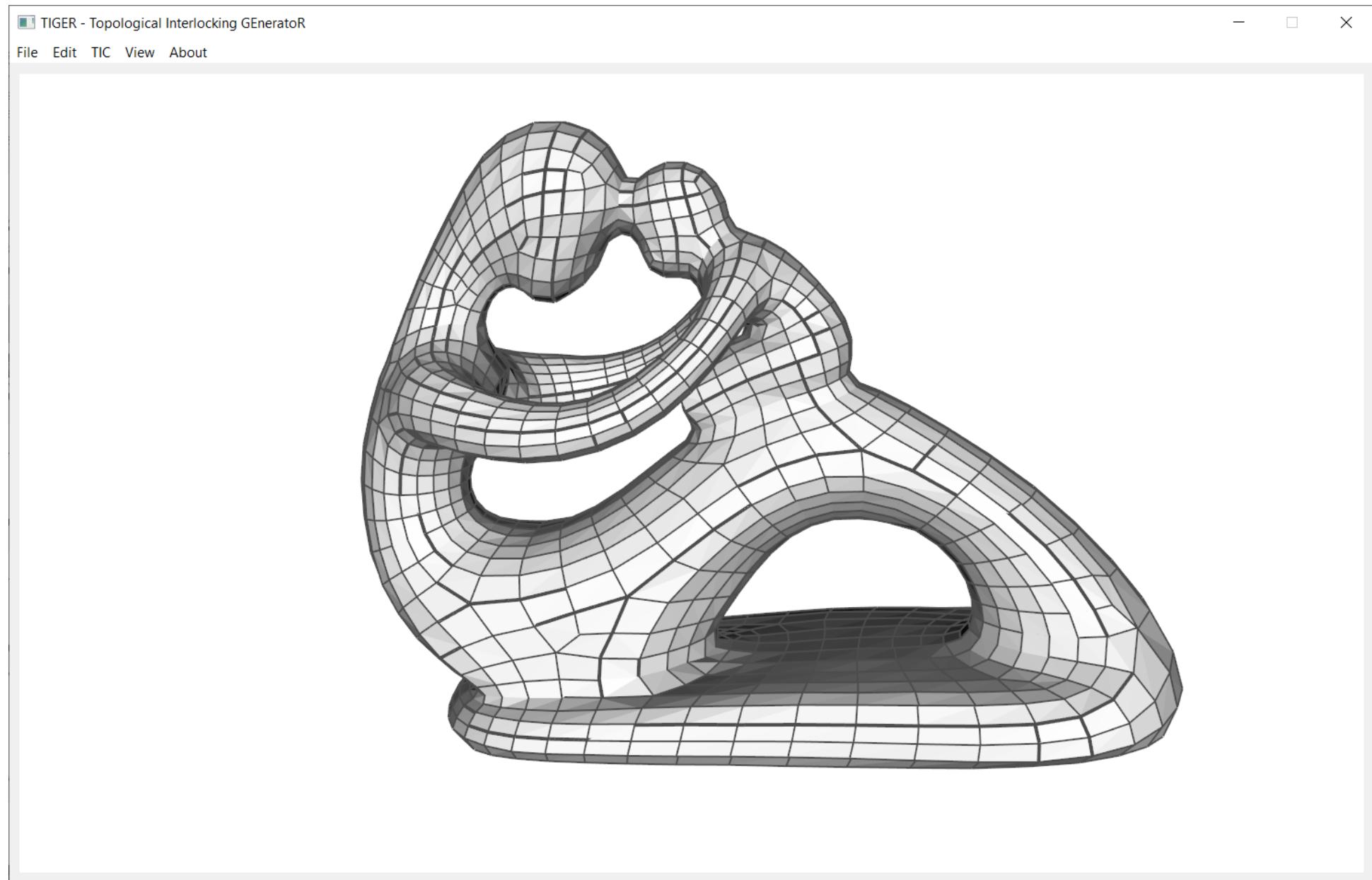
Motivation

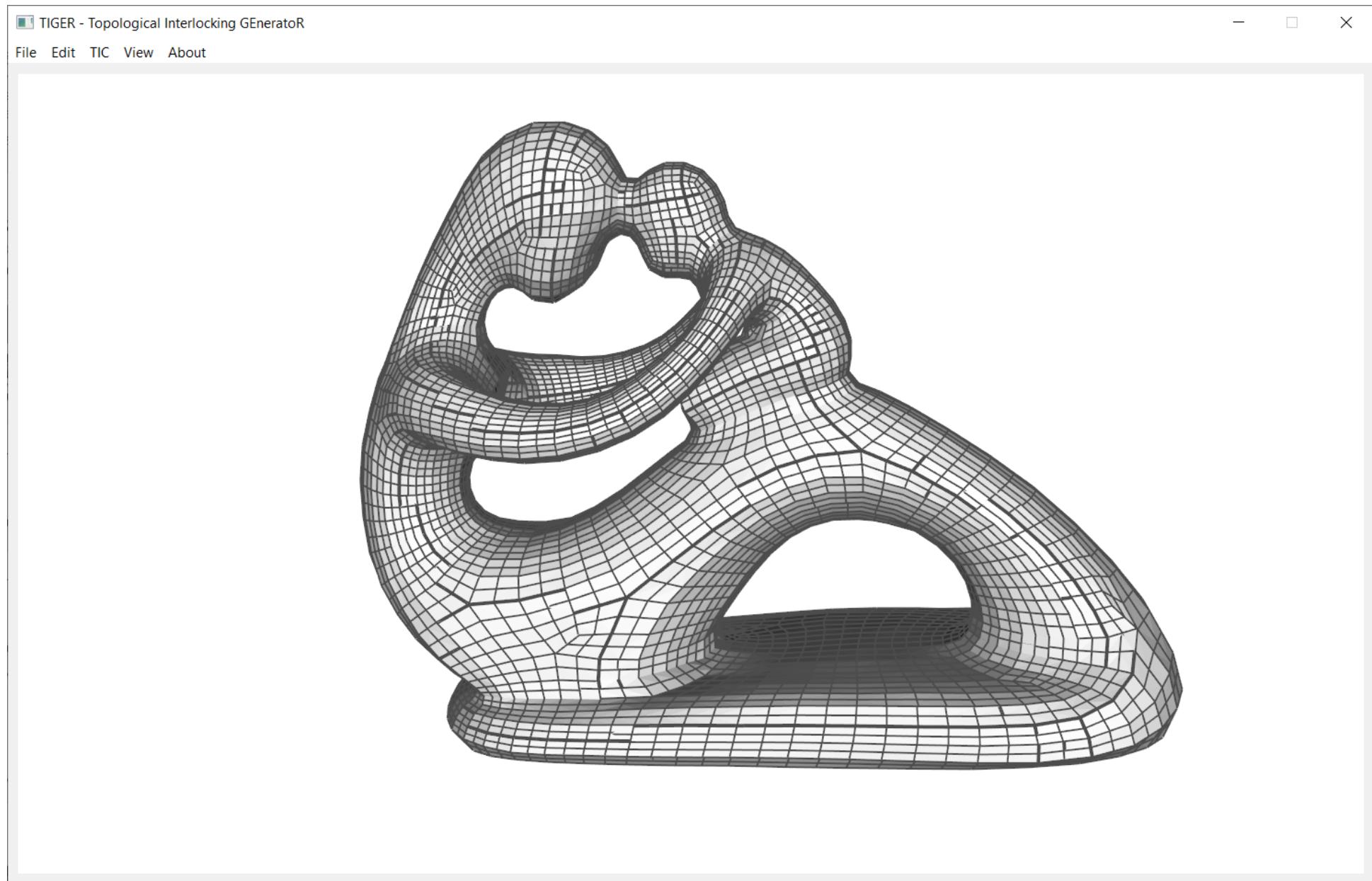


Enter TIGER

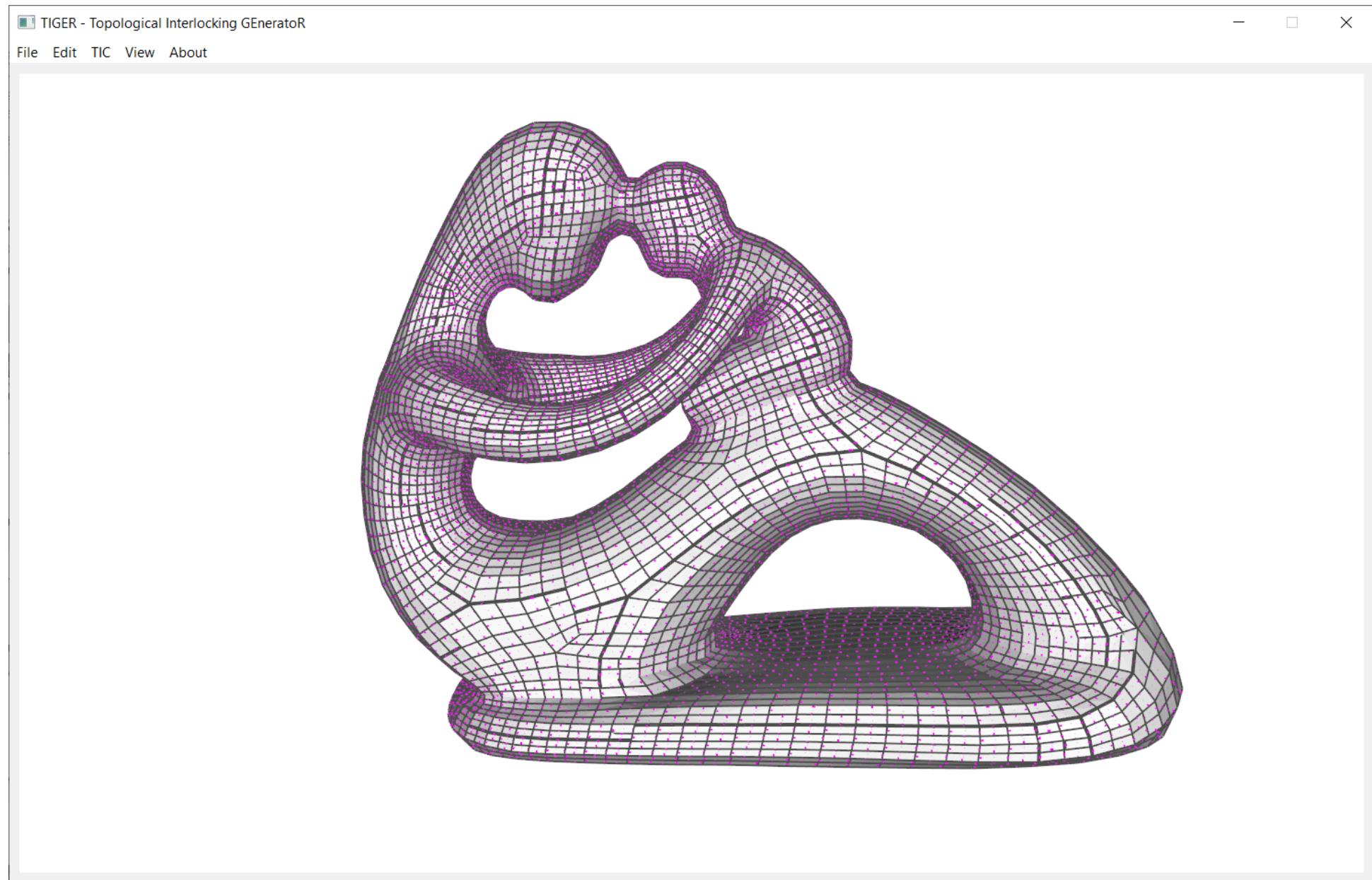
- 
- The diagram consists of three blue circles arranged vertically. A horizontal line connects the top of the first circle to the center of the second, and another horizontal line connects the top of the second circle to the center of the third. To the left of each circle is a white number: '1' for the top circle, '2' for the middle, and '3' for the bottom. To the right of each circle is a descriptive text item.
- 1 Desktop application to design TICs
 - 2 Basic geometry editing
 - 3 Static Equilibrium Analysis

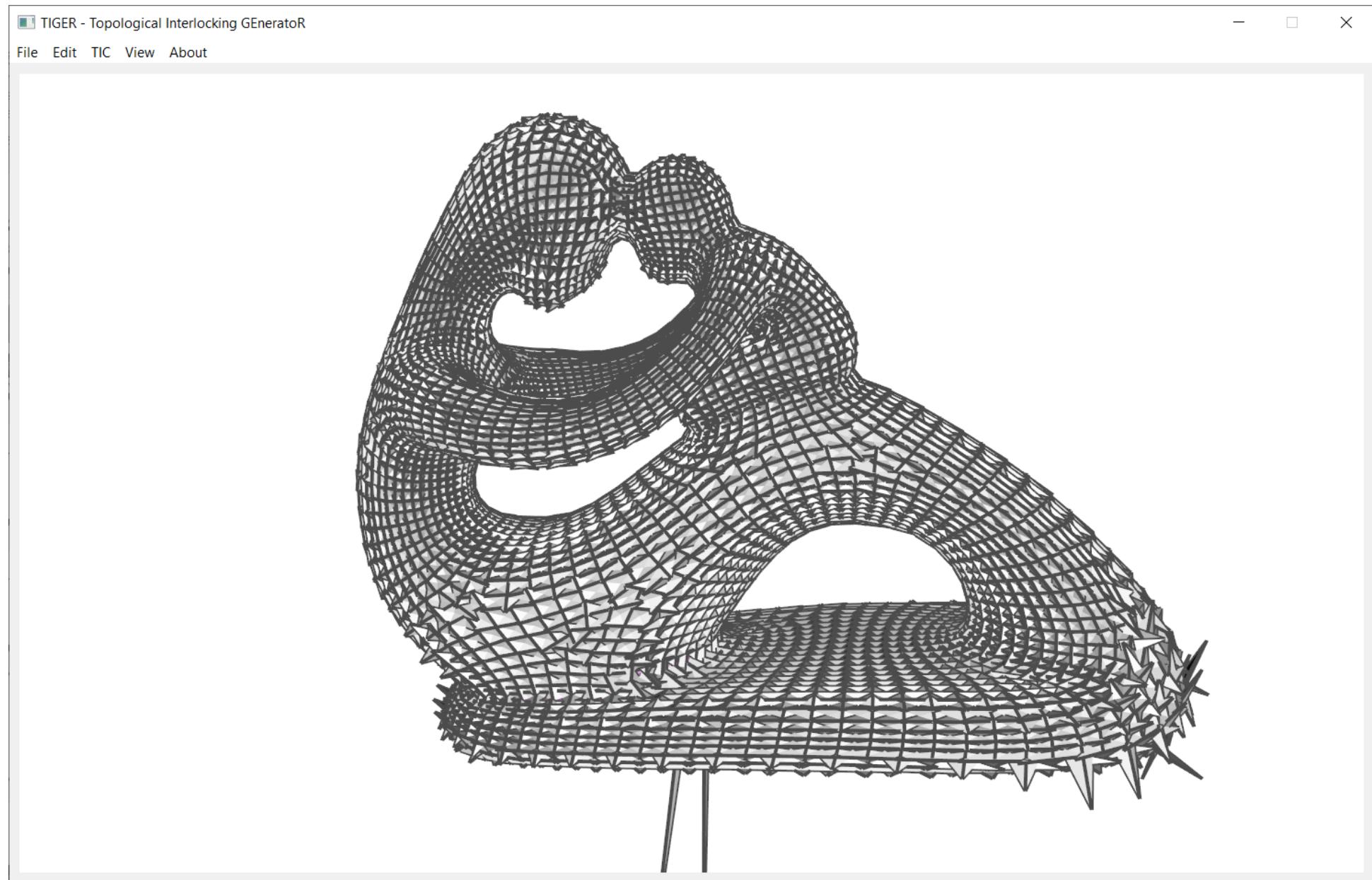


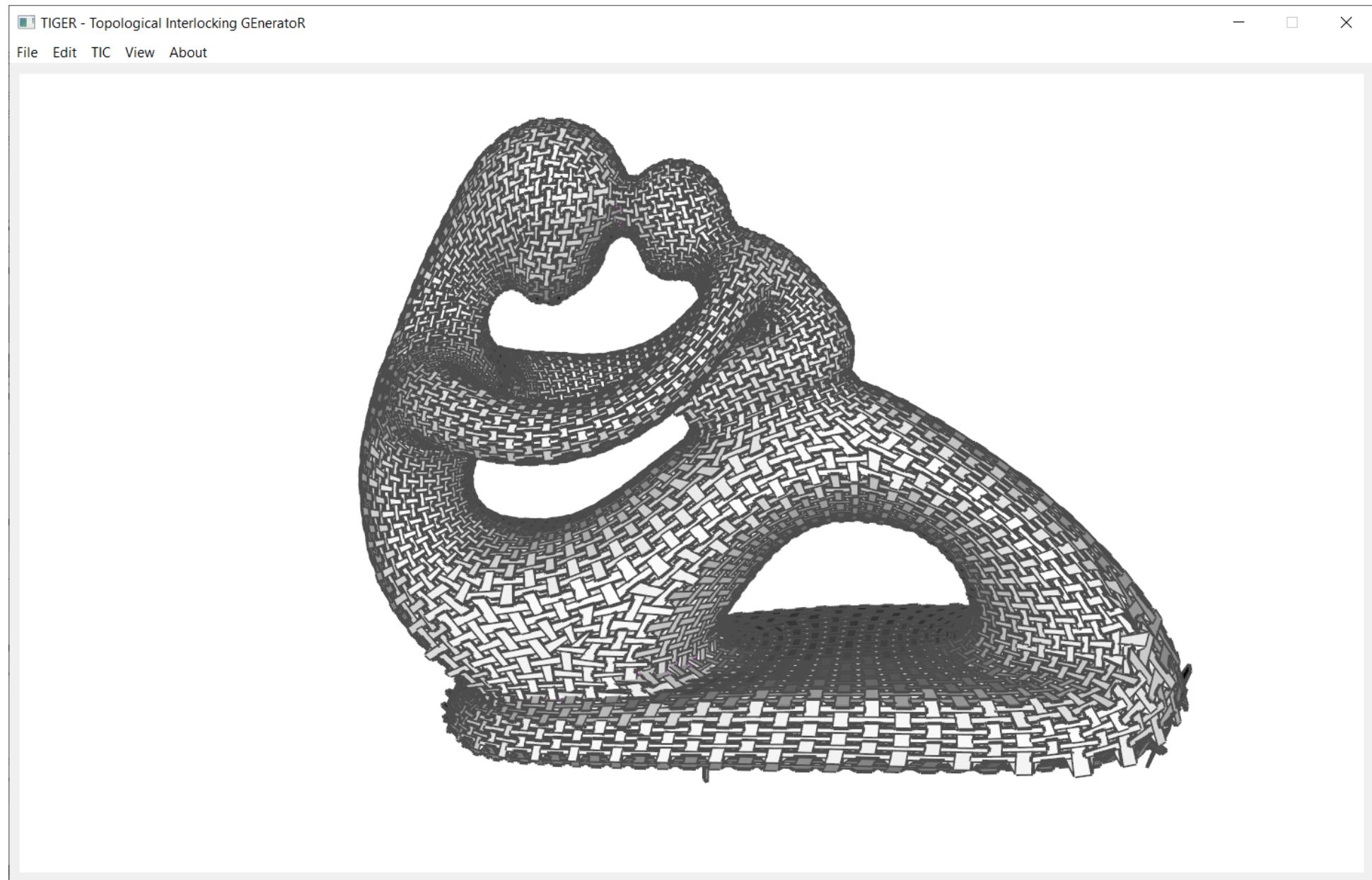




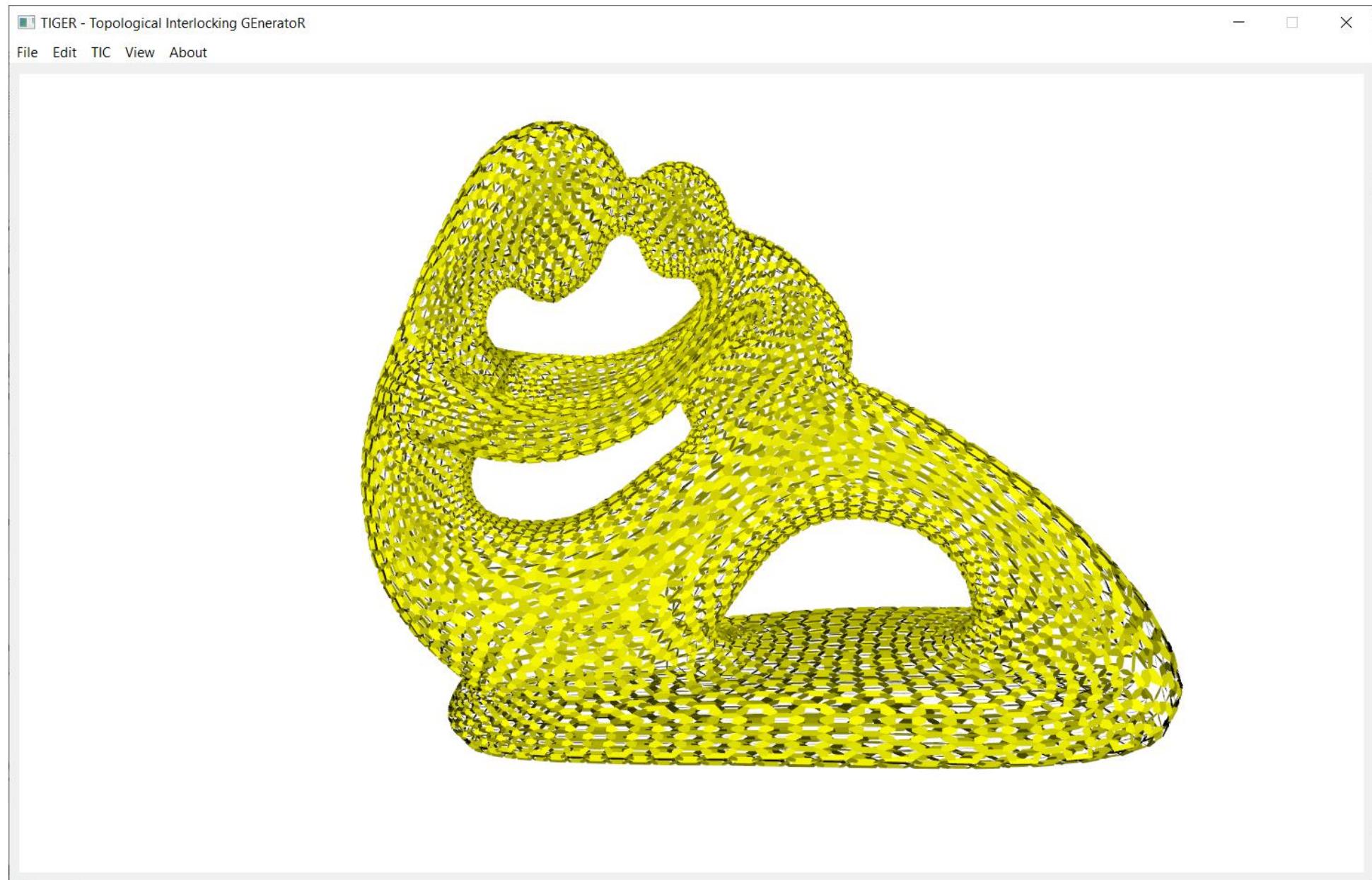
Subdivided geometric domain into quadrilaterals (5611 vertices, 8992 faces)

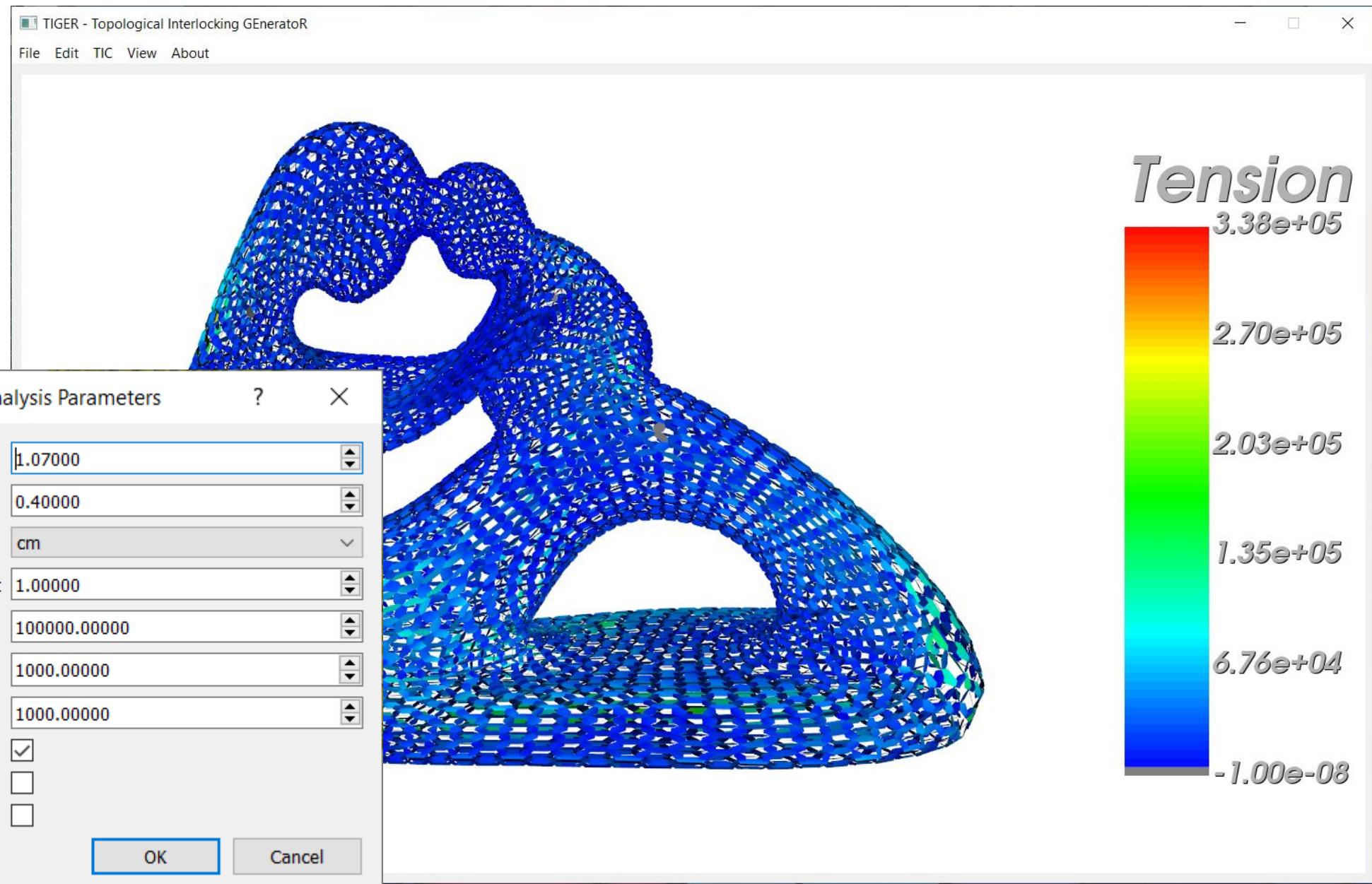


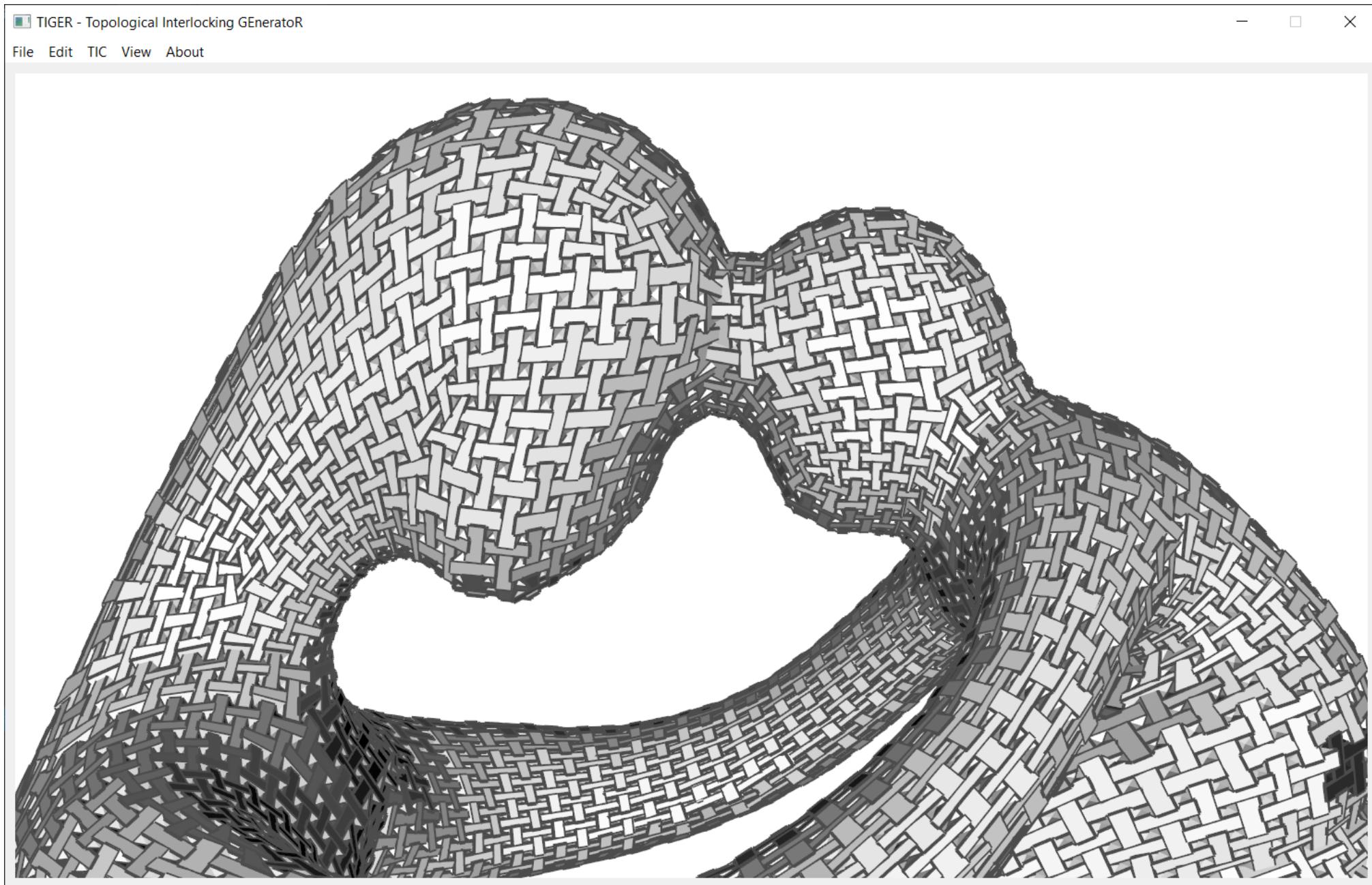




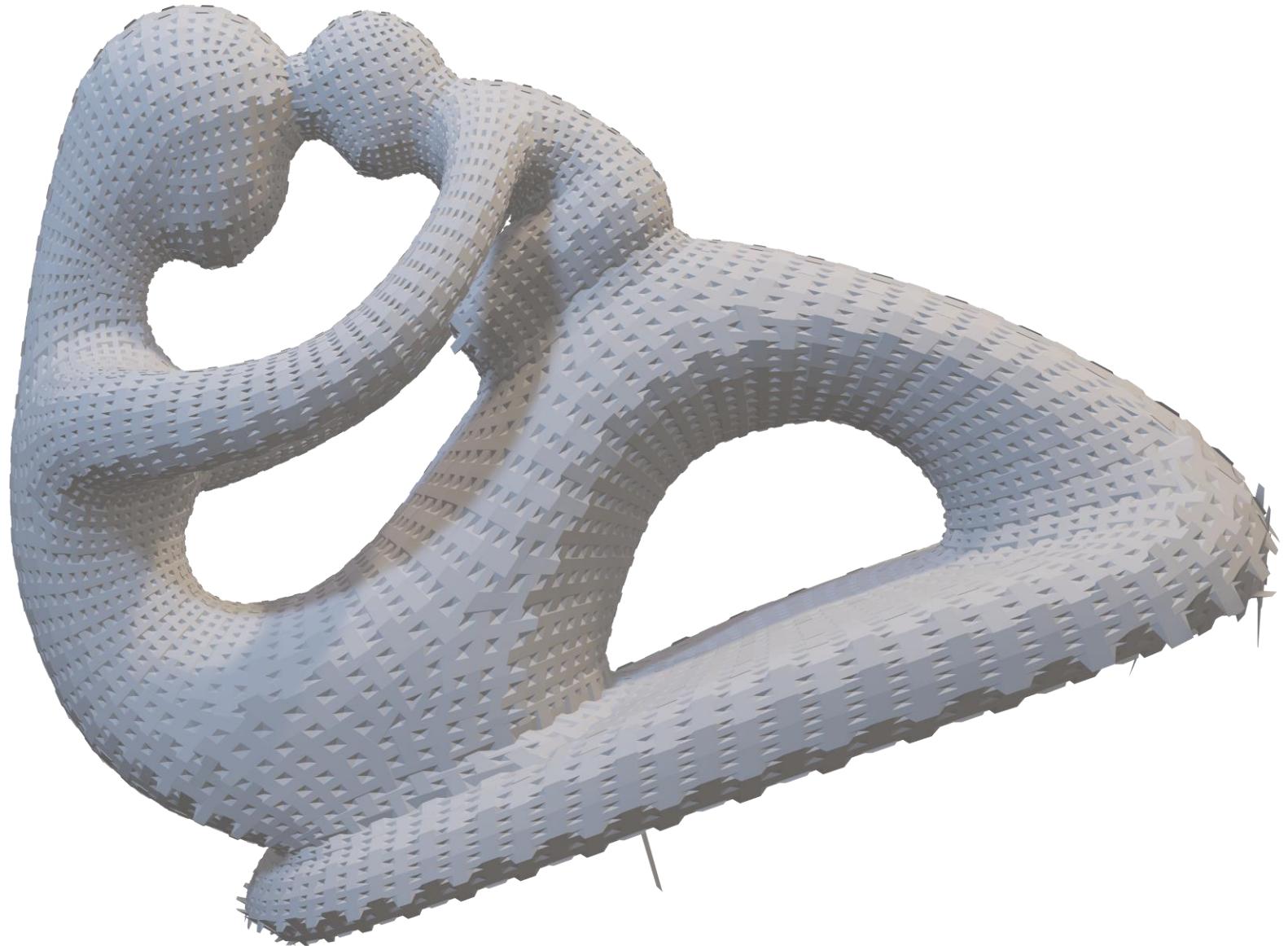
Clip blocks to remove overlapping and improve alignment (8992 blocks)

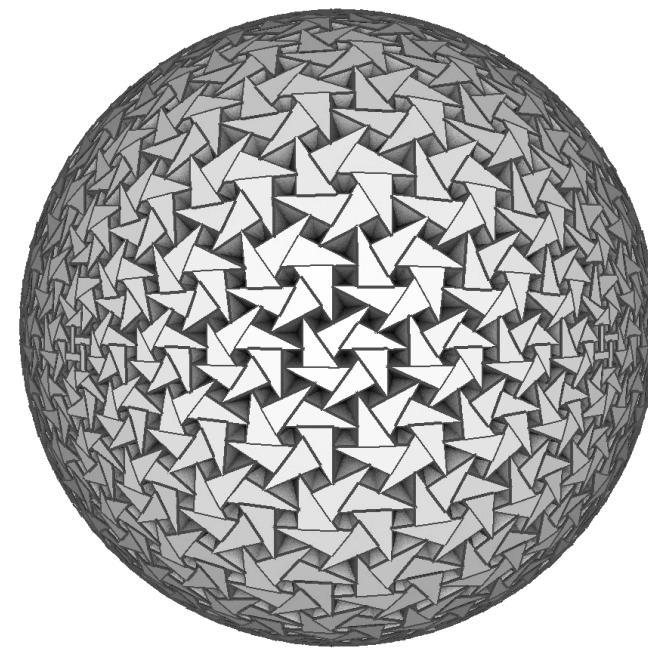
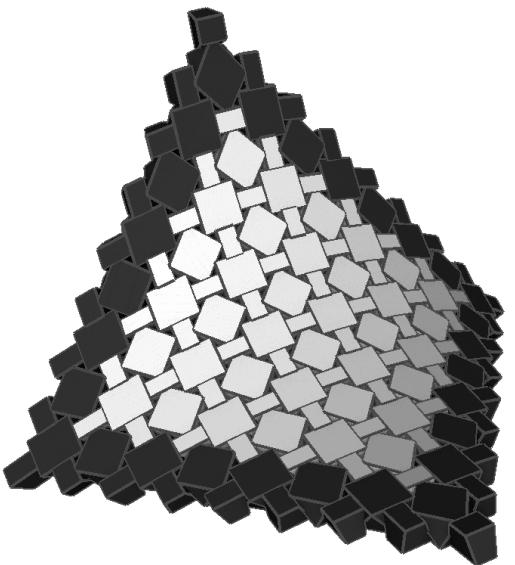
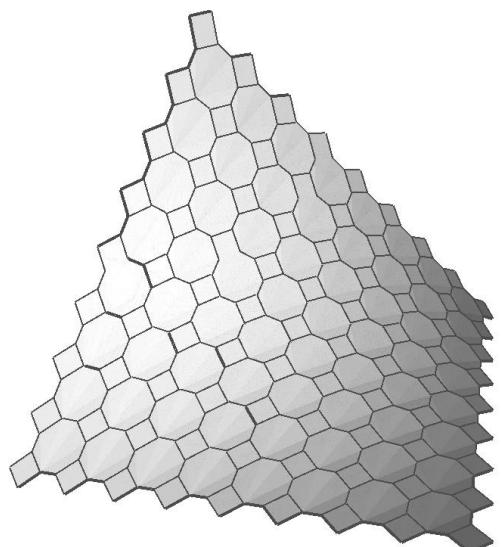
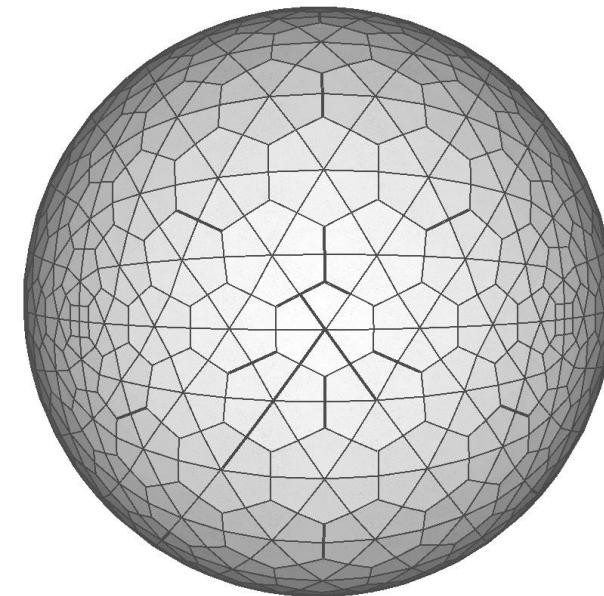
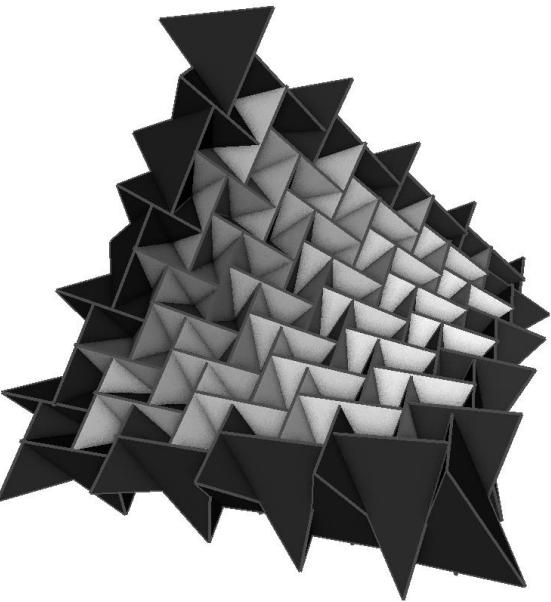
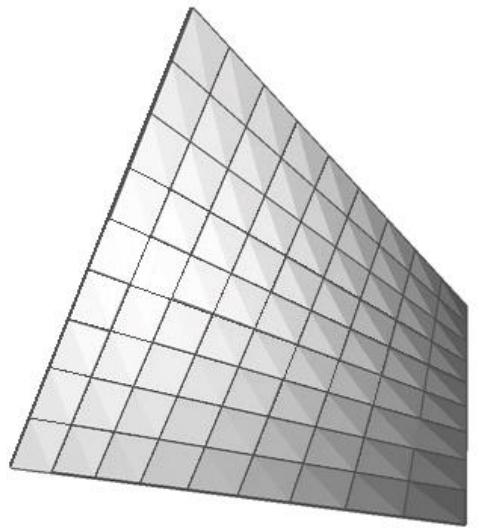


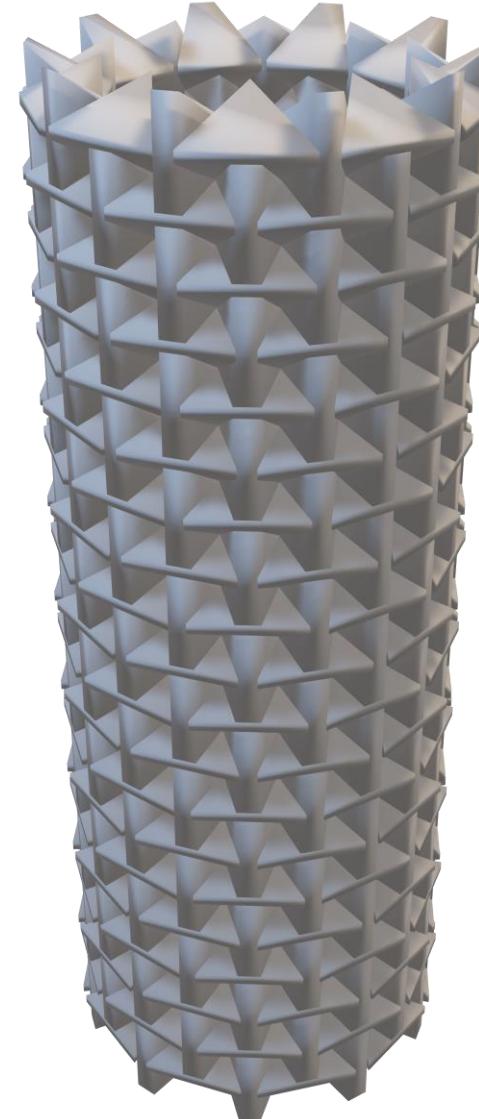
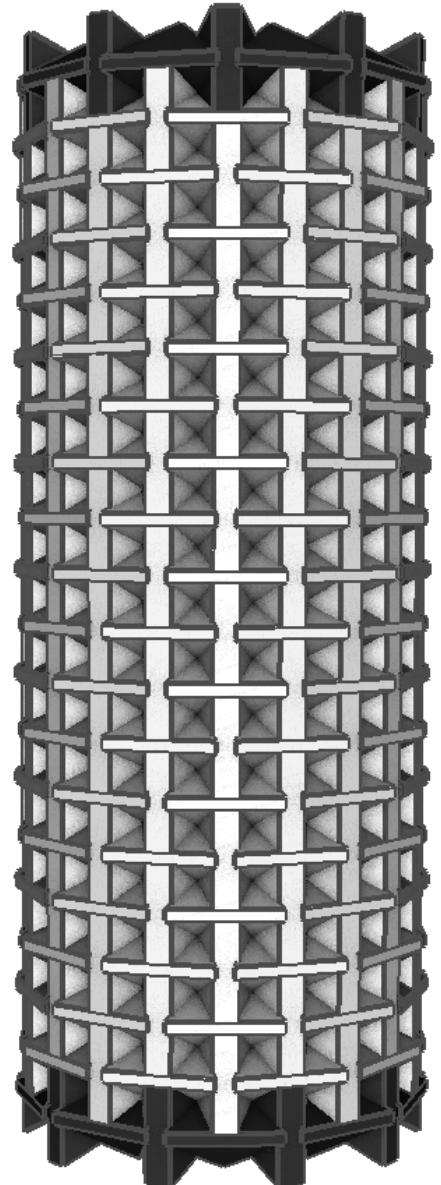




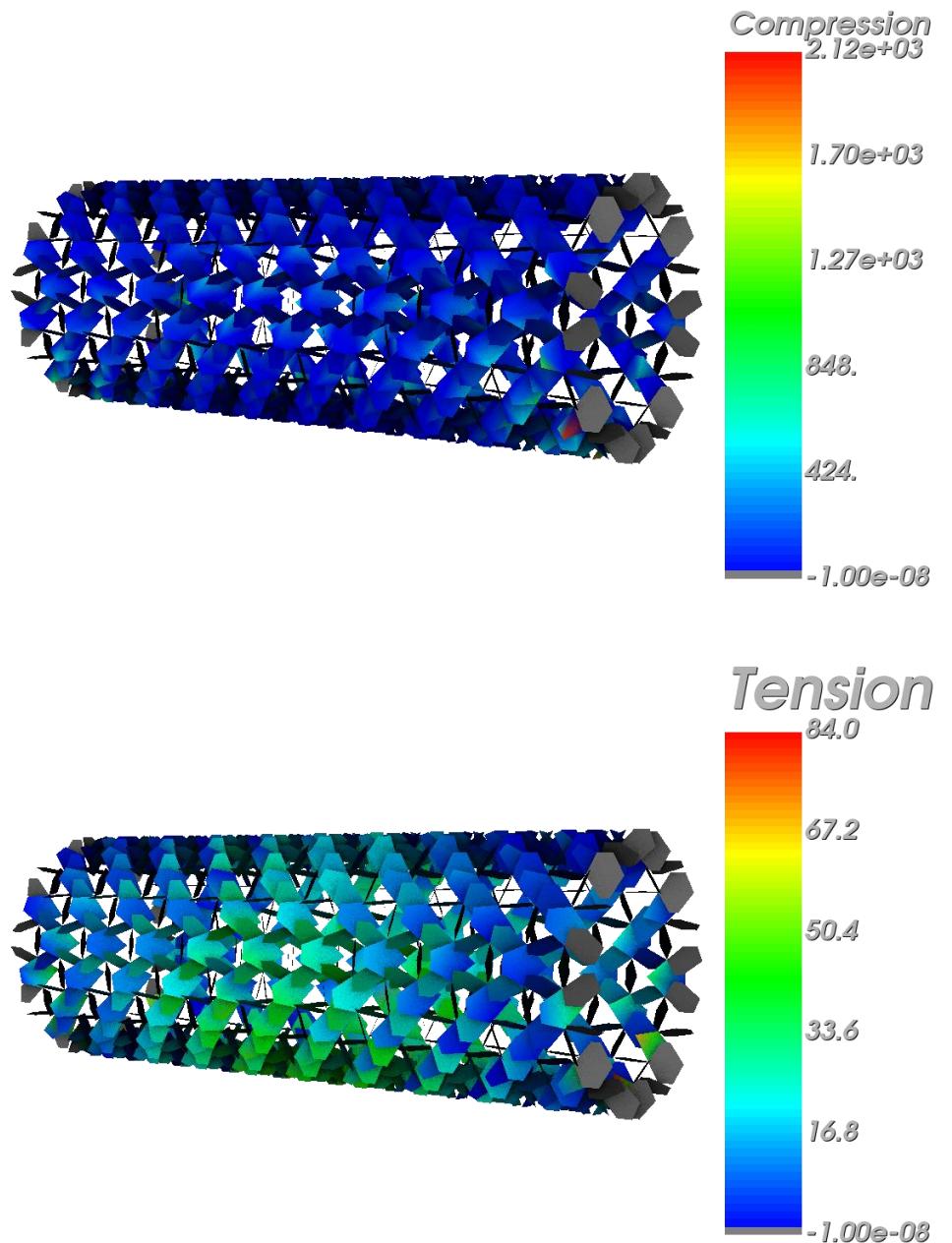
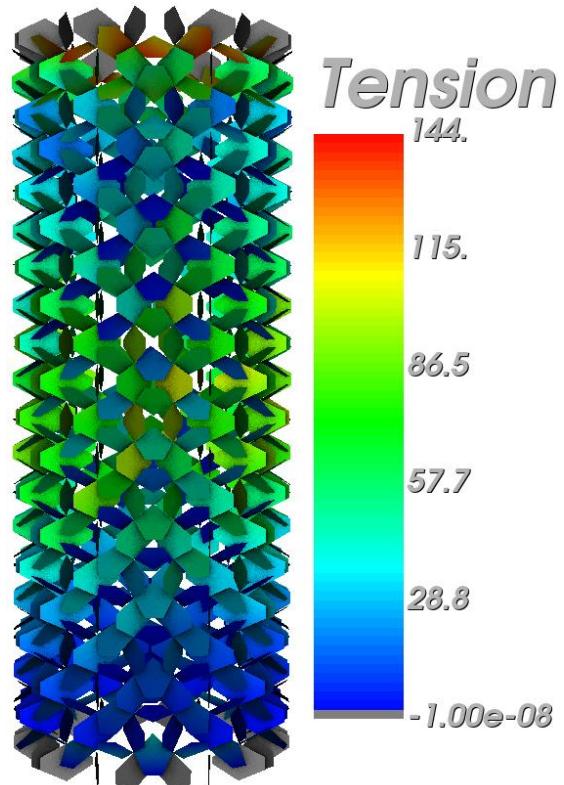
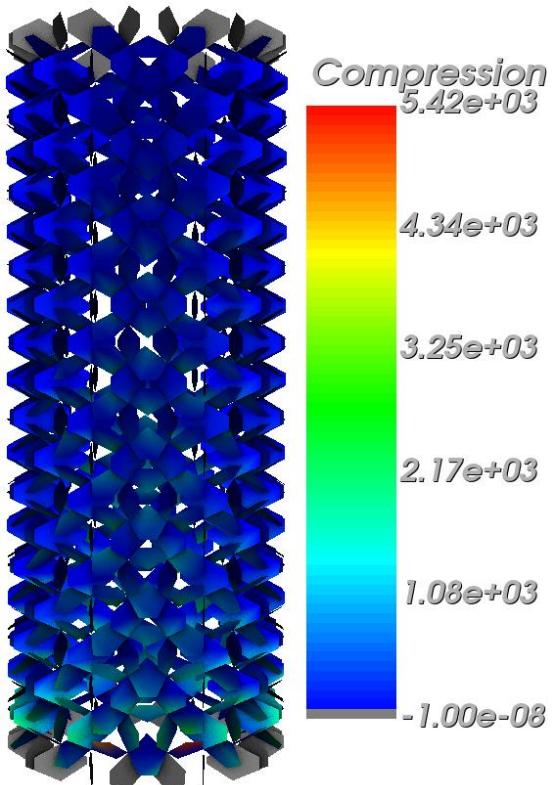
High detailed blocks on convex and concave sections of the geometric domain



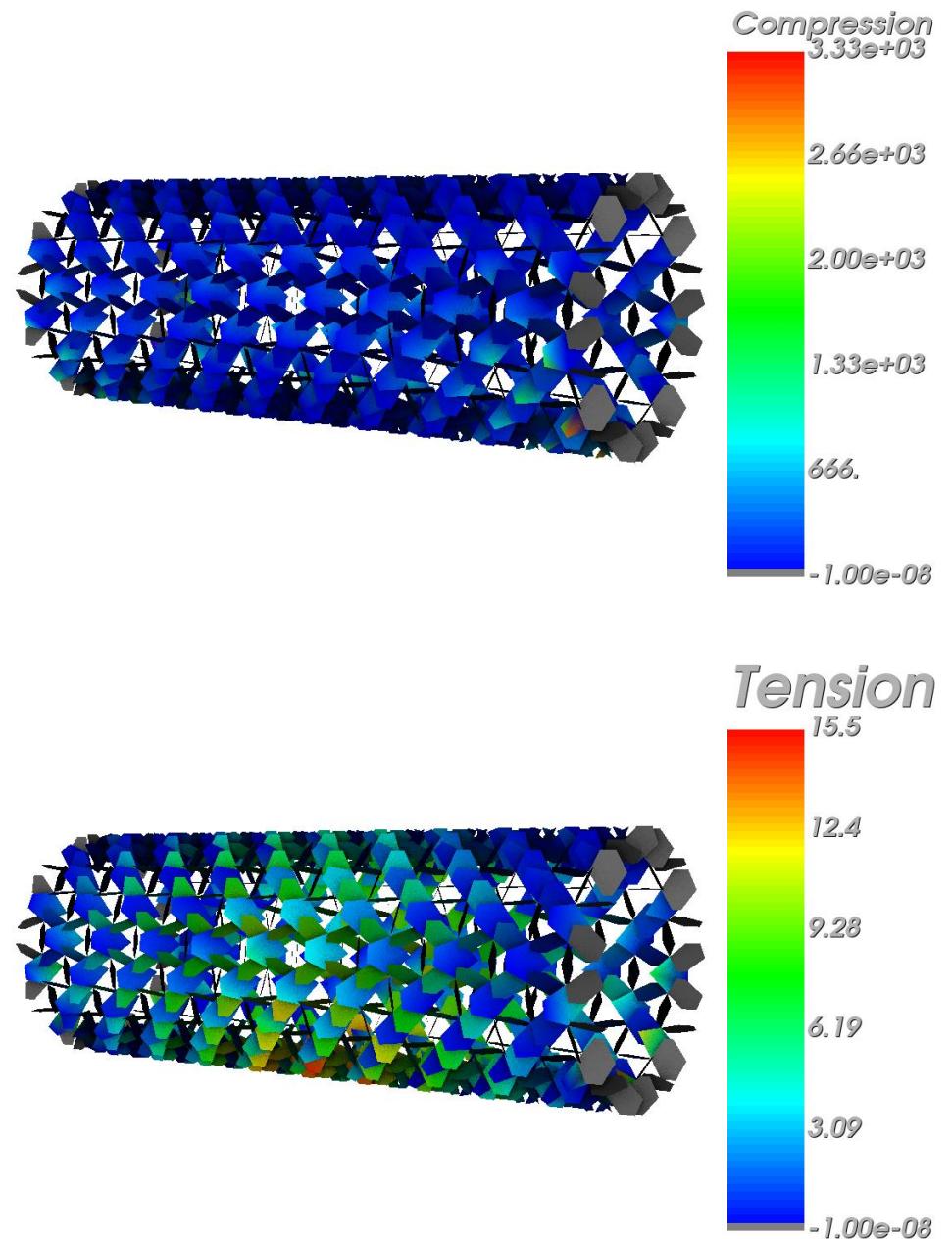
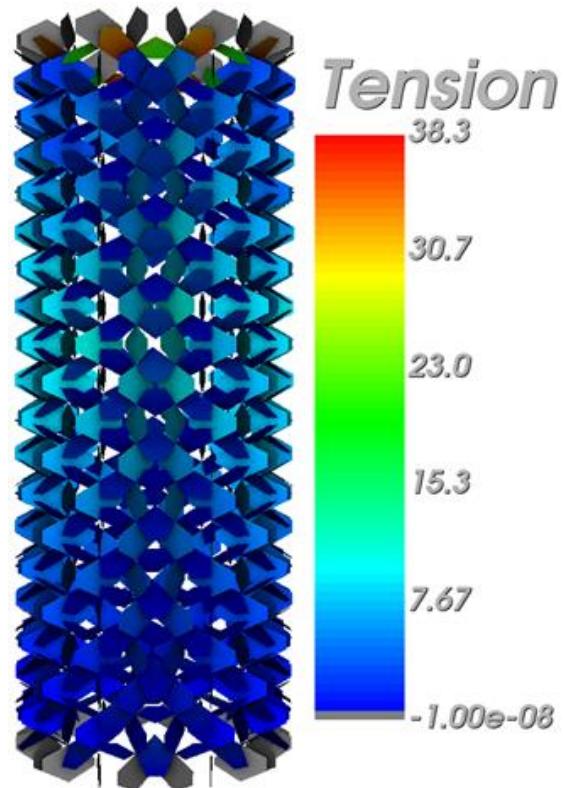
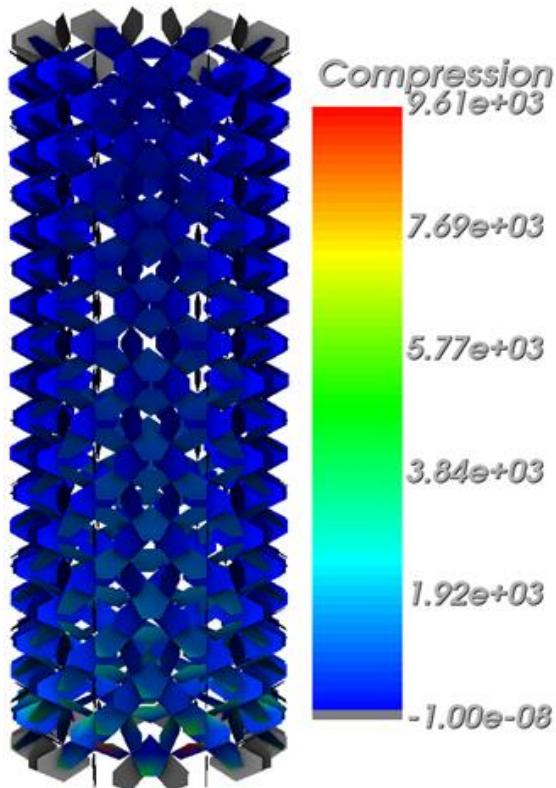


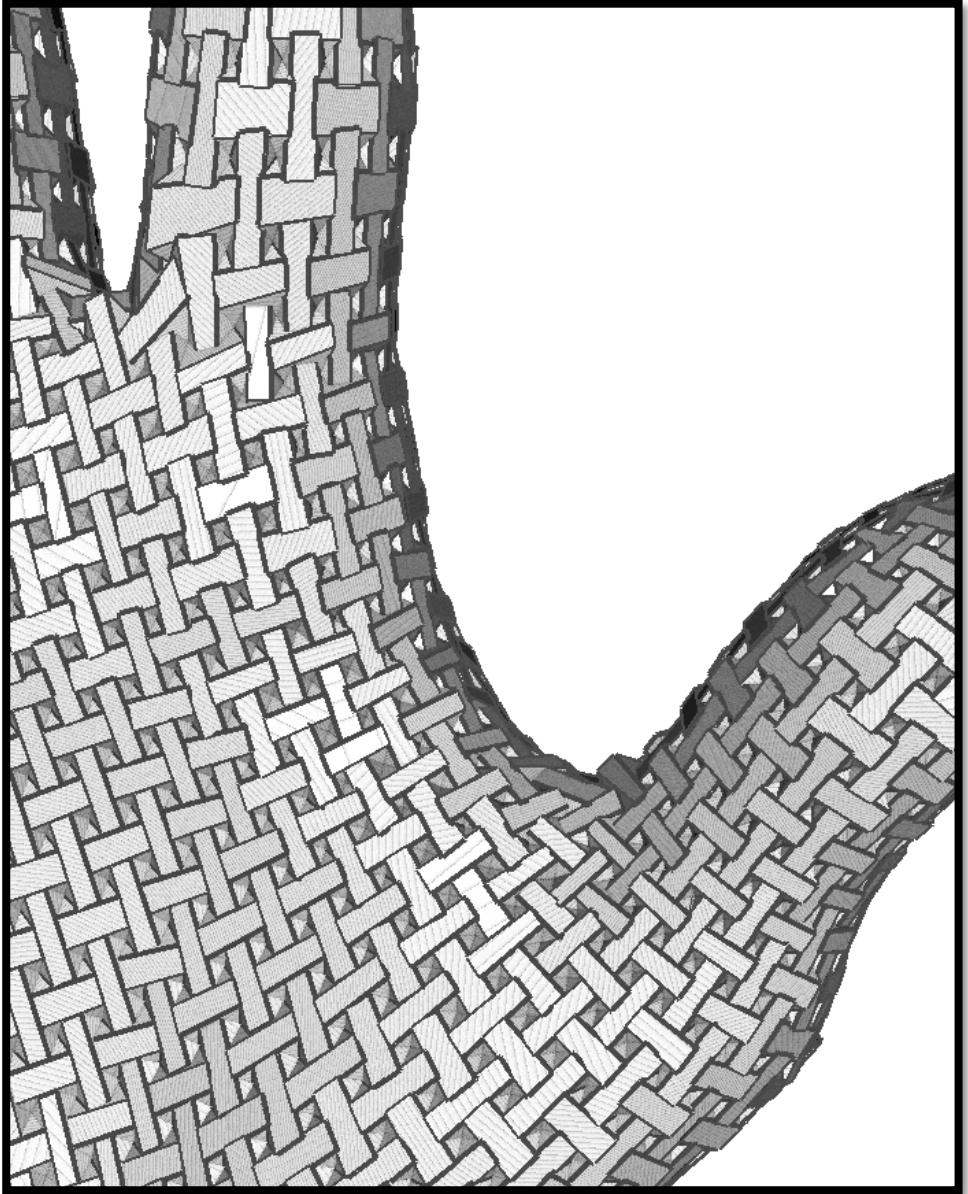


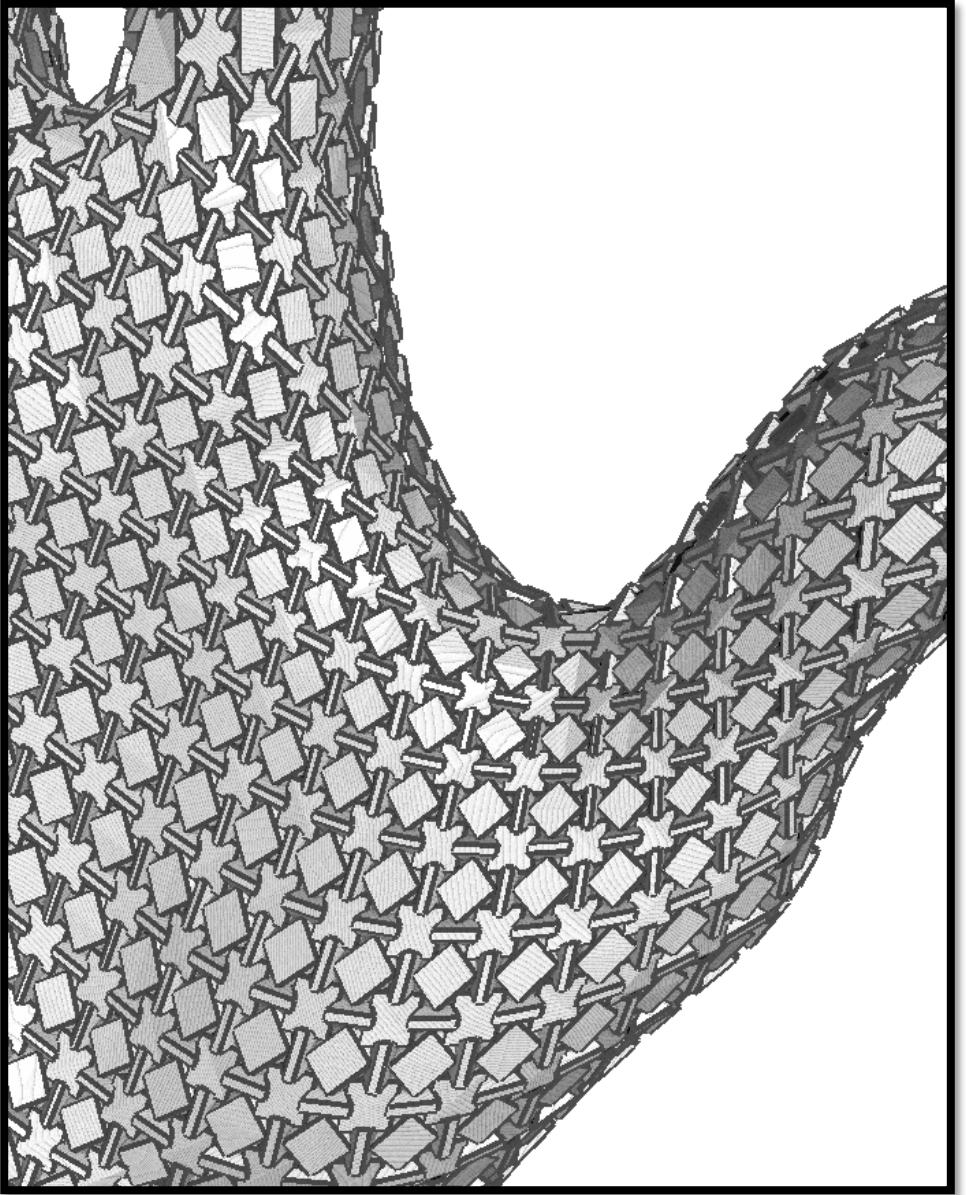
Cylinder: ABS Plastic

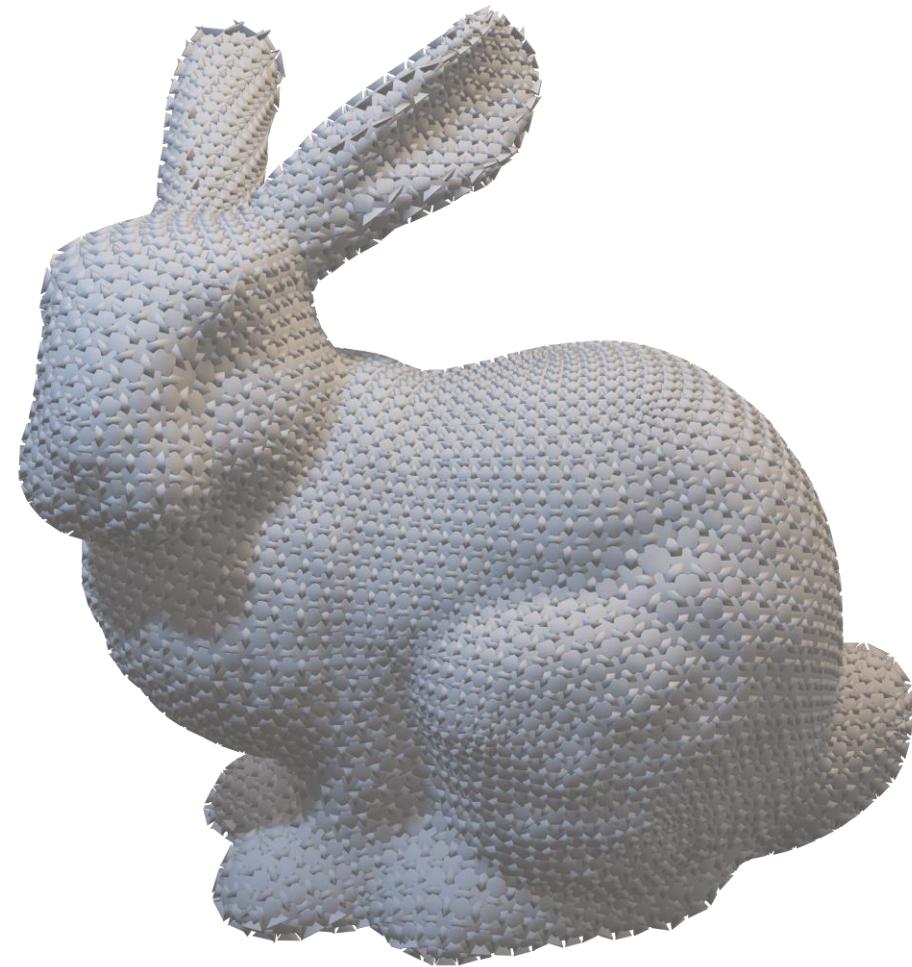
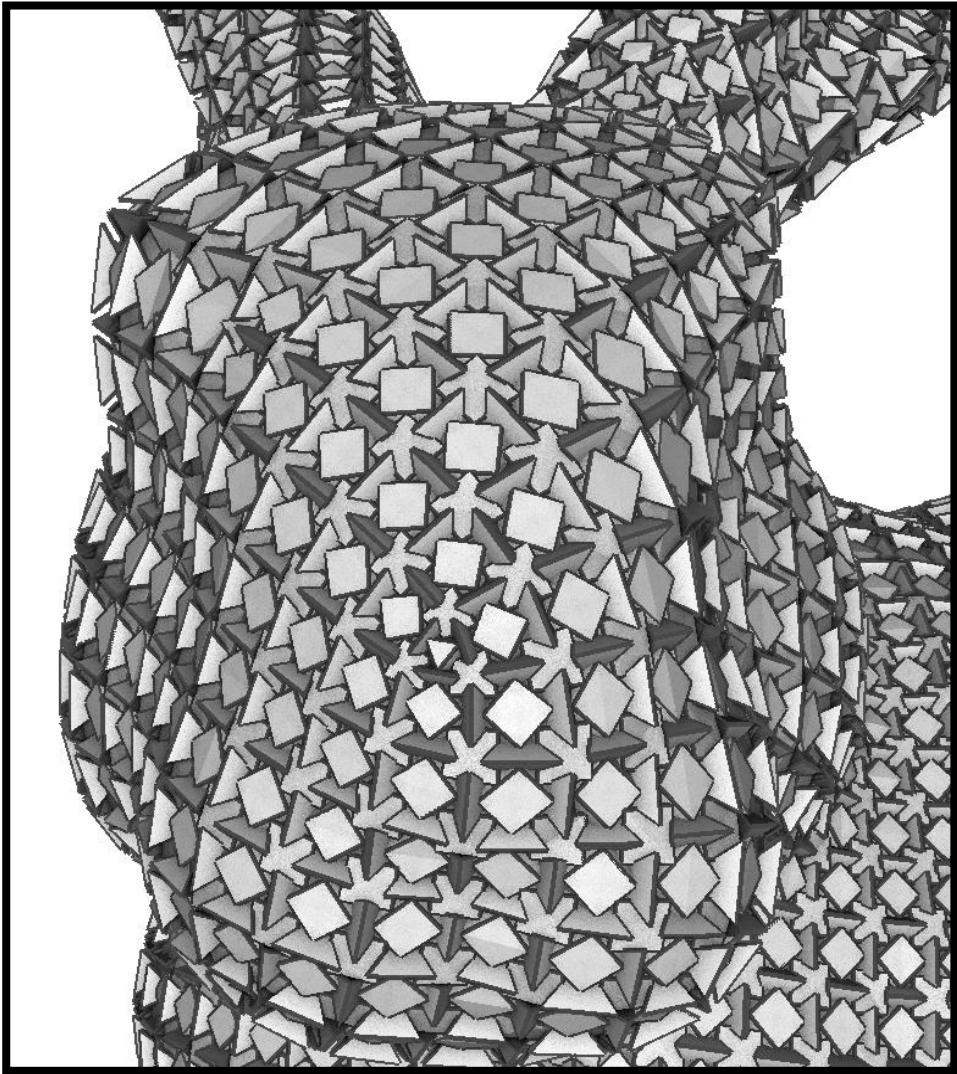


Cylinder: Masonry

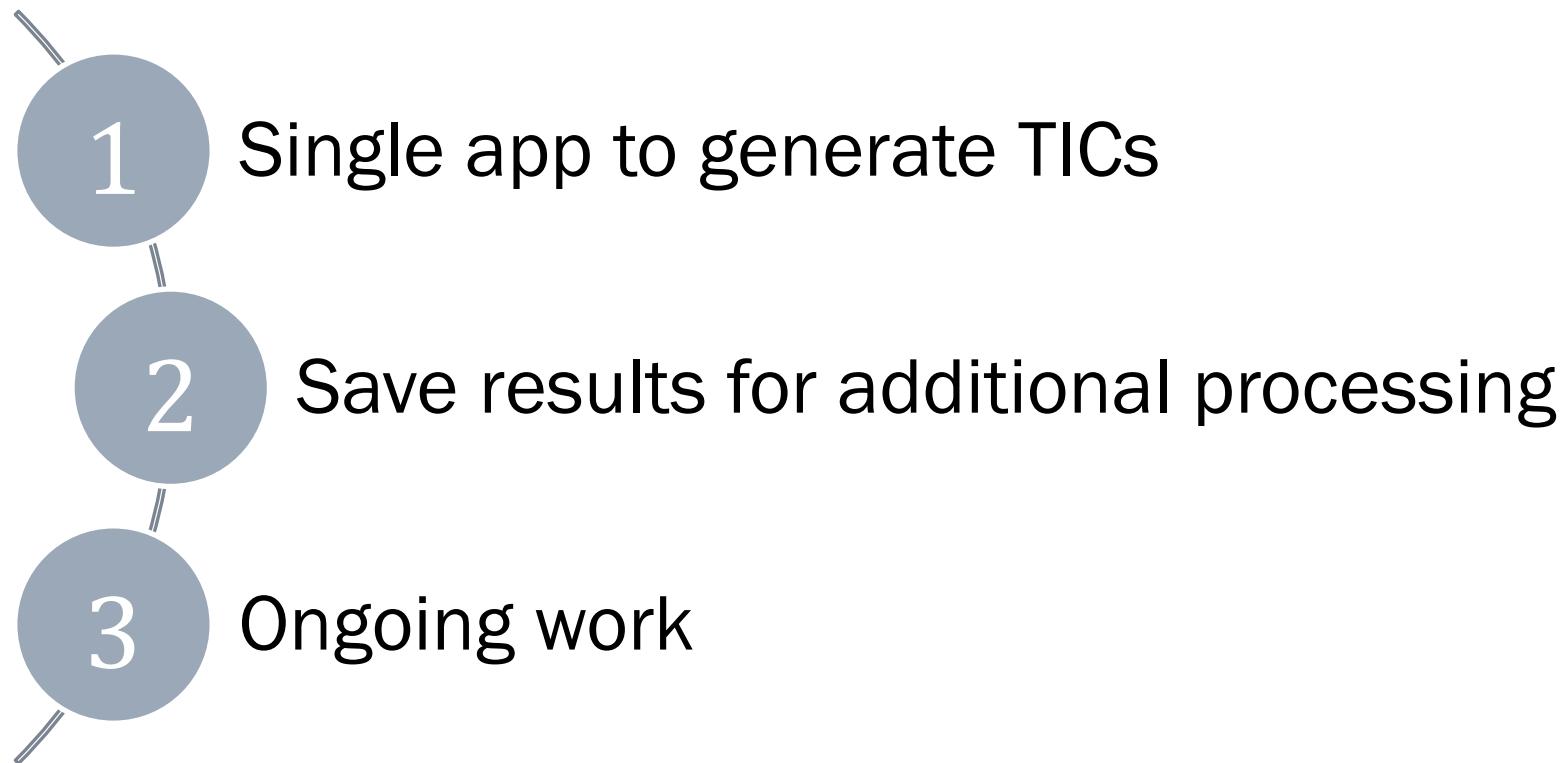








Conclusion

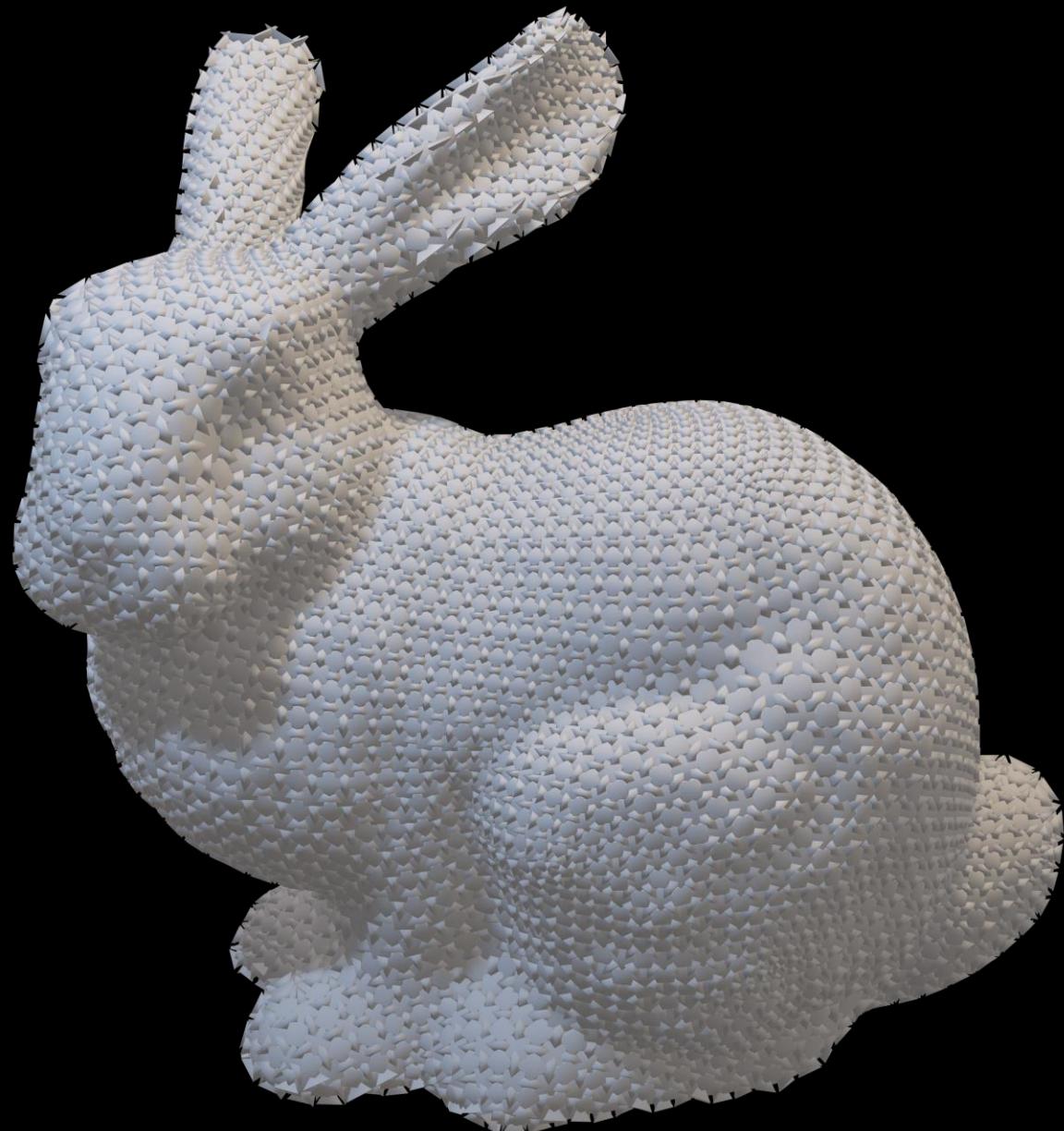
- 
- 1 Single app to generate TICs
 - 2 Save results for additional processing
 - 3 Ongoing work

Thank You!

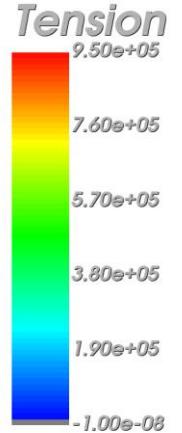
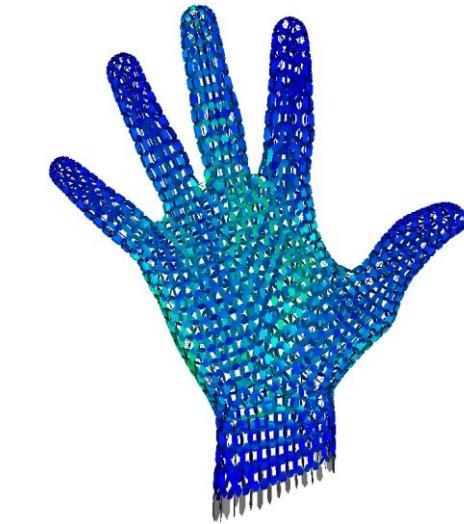
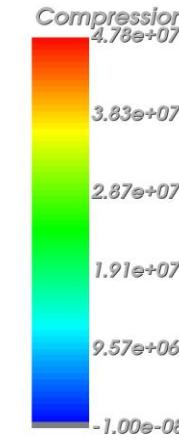
✉ abejara@purdue.edu

🐦 @andresbeja87

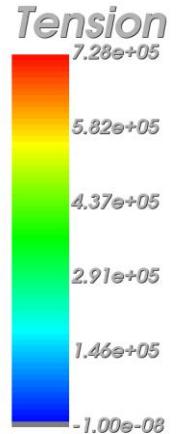
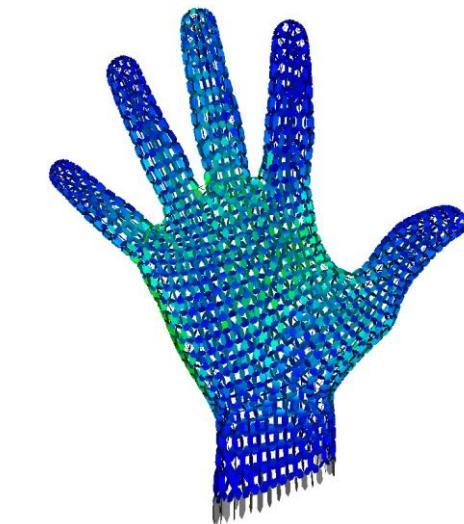
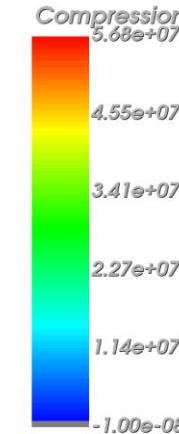
🌐 <http://andresbejarano.name>



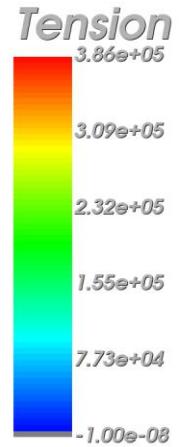
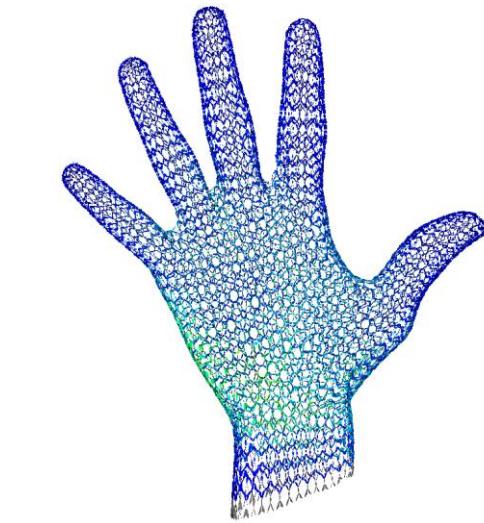
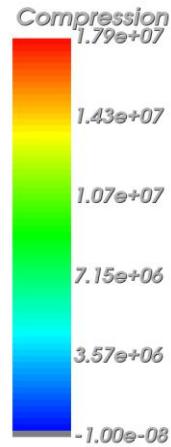
ABS Plastic



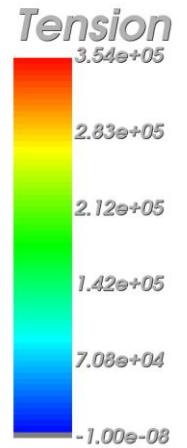
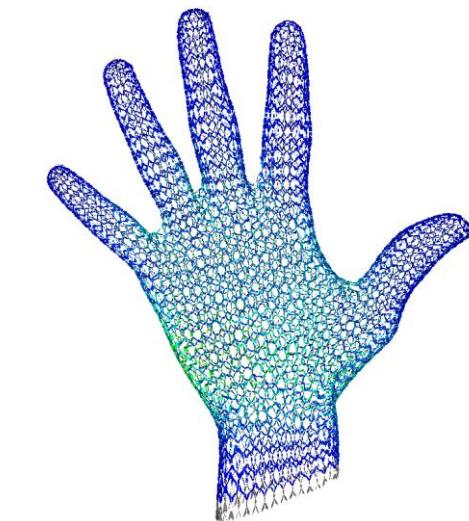
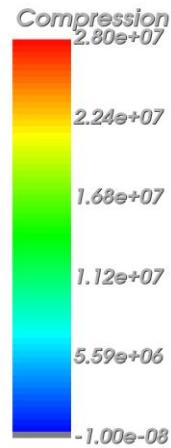
Masonry



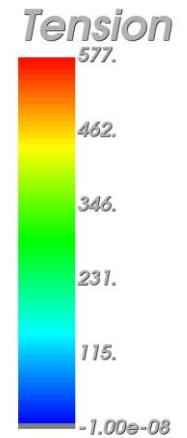
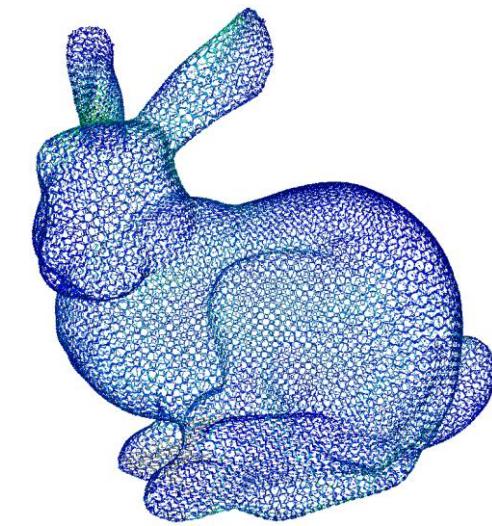
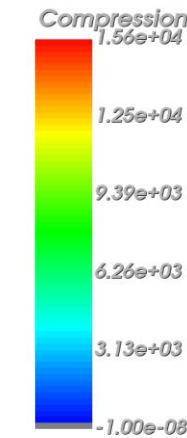
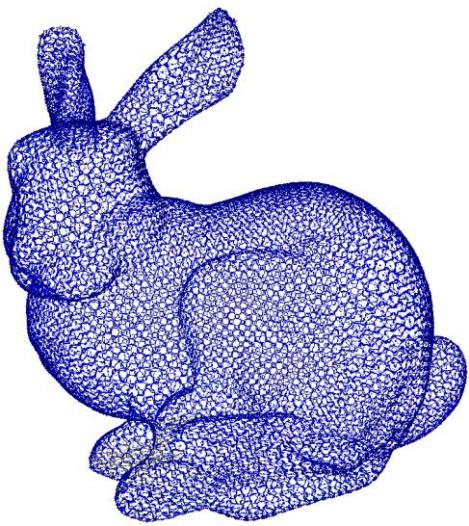
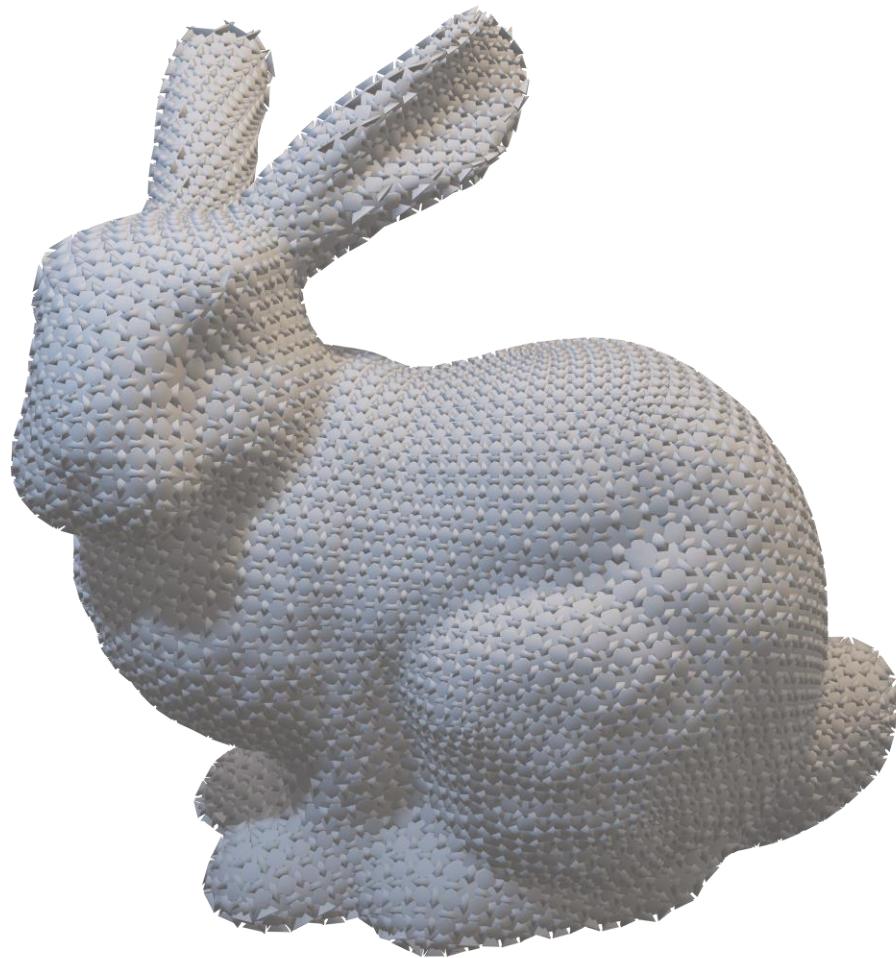
ABS Plastic



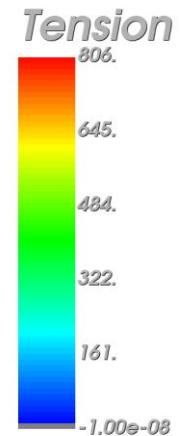
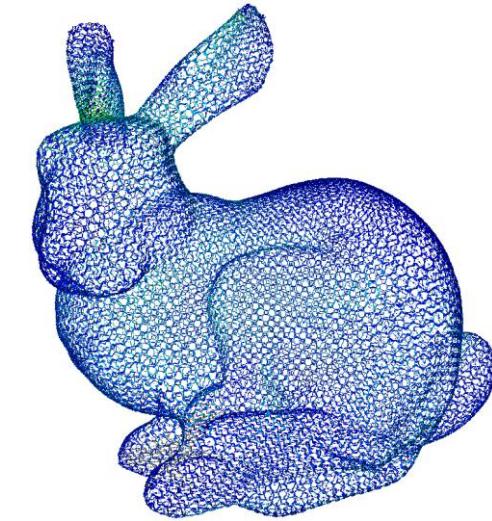
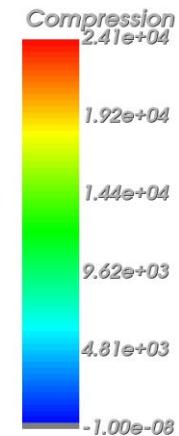
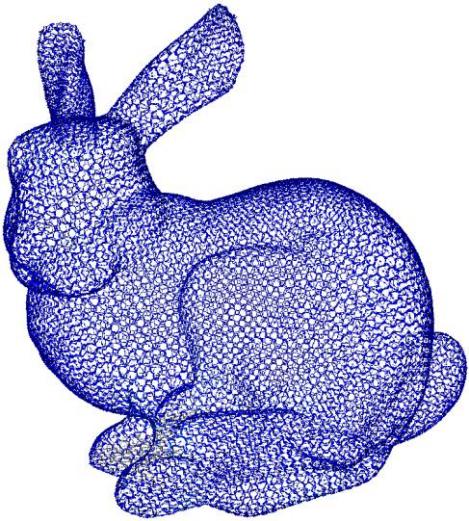
Masonry



ABS Plastic



Masonry



Material	Density ρ	Static Friction μ
ABS Plastic	1.07 g/cm ³	0.4
Masonry	2.1 g/cm ³	0.7

Shape	Tiles	#Blocks	#Intfs.	Material	#Iters.	Dur. (s)
Planar	Squares	81	144	ABS Plastic	16	0.09
Planar	Squares	81	144	Masonry	15	0.07
Planar	Archimedean	145	368	ABS Plastic	17	0.15
Planar	Archimedean	145	368	Masonry	17	0.14
Saddle	Quads	81	144	ABS Plastic	15	0.08
Saddle	Quads	81	144	Masonry	16	0.13
Saddle	Archimedean	145	368	ABS Plastic	17	0.20
Saddle	Archimedean	145	368	Masonry	17	0.19
Cyl. (V)	Squares	400	780	ABS Plastic	57	1.49
Cyl. (V)	Squares	400	780	Masonry	42	0.87
Cyl. (H)	Squares	400	780	ABS Plastic	54	1.44
Cyl. (H)	Squares	400	780	Masonry	45	1.00
Sphere	Quads	1536	3072	ABS Plastic	48	5.72
Sphere	Quads	1536	3071	Masonry	52	11.30
Hand	Quads	2368	4715	ABS Plastic	114	22.86
Hand	Quads	2368	4715	Masonry	90	18.63
Hand	Archimedean	4717	14068	ABS Plastic	124	50.62
Hand	Archimedean	4717	14068	Masonry	98	41.67
Bunny	Archimedean	13478	40420	ABS Plastic	85	129.05
Bunny	Archimedean	13478	40420	Masonry	85	126.26