

Automating CAD – Making 3D Models Programmatically - Handout

Dave Ackmann – Gateway Division NMRA, September 4, 2022

This Clinic describes the use of “Generators” to design 3D model “primitives” for structures in an easier fashion than traditional Computer Aided Design. Primitives such as a basic four walled building, with clapboard, log or board-and-batten siding, and sloped or peaked rooflines are possible. Other generators create different varieties of roofing, flooring, foundations, windows and other structural elements.

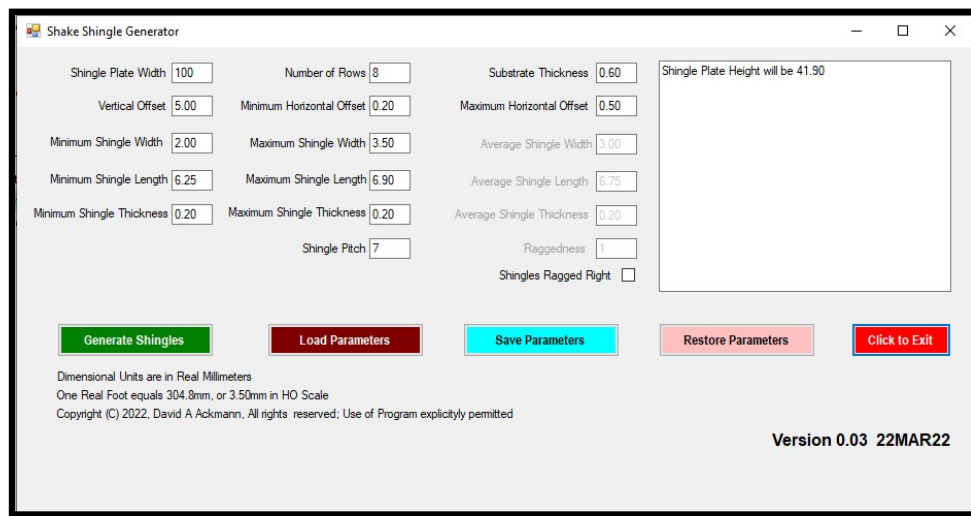
Generators are individual Microsoft Windows-based executable computer programs into which the user enters design parameters to meet their needs. Although copyrighted, Generators are available for download at <http://daackm.github.io>, at no charge, and may be used to construct structures on an individual or club layout; they may not be resold. In the clinic description, you are instructed to “Click Here” to download a ZIP file containing the current collection of Generator programs.

Once the executable files are extracted, they can be launched and an object designed. Properties of the object, such as width, depth, and many more primitive-specific options may be modified from their default values to create a custom object. When the green “Generate” button is pressed, the Generator calculates a set of instructions for the OpenSCAD program. OpenSCAD then converts the instructions into a Stereo Lithography file, suitable for 3D printing or further modification in a traditional CAD package such as TinkerCAD.

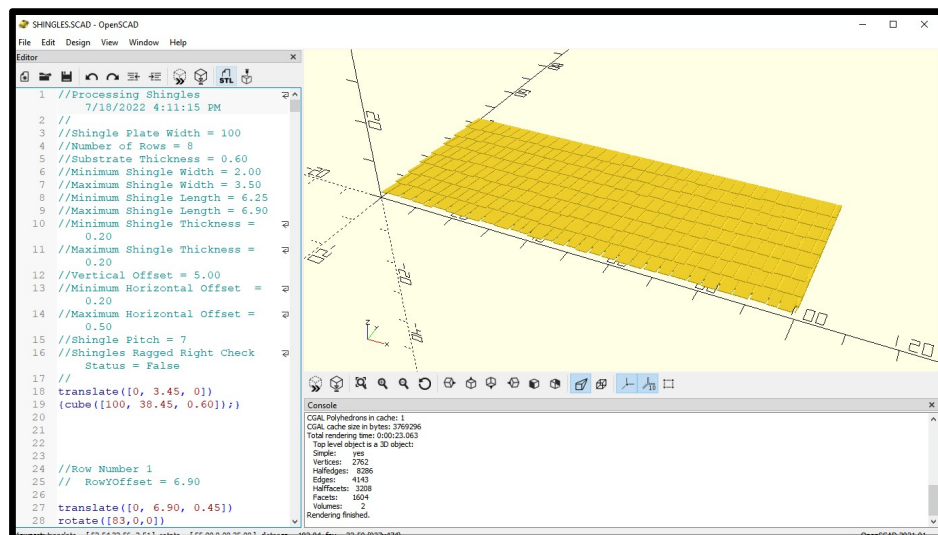
OpenSCAD may be downloaded from <http://www.openscad.org>, and is also free. A “trailer” video and a complete instructional clinic video are also available at <http://daackm.github.io>. Eventually documentation will be available for each generator type, but as of September 4, 2022 only field descriptors are provided.

Generator dimensions are specified in real millimeters, and thus are scale independent.

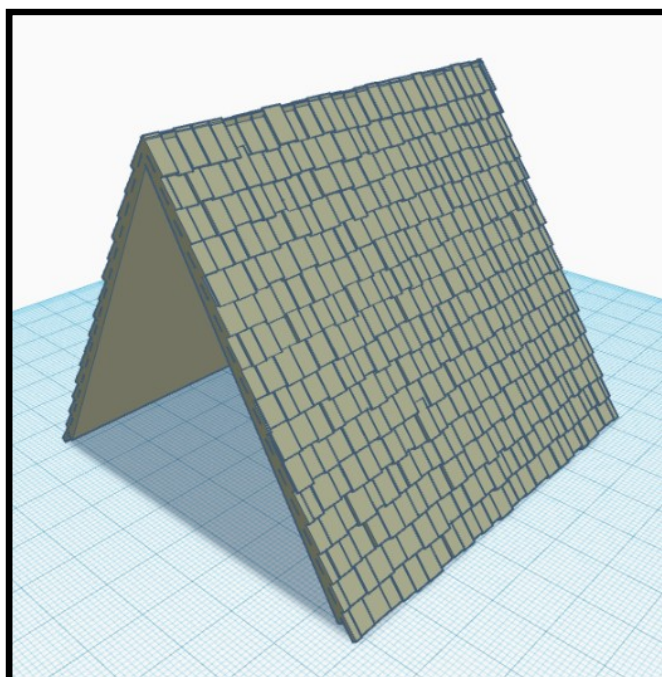
A sample generator screen for a Shake Shingle Generator is shown below:



The OpenSCAD file produced by a Generator is basically a programming language and is human-readable. To process the file, just launch OpenSCAD, and do a “File/Open” on the file created by the Generator. A “quick and dirty” drawing of the object will appear, and if the drawing looks promising, the “F6” key is used to do a final rendering. Once the final rendering is completed, a Stereo Lithography model can be saved by pressing the “STL” icon.



A sample of the resulting roofing, once processed through OpenSCAD, is shown at right:



A sample generator screen for a Basic Building Generator is shown below:

Basic Building Walls and Rafters

Building Style

☐ Flat Wall ☐ Clapboard ☒ Log Cabin ☐ Brick ☐ Board/Batten

House Width House Length Substrate Thickness

Wall Height Roof Pitch

Log Diameter

Log Overlap

Log Offset

Print

☒ All Walls ☐ North Wall Only ☐ East Wall Only ☐ South Wall Only ☐ West Wall Only

Dimensional Units are in Millimeters
One Real Foot equals 304.8mm, or 3.50mm in HO Scale.
10' in HO corresponds to 35.00mm
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Version 0.05 26JUN22

At right is a log cabin. The basic building was created with a “BasicBuilding” Generator, and the roofing, windows and decking were also created with their respective Generators; the railings, chimney and steps were created with traditional Computer Aided Design.



At right is a table of Generators available at <http://daackm.github.io> as of September 4, 2022. No warranty is expressed or implied as to their suitability for use or freedom from programming errors; they are provided “As Is”. Users are welcome to submit suggestions for improvement or discovery of errors to Ackmanns@charter.net, but no guarantee of correction is promised. Although the author does employ multiple pieces of malware (virus) protection, after download and prior to use, it is highly recommended that every user scan the Generators for malware on their own Personal Computers.

Topic	Version	Tutorial Link
Basic Building Assemblies	0.07 22JUL22	Not Yet Available
Shake Shingles	0.05 22JUL22	Not Yet Available
Brick Walls	0.03 22JUL22	Not Yet Available
Windows	0.06 22JUL22	Not Yet Available
Floors and Decks	0.03 22JUL22	Not Yet Available
Foundation	0.03 22JUL22	Not Yet Available
Roofing, Rafters and Purlins	0.06 22JUL22	Not Yet Available
Piers and Deck Supports	0.01 03SEP22	Not Yet Available
Shutters and Louvers	Not Yet Available	Not Yet Available
Canopies and Awnings	Not Yet Available	Not Yet Available
Billboard Supports	Not Yet Available	Not Yet Available
Masking Tools	Not Yet Available	Not Yet Available
Trestles	Not Yet Available	Not Yet Available
Staircases/Handrails	Not Yet Available	Not Yet Available
Lattices	Not Yet Available	Not Yet Available