Automating CAD – Making 3D Models Programmatically - Handout

Dave Ackmann – Gateway Division NMRA, July, 2022

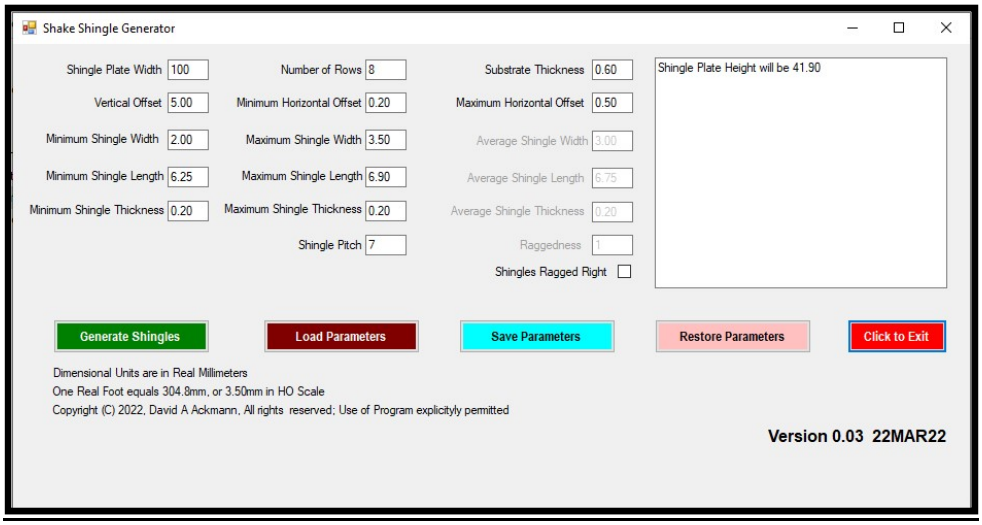
This Clinic describes the use of “Generators” to design 3D model “primitives” for structures in an easier fashion than traditional Computer Aided Design. Primitives such as a basic four walled building, with clapboard, log or board-and-batten siding, and sloped or peaked rooflines are possible. Other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

Generators are individual Microsoft Windows-based computer programs into which the user enters design parameters to meet their needs. Parameters such as the item width, depth, and many more primitive-specific options are provided. 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.

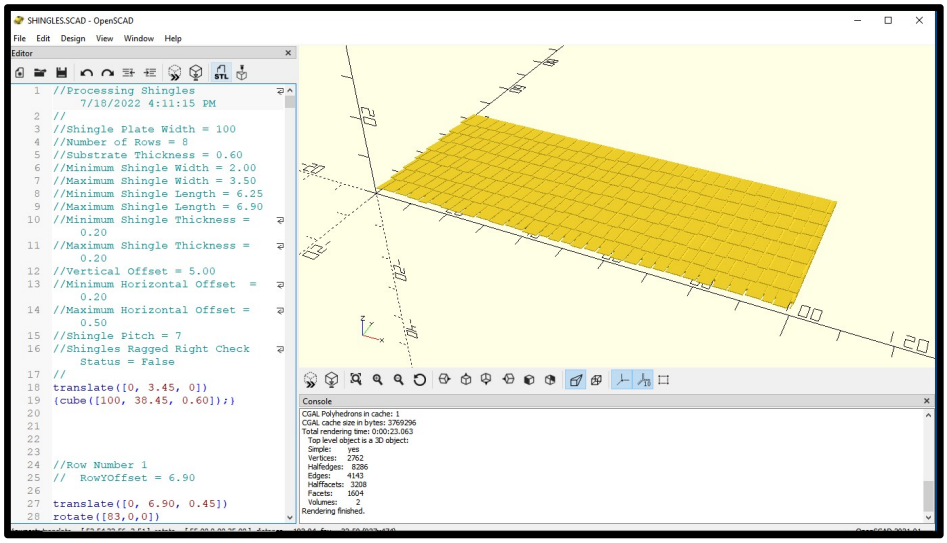
Although copyrighted, Generators are available for download at http://daackm.github.io, at no charge, and may be used to construct structures on an individual or club layout; they may not be resold. A matrix at the website provides links to each Generator type. OpenSCAD may be downloaded from http://www.openscad,org, 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 July, 2022 only field descriptors are provided.

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

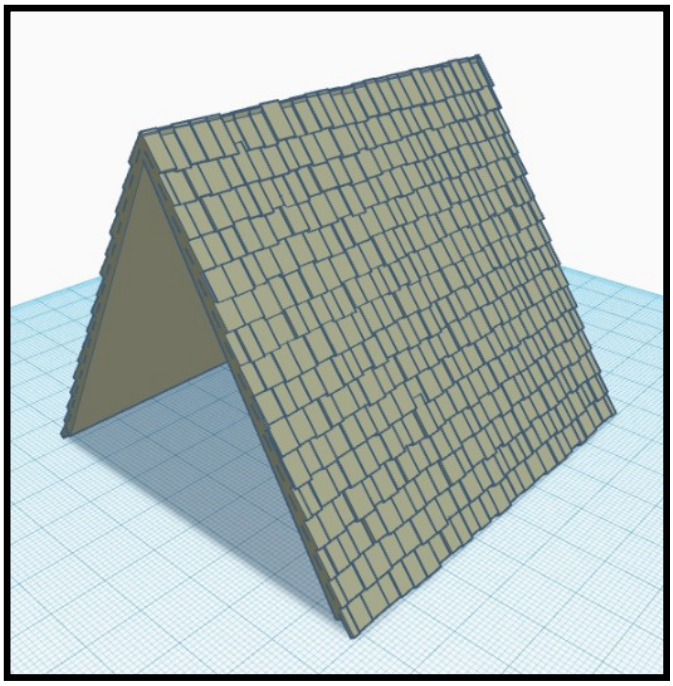
A sample generator screen for a Shake Shingle Generator is shown below:



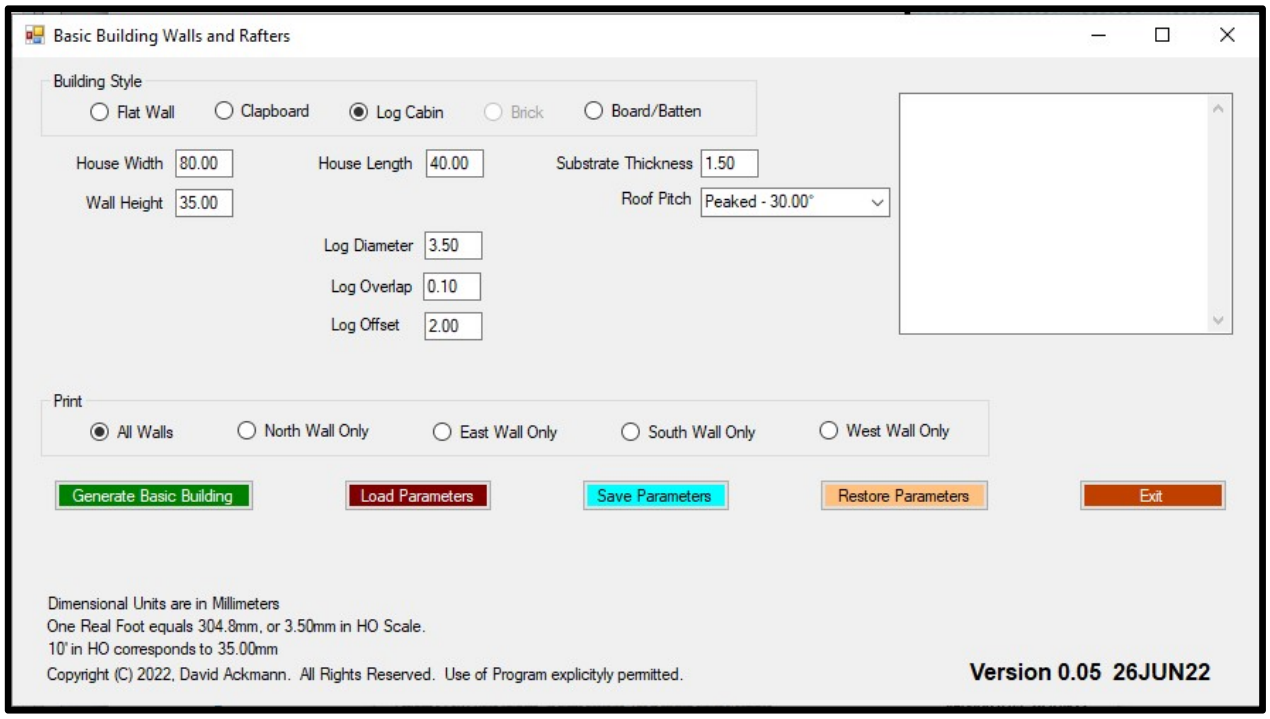
The OpenSCAD file produced by a Generator is basically a programming language and is human-readable. To process the file, just launch OpenSCAD, and do a “File/Open” on the file created by the Generator. A “quick and dirty” drawing of the object will appear, and if the drawing looks promising, the “F6” 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:



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 July, 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.

Topic	Download Link	Tutorial Link
Basic Building Assemblies	Click Here	Not Yet Available
Shake Shingles	Click Here	Not Yet Available
Brick Walls	Click Here	Not Yet Available
Windows	Click Here	Not Yet Available
Floors	Click Here	Not Yet Available
Foundation	Click Here	Not Yet Available
Roofing and Rafters	Click Here	Not Yet Available
Shutters and Louvers	Not Yet Available	Not Yet Available
Piers and Purlins	Not Yet Available	Not Yet Available
Canopies and Awnings	Not Yet Available	Not Yet Available
Masking Tools	Not Yet Available	Not Yet Available
Trestles	Not Yet Available	Not Yet Available
Staircases	Not Yet Available	Not Yet Available
Lattices	Not Yet Available	Not Yet Available