
Technical Modeling with OpenSCAD

Create Models for 3D Printing, CNC Milling,
Process Communication and Documentation



Tam HANNA

Chapter 1 • Why OpenSCAD?	9
1.1 What do we need?	12
1.2 Who am I?	13
Chapter 2 • Installing OpenSCAD.	15
2.1 Installing OpenSCAD: Linux, compiled package.	15
2.2 Installing OpenSCAD: Linux, compilation.	16
2.3 Installing OpenSCAD: Windows, finished binary	22
2.4 Excursus: Nightlies	23
2.5 Conclusion	24
Chapter 3 • User interface and first experiments.	25
3.1 OpenSCAD start screen	25
3.2 Manipulating the Viewport	29
3.3 More Settings	31
3.4 Conclusion	32
Chapter 4 • Create, combine and move 3D objects	33
4.1 Hands hovering over the building surface	33
4.2 Create cuboids: data types and more.	36
4.3 Sphere and cylinder.	39
4.4 Translation operators move objects	42
4.5 Rotation operators rotate objects	44
4.6 Color parts of objects.	47
4.7 Linking translation and rotation.	49
4.8 Combine 3D objects smartly	51
4.9 Outlook: Realisations, polyhedra, and projections	54
Chapter 5 • Realize and understand (round) objects	55
5.1 Edges and corners.	55
5.2 Antipattern: Construct with \$fn	58
5.3 Excursus: 3D print pipeline.	58
5.4 3D printing models	60
5.5 Holes, for the first	60
5.6 Conclusion	63
Chapter 6 • OpenSCAD as 2D modeling tool	64

6.1 Theory of construction in the two-dimensional domain	66
6.2 Creating Ellipses	68
6.3 Linear extrusion	70
6.4 Worked Example: Coat rack a la Tam	71
6.5 linear_extrude with advanced parameterization.	74
6.6 Create rotationally symmetrical objects	78
6.7 Fully parametric construction from point clouds.	81
6.7 Holes in polygons	85
6.8 Worked Example: Board holder	86
6.9 What next?	91
Chapter 7 • OpenSCAD as a dynamically reconfigurable modeling system	92
7.1 Variable in OpenSCAD	92
7.2 Modules create geometry	96
7.3 Selections react to parameter states	101
7.4 Selections, modules, children	102
7.5 Reject parameters with Assert.	103
7.6 Duplicate geometry with "for"	105
7.7 Functions and calculations	110
7.8 Processing lists	111
7.9 Tools for troubleshooting	115
7.10 Conclusion	119
Chapter 8 • Texts, projections and bump mapping	120
8.1 Render texts	120
8.2 A question of alignment	122
8.3 Add and manage fonts	124
8.4 Exporting 2D Snapshots	125
8.5 Import geometry item maps	129
8.6 Conclusion	134
Chapter 9 • Advanced 3D objects	135
9.1 Create three-dimensional polygons	135
9.2 Excursus: Soap Dispenser, Part 1	138
9.3 Polygon alignment in three-dimensional space	141

9.4 Combination with Minkowski	143
9.5 Effect of the Minkowski operator on boreholes.	148
9.6 Excursus: Soap dispenser, part 2.	150
9.7 The Hull operator.	152
9.8 Conclusion	155
Chapter 10 • MCAD - technical primitives for OpenSCAD	156
10.1 Providing the library.	156
10.2 Generation of gears, analysis of the library structure.	157
10.3 Conjuring screws and nuts	158
10.4 Lego emulation	161
10.5 Generate outlines of stepper motors	162
10.6 Conclusion	164
Chapter 11 • Value-added OpenSCAD	165
11.1 Model to measure	165
11.2 Controls of the Customizer	171
11.3 Custom model, second	172
11.4 OpenSCAD without App	174
11.5 OpenSCAD meets Python	176
11.6 Conclusion	180
Appendix • Quo vadis?	181
Contact the development team	181
Contact the author	182
Read more	183
Index	183