Web Based Case Designer Problem Statement

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Abstract

The TekBots makerspace at Oregon State University provides access to 3D printers and laser cutter for students, but many potential users are inexperienced with 3D rendering software and don't have the necessary skills to create enclosures for their projects. Online Case Designer is a tool that can generate a 3D model that can fit students' specifications to be used for fabrication. The tool will visualize the output as a 3D model that reacts live to the users input. Users will also be able to specify holes in the case to accommodate the needs of their project.Successful completion of the project is a working and simple web application that can design basic cases with holes for whatever ports, cables, etc. Our final product will provide greater levels of freedom than currently available tools to support development of student projects at Oregon State University.

I. The Problem

The problem at hand is that there is not an easy and readily accessible solution for designing a case for custom electronics. The TekBots makerspace is a general resource for electrical engineering and computer science help, and one of the services it provides is 3D printing and laser cutting. Our client has noticed that many students don't have experience with or access to 3D computer-aided design applications to model the enclosures they need. He has searched for online tools to help students easily generate 3D models for cases but has only found some with rudimentary capabilities. Our Online Case Designer will help them create a 3D model that can easily be exported for fabrication.

II. Proposed Solution

The solution and the main goal of this project is to create an online, free to use software that lets students define exact measurements for a case which can be exported to be fabricated. This lets students create exactly what they need with no background knowledge of the intricacies of 3D printers and laser cutters and with no experience in 3D auto computer-aided design. A basic version of this application already exists in a few forms online, but our implementation must include the ability to add user defined holes in the model, a feature which Professor Heer has not been able to find in any other tools. This feature could be applied for artistic or functional purposes. For example, holes could be made for cables going outside the case or for strapping in components to the enclosure. With the simple tools this application will provide, users can easily create an enclosure from start to finish without any previous knowledge of 3d modeling.

The model generated by our site must also adhere to the standards for laser cutting and 3D printing, considering constraints such as material thickness, edge geometry, and minimum or maximum size. The model outputted must be able to go directly to fabrication without any tweaking in external software. This will require some research and most likely experimentation with fabricating our outputted models. This tool will hopefully promote creativity and support many students who want to use the TekBots space to create elegant and functional enclosures for their projects.

III. Performance Metrics

Professor Heer noted that he requires the tool to follow the What You See is What You Get (WYSIWYG) design principle which values quick and responsive User Interfaces that update live to the users specifications. To implement this philosophy, the main focus of the editor will be a 3D visualization of the case that is updated real time as the measurements are updated. First the user will be able to define the width, height, and length of the case. Next the user can select the joint types of the case. This decides how the panels that make the sides of the case fit together at the edges of the model. One of the most common edge shapes used in laser cutting and 3D printing is the "interlocking fingers" style where there are interlacing blocks evenly cut out of the faces of the case. Other edge styles could possibly be implemented, for example an edge type that is scored repeatedly to be bent into a curve.

After the user is finished entering the dimensions and edge types for the case they can continue to the second screen where they can define holes in the model. How holes will be input is yet to be decided, whether it be from a toolbox of predefined shapes or if custom shapes can be drawn. To make sure hole placement can be exact, snapping guides or a ruler will show when placing holes. After completing their enclosure the user can export the model to a set of standard 3D model file types to be used for fabrication. The application will support at least the .dxf file type with a stretch goal of adding more types.

With all of these features implemented the web application will be considered complete. Stretch features include, but are not limited to, a library of predefined hole sets, a storefront for users to share or sell their cases, and a way for users to return to a previous in-progress project. These features will be worked on as time allows.