

Designing an Indoor Model using OpenSCAD

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Generating STL Files

Many folks who use OpenSCAD generate *STL* files from their design. These files are used as part of the 3D printing process. Although I wish we could 3D print flyable model airplanes, that is not what we will do with the STL files in this project.

STL stands for *Standard Tessellation Library* [1]. Translated, that means an STL file is a list of triangular objects that describe the surface of a 3D object. These triangles cover the surface making a “water tight” approximation to the real surface. Triangles are guaranteed to be flat in the 3D space, and if they are tiny enough, they can be rendered to create a 3D display of the object, or sent to a 3D printer after suitable processing of all the triangles so the printer knows where the surface is (that is a topic for another article!)

My purpose in introducing these triangles is simple. I want to know how much my model will weigh, and I want to know where the center of gravity will be when the design is constructed. Figuring out these two details is impossible using conventional building techniques: you build the model, weight it, and figure out the center of gravity manually. Computer geeks never do anything manually if they can get their computer to do the work.

I found a nice Python library that is all set up to figure out the volume of a 3D shape defined in an STL file, and return its center of gravity location. It is simple enough to add in the predicted wood density for the design and come up with a weight estimate for each part. A little post-processing of all this data will give us some estimate of the total design's weight. Unfortunately, figuring out the weight of the glue is not so simple. For that we need to know where each glue joint will be and the surface area of the glue joint. I am working on that problem now, but am not ready to show any results yet.

Knowing where each part will be placed in the final design, and the CG data for that part will let us predict the CG for the complete model as well!

References

- [1] W. Authors. STL (file format) - Wikipedia, 2021. URL [https://en.wikipedia.org/wiki/STL_\(file_format\)](https://en.wikipedia.org/wiki/STL_(file_format)).