Hexahedral Meshing with Varying Element Sizes
Supplemental material

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1 Models in our experiments

The following figures provide additional results of our method. Each figure shows the results of a model. The seven sub-images (from top to bottom, left to the right) in each figure correspond to the original mesh (with the extracted skeleton and segmentation), the magnified mesh with the scaling factor for each ROI, the polycubes of the magnified mesh, the output hex-mesh with our method, the hex-mesh generated by the MeshGems [1] (i.e., the octree-based approach), and the corresponding base complex of our hex-mesh and MeshGems' hex-mesh, respectively. The red dots in the base complex visualizations are the corners of the hexahedral (or cuboid-like) components, and the cyan curves are the edges of the components. For the base complexes of those hex-meshes generated by the octree-based method, we do not show the corner points due to the excessive number of components. A detail statistics of all the generated hex-meshes can be found in Table 1.

References

[1] MESHGEMS: Volume meshing: Meshgems-hexa, 2015.

[2] HUANG J., JIANG T. F., SHI Z. Y., TONG Y. Y., BAO H. J., DESBRUN M.: l1-based construction of polycube maps from complex shapes. *Acm Transactions on Graphics (Proceedings of SIGGRAPH 2014) 33*, 3 (2014).

Table 1: Statistics of the resultant hex-meshes. * denote the hex-meshes obtained using the original ℓ_1-polycube [2]. ^{o} shows meshes generated by the octree-base method [1]. #Tet and #Tri are the numbers of tetrahedra and triangles in the input meshes, respectively. #Seg is number of the segments of each model. #Scal is the maximum scaling factor for the magnification. #Sin is the number of singularities. #Com is the number of components in the base-complex. MSJ/ASJ represents the minimum and average scaled Jacobian, respectively. H Dis denotes the Hausdorff distance from the boundary of the hex-mesh to the input surface (‰ of the diameter of the bounding box of each model). S Time, P time and H time show the timing for segmentation, ℓ_1-polycube construction, and hex-mesh extraction. All timing information is obtained in a workstation with Intel(R) Xeon(R) CPU E5-1620 v2 @3.70GHz and 48GB Memory @1866MHz.

Model	#Tet	#Tri	#Seg	#Scal	#Sin	#Com	#Hex	MSJ / ASJ	H Dis	S Time	P Time	H Time
bumpycube	–	39936	–	–	60	121	16937	0.266/0.905	2.65	–	18m27s	16s
bumpycube^o	–	39936	–	–	3631	7516	7786	0.128/0.807	2.39	–	–	1.1s
bear	98548	14626	8	2.2	188	467	7697	0.443/0.918	3.13	1.3s	209m31s	55s
bear^o	98548	14626	–	–	21394	37754	37818	0.160/0.804	2.26	–	–	1.2s
bear*	10912	4588	–	–	140	104	10700	0.470/0.935	2.43	–	1m53s	10s
bunny	24169	7098	3	2.0	60	77	14571	0.275/0.900	2.92	0.5s	6m27s	19s
bunny^o	24169	7098	–	–	46900	81556	81556	0.018/0.799	2.40	–	–	2.2
bunny*	169341	52302	–	–	190	273	37734	0.382/0.926	1.24	–	130s	–
chair	14163	7490	8	2.0	160	266	9659	0.274/0.918	1.81	0.6s	2m43s	50s
chair^o	14163	7490	–	–	12005	35223	41664	0.076/0.864	1.08	–	–	1.2s
elephant	119321	24806	9	1.8	526	5827	23002	0.242/0.887	1.51	1.9s	193m10s	110s
elephant^o	119321	24806	–	–	61248	100412	100412	0.015/0.800	0.90	–	–	2.3s
elephant*	132796	21414	–	–	400	2842	171657	0.221/0.887	0.829	–	23m24s	–
horse	41831	7506	4	2.0	78	124	7523	0.259/0.876	6.14	0.5s	14m19s	21s
horse^o	41831	7506	–	–	72295	118136	118136	0.011/0.766	5.08	–	–	2.3s
kitty	4521	1946	2	2.0	80	129	7124	0.291/0.887	2.56	0.2s	36s	6s
kitty^o	4521	1946	–	–	9031	15049	15049	0.125/0.784	3.18	–	–	1.1s
kitty*	4951	2220	–	–	75	121	7083	0.424/0.910	2.29	–	36s	–
pipe	16285	4442	3	2.0	80	86	9045	0.419/0.933	1.59	0.2s	2m37s	12s
pipe^o	16285	4442	–	–	1847	2656	5571	0.092/0.790	3.92	–	–	
pipe*	16285	4442	–	–	80	69	7168	0.258/0.925	1.45	–	2m32s	14s
robot	27606	9032	10	1.9	196	598	8013	0.254/0.941	1.80	0.6s	6m30s	25s
robot^o	27606	9032	–	–	23398	46362	47174	0.014/0.758	1.05	0.6s	6m30s	25s
rod	70178	13818	4	1.5	48	66	11448	0.063/0.932	1.14	1.2s	53m53s	48s
rod^o	70178	13818	–	–	2949	6645	7403	0.016/0.774	4.07	–	–	1.1s
rod*	79936	19806	–	–	80	122	11092	0.418/0.929	1.27	–	48m	–

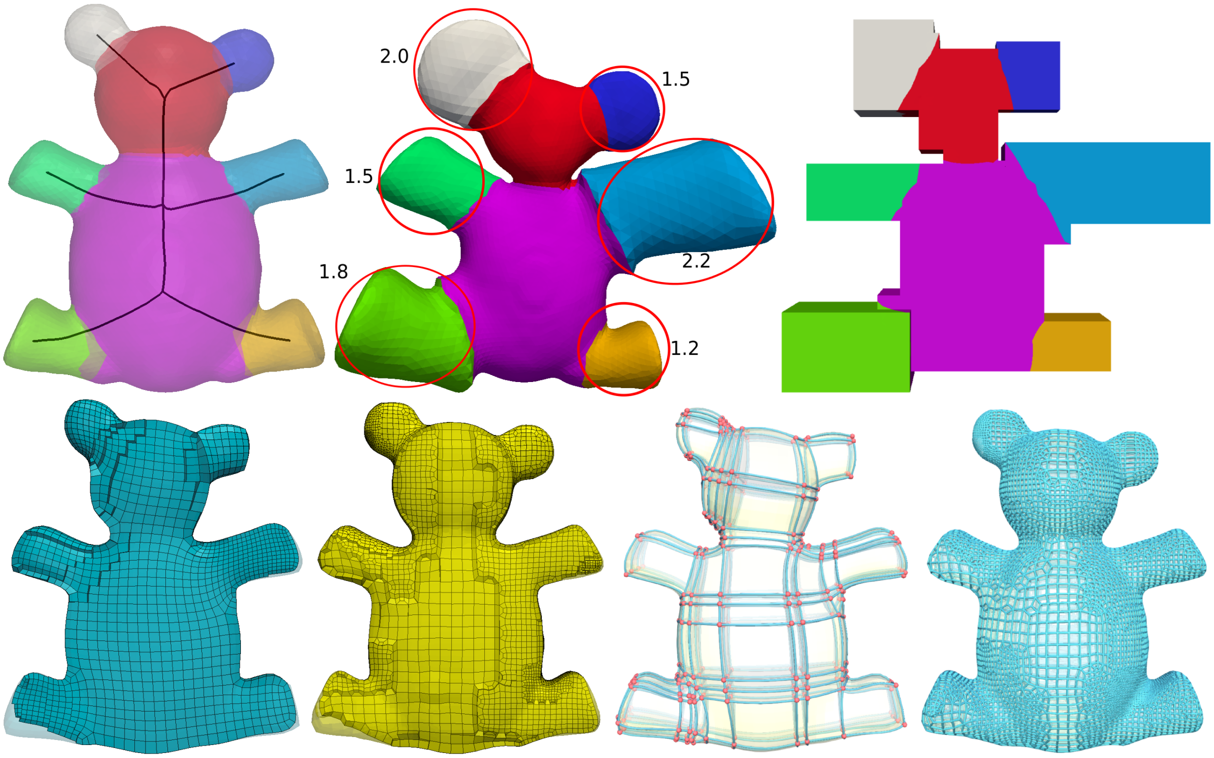

Figure 1: Bear

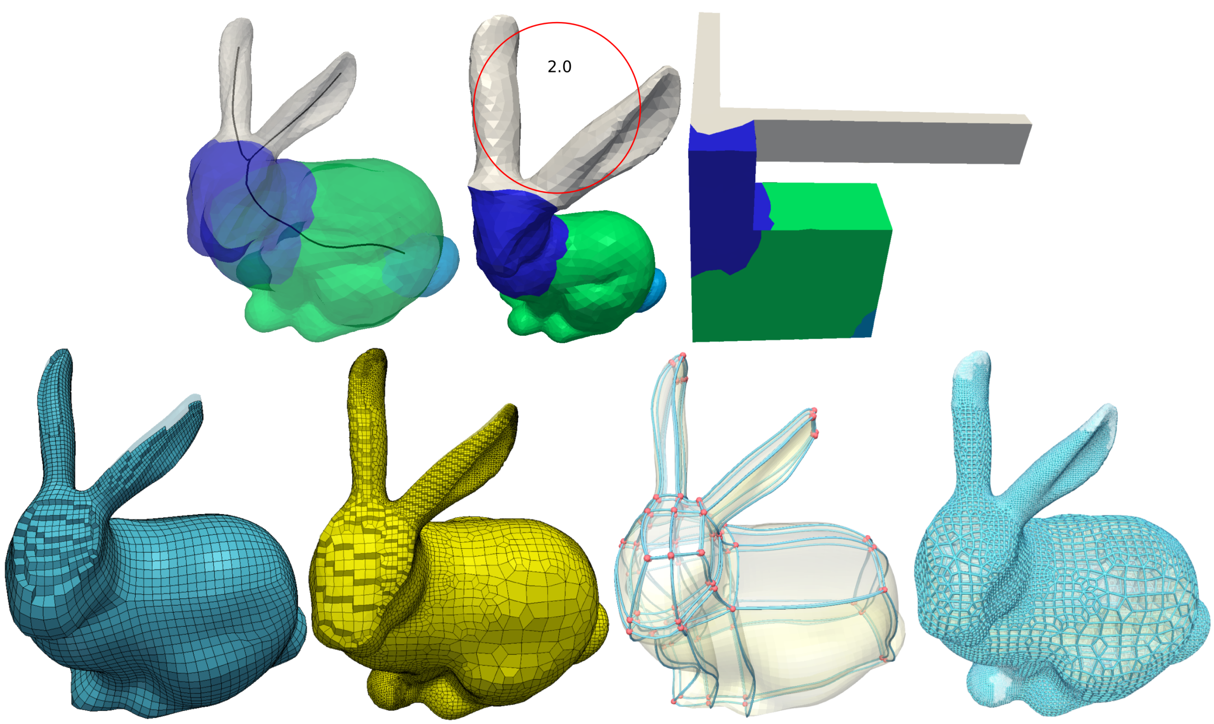

Figure 2: Bunny

Figure 3: Chair

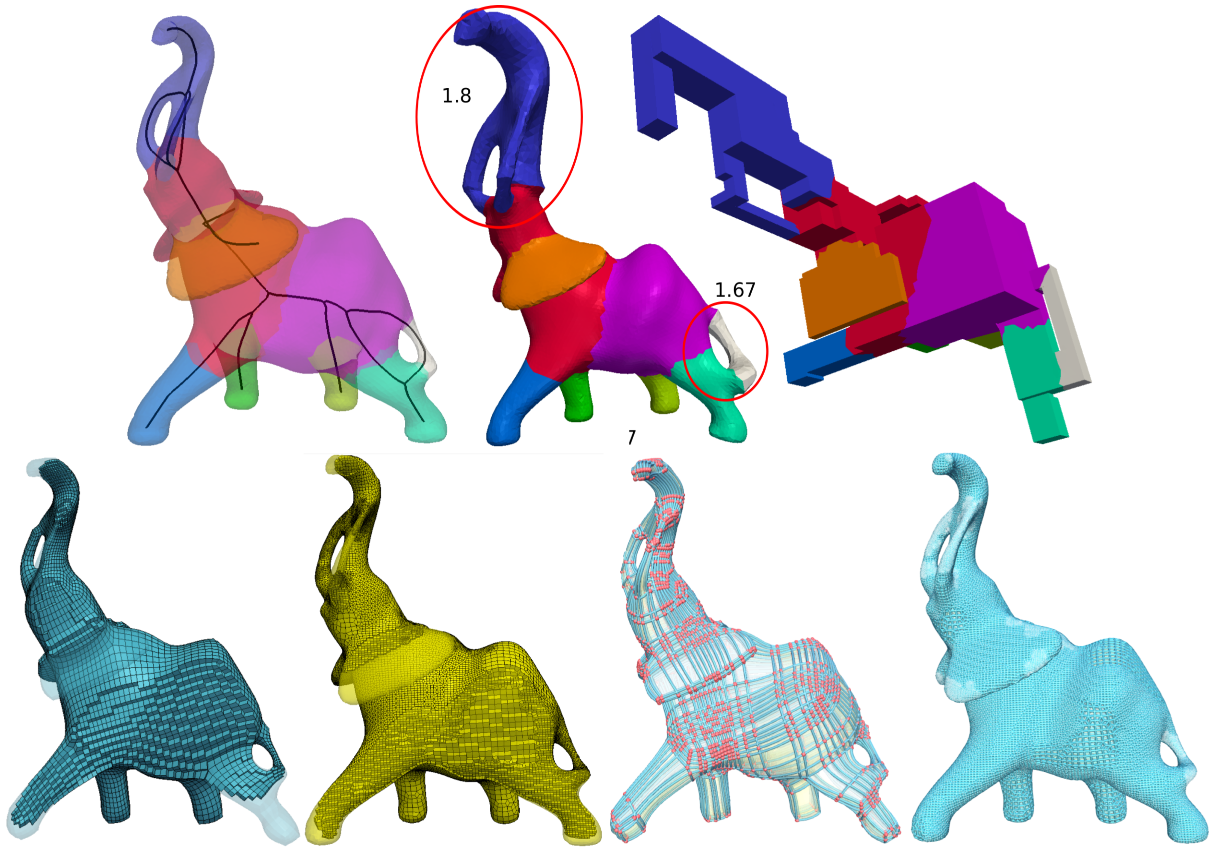

Figure 4: Elephant

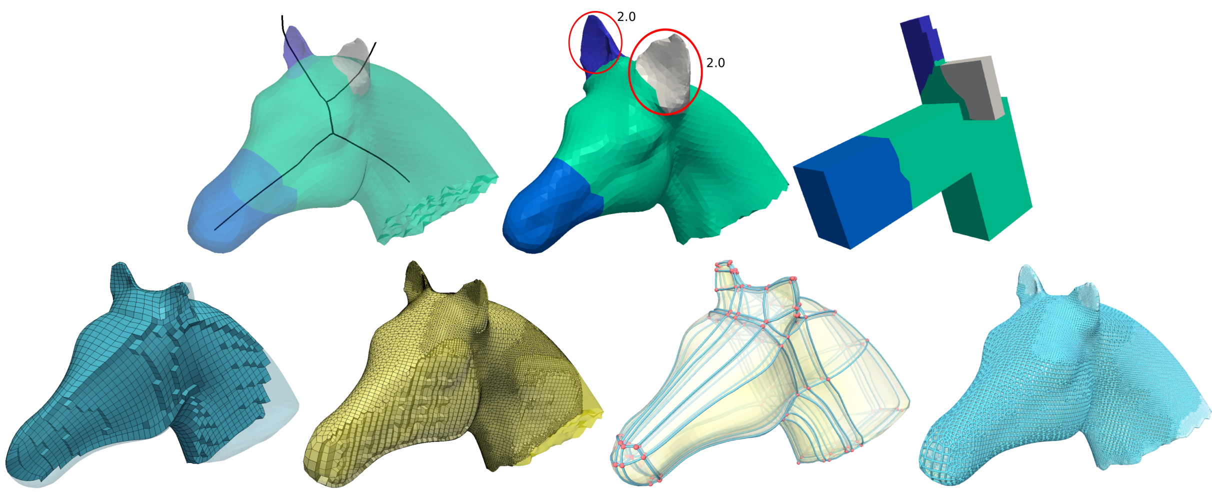

Figure 5: Horse

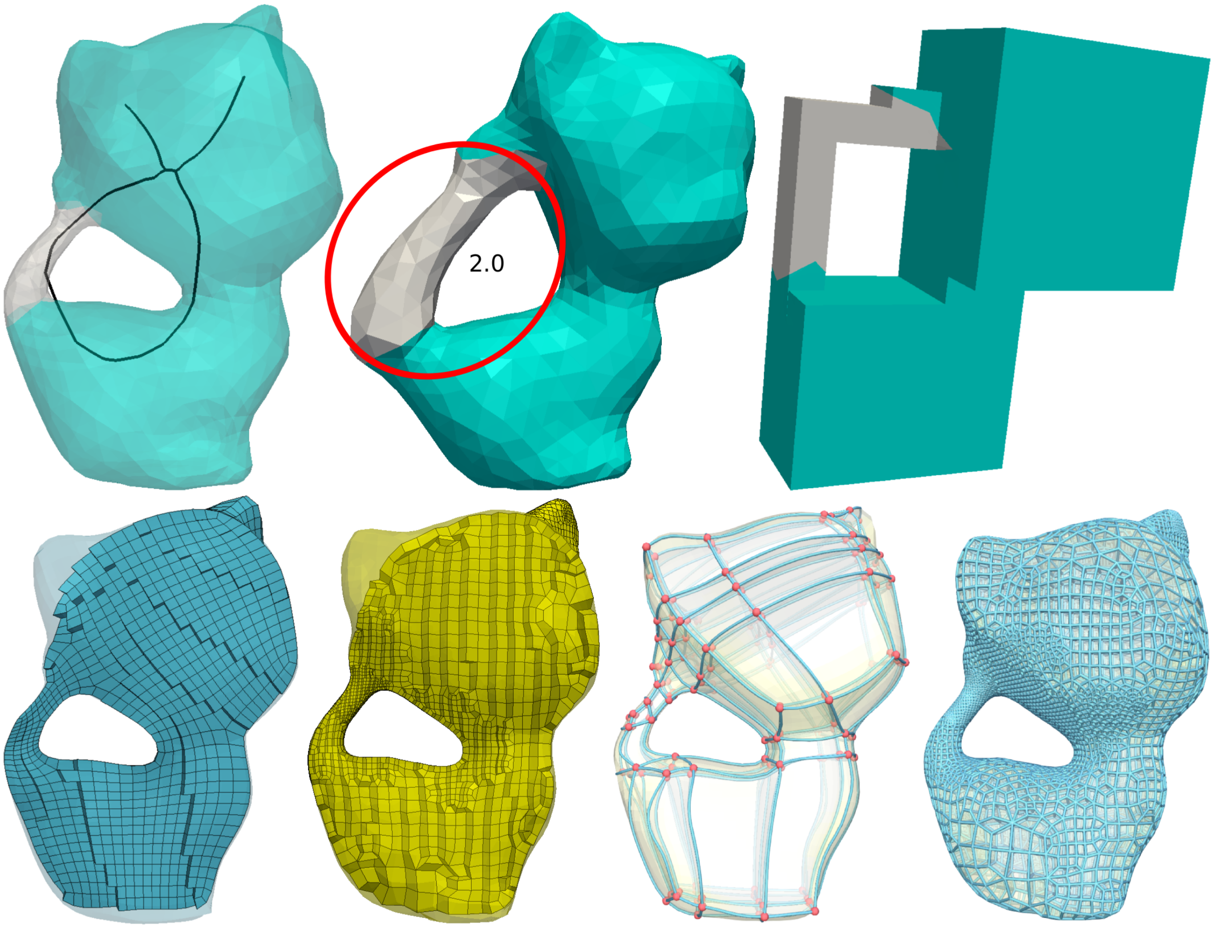

Figure 6: Kitty

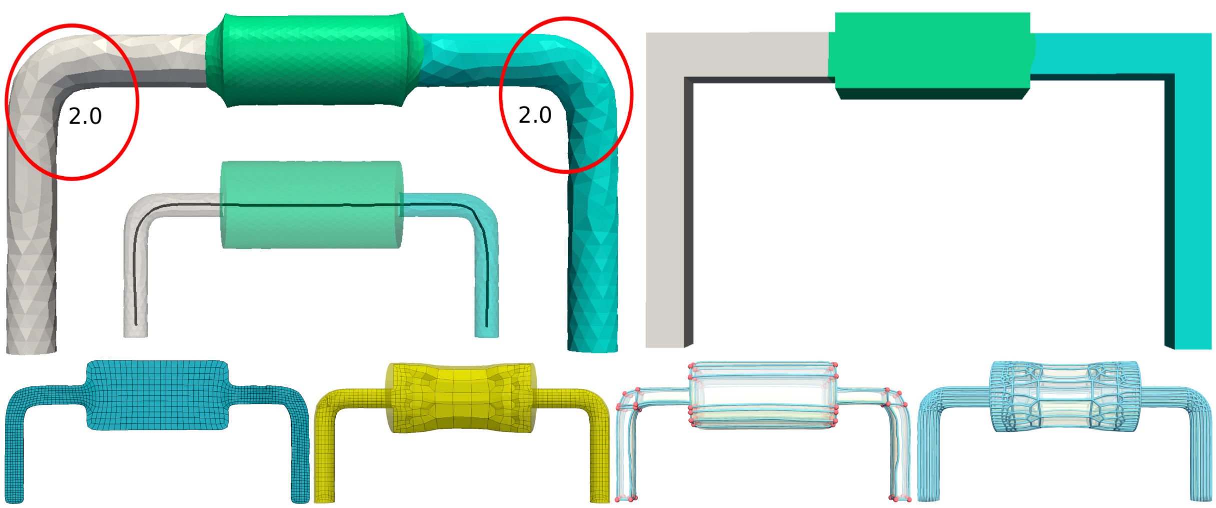

Figure 7: Pipe

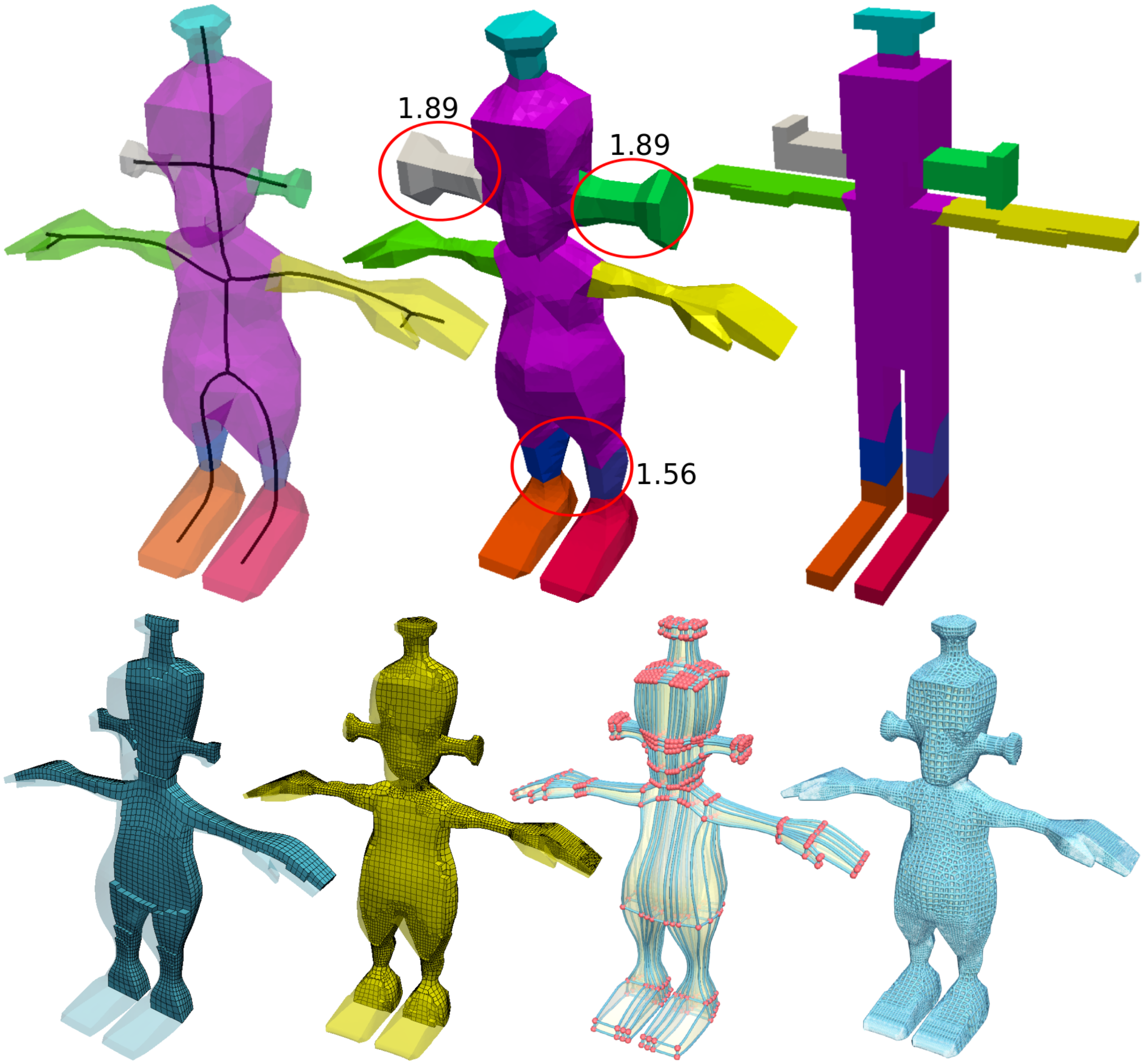

Figure 8: Robot

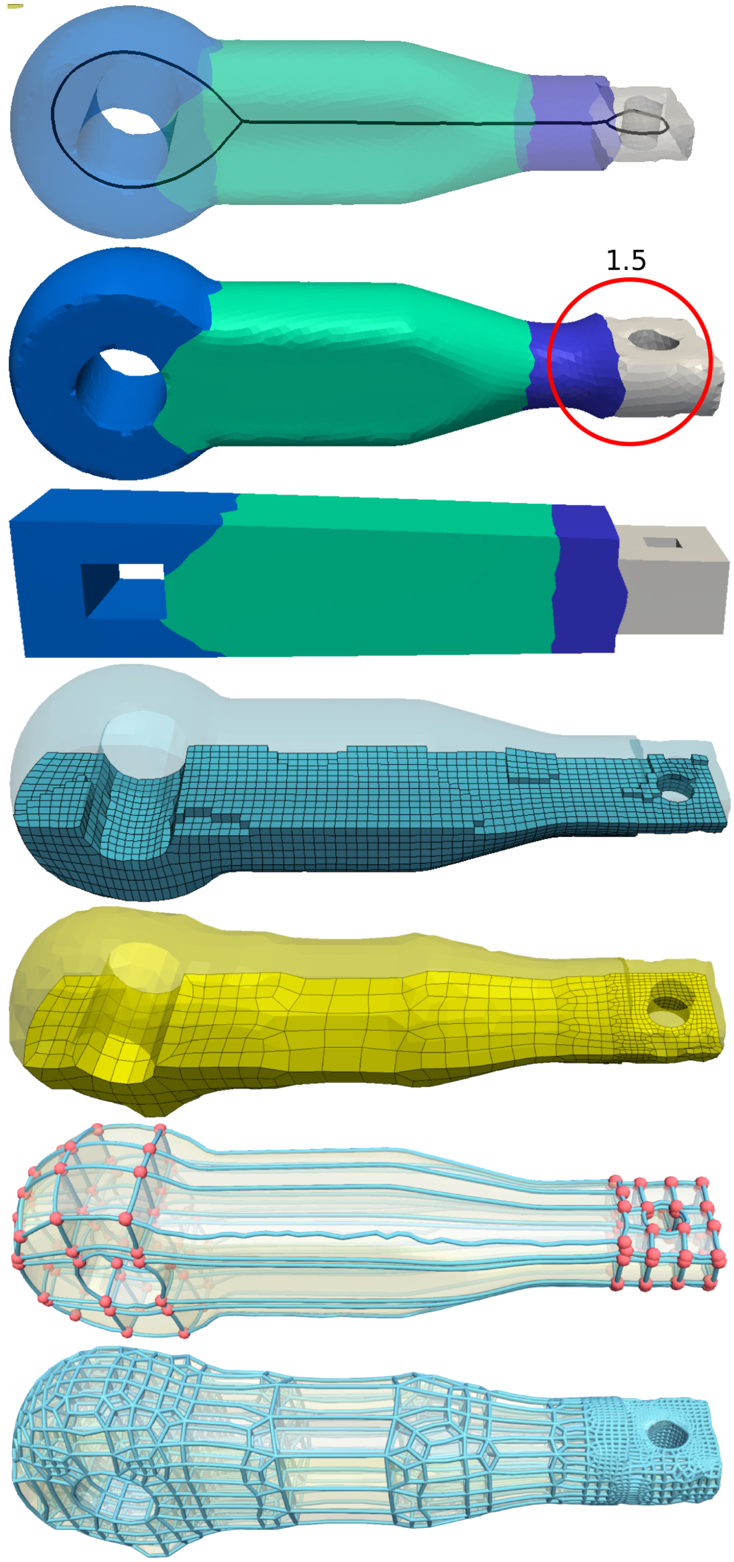

Figure 9: Rod