Parametric Modeling of a Carton Forming Tool using C#

Mechanical Engineering

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Abstract

This mechanical engineering project is infused with computer science, involving parameterizing different parts and assemblies of the sponsor's carton forming toolsets (shown in Figures 1-a and 1-b). An exclusive SolidWorks plug-in is created using C# programming language which acts an interface between the CAD software and the user. The output of the plug-in shall be parametrically modeled SolidWorks parts and assemblies. The end goal of this project is to increase efficiency at the sponsor company.

Implementation

The dimensions that the user inputs are not applied directly to the parts. The parts' dimensions that will be changed must be renamed and parameterized. With the parameterization equations, proper dimensions can be applied to the individual components based on the user inputs (see Table 1).

The developed software also builds a catalog of parts as it is used for projects in which new components must be generated. By maintaining logs of unique parts, the plugin can reference parts used in previous tooling sets, should they also work for the current carton geometry entered by the user. This functionality eliminates the possibility of duplicate parts, and establishes a fixed, standardized catalog which may be used for future projects.

User Interface

When Solidworks is started, the UI prompts the user for the type of machine tooling. Once a selection is made, the second prompt requests dimensions of the carton. These dimensions are processed by a series of commands in Solidworks' application programming interface (API). The UI is programmed in Visual Studio's Extensible Application Markup Language (XAML).

Figure 2-a and 2-b show the first interface and second interface, respectively. The interfaces exist simultaneously as the plug-in runs, but are selectively hidden as the user progresses through the selection options.

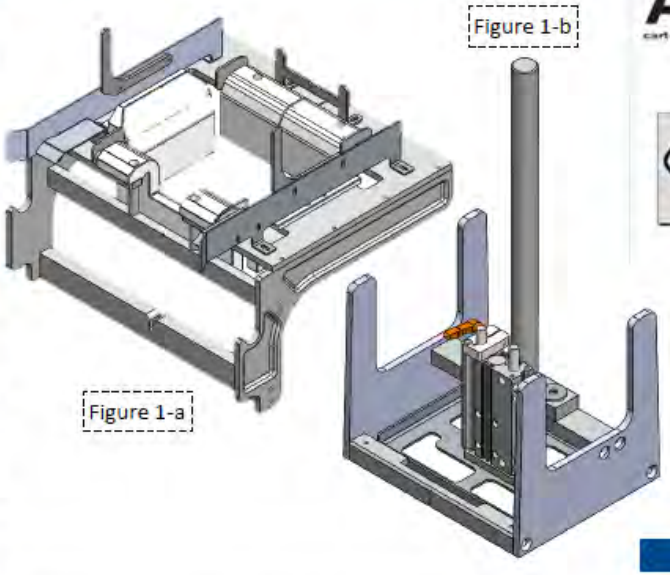

Figure 1-a

Figure 1-b

Figure 2-a

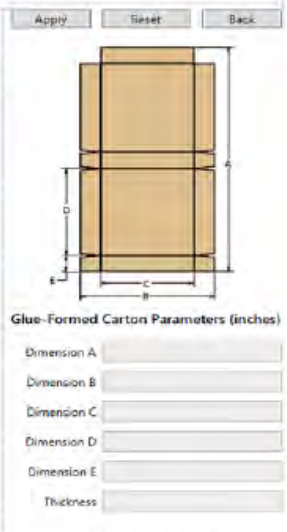

Figure 2-b

Dimension Name	Relation to user inputs
SpreadLength@Extrude1	C-0.375*2
PushPlateWidth@Sketch1	C-0.828*2
PushPlateLength@Sketch1	D-1.406*2
MandrelSideWidth@Sketch1	D
MandrelSideHoles@Sketch3	0.5009*(D-9.1875)+2.589
MountLength@Extrude1	SpreadLength
A1@Sketch1	0.5*A-1.5*E-0.03125
A2@Sketch1	0.5*A-1.5*E+0.03125

Table 1

Conclusion

The outputs provided by our product will be compared to those created by engineers in the manufacturing environment. Each component will be inspected by the sponsor to verify that it is suitable for production. We believe that this was a great project because we created a tool capable of cutting company costs by reducing the amount of engineering hours.

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