

Mr. Uken

CIM 1°

November 14th, 2022

Laser Cut Project Abstract

Description of Project

The project was to design a piece to be engraved and cut using the laser cutter. The only constraint of the project was that the piece had to fit in a 3" x 3" envelope. The goal was to create a piece on Fusion 360 that would be edited in Inkscape which would display the abilities of the laser cutter printer.

Description of Project Design

After brainstorming approximately eight design ideas for the project, the designer chose a picture of a bear holding a flower that is protecting a butterfly from the rain, shown in Figure 1. This design was inspired by the designer's childhood toy, a stuffed bear, which she holds dear. As seen in the brainstormed sketch, Figure 1, the designer had intended to create a puzzle with the scene of the bear engraved onto it. The puzzle aspect of the design was later scrapped due to the great

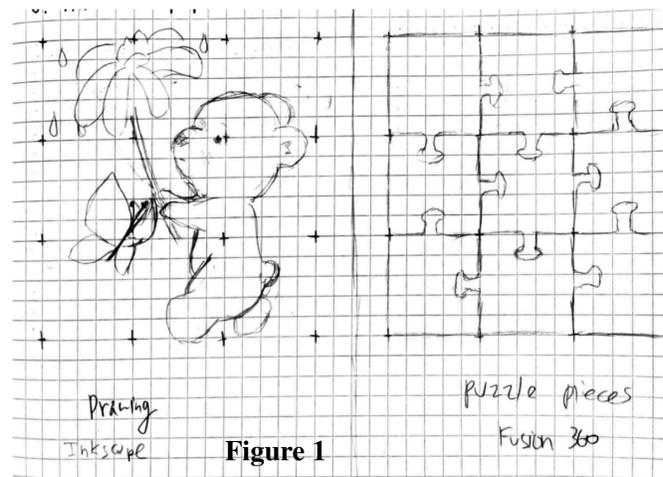


Figure 1

difficulty in using the Inkscape platform to differentiate the lines that should be engraved and the lines that should be cut. The assembly of the piece in Fusion 360 had been fairly straightforward as the designer had sketched the drawing in her notebook, uploaded the image to Fusion 360, and then used the spline feature to duplicate the sketch. The different aspects of the sketch were then extruded and transformed into a drawing which was then exported as a PDF. When transforming the piece in Fusion 360 to a drawing, the designer scaled the piece up, at a 3:1 ratio, to make it larger when cutting, as seen in the measurements of

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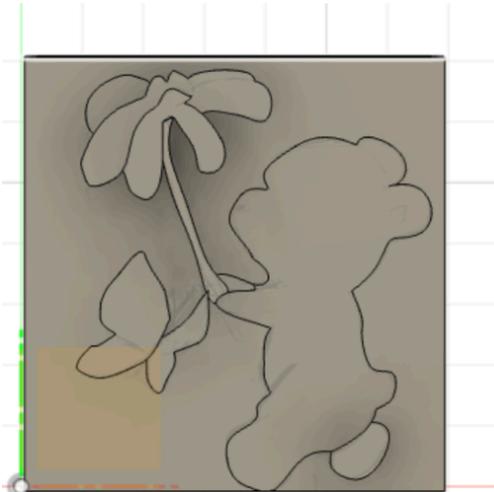
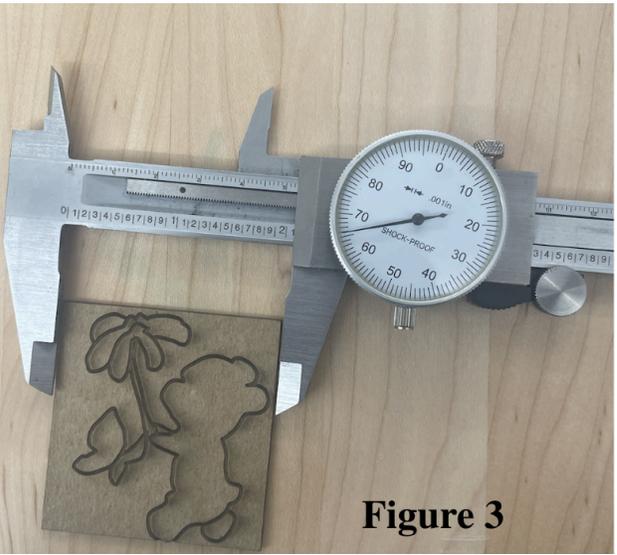
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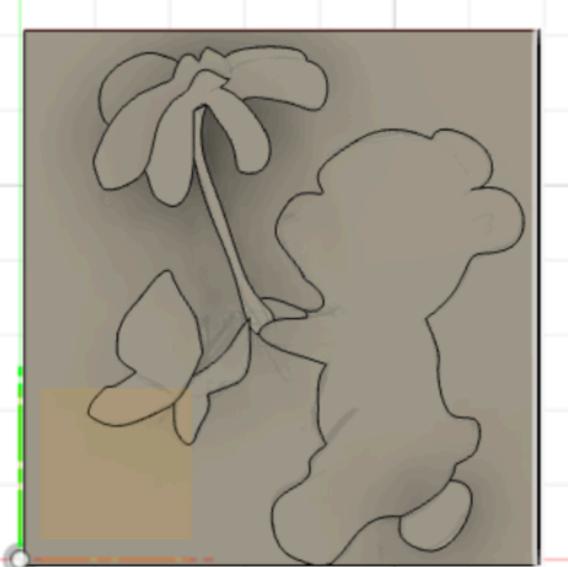
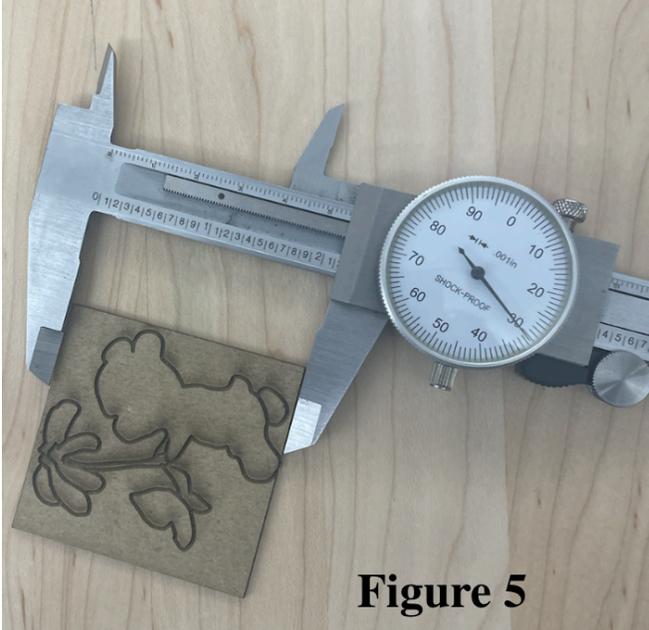
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the Fusion 360 piece in Figure 2 compared to the measurement of the final piece in Figure 3. The PDF was then uploaded to Inksapes where the designer changed the thickness of the lines that had to be cut, the outer square, to red and a thickness of 0.001 pt and the engraved lines to black. The project was saved as a PDF once again and then uploaded to the computer that fed the laser cutter the information and engraved, as well as cut, the final project onto mat board.

Accuracy of the Laser Cutting Process

As seen in the measurements in Figures 2 and 3, the cutting process was quite accurate. The final product does not have exactly three times the length of the Fusion 360 model but is significantly larger with the ratio of the final product to Fusion 360 model being 2.99:1. The other important measurements of the width, seen in Figures 4 and 5, further prove the accuracy of the process.

Fusion 360 Model	Piece Cut (Three Times the Length of Fusion 360 Model)
 <p>Figure 2 shows a digital model of a square piece with a complex, organic shape cut out of it. The shape resembles a stylized flower or a decorative element. The model is displayed on a grid background. A red line indicates the length of the square, which is 0.689 inches. The text "1 Edge Length : 0.689 in" is visible at the bottom of the image.</p> <p>Figure 2 1 Edge Length : 0.689 in</p> <p>Length: 0.689 inches</p>	 <p>Figure 3 shows the physical piece cut from the mat board. The piece is a square with the same complex shape as in Figure 2. It is placed on a wooden surface. A vernier caliper is used to measure the length of the piece, which is 2.0611 inches. The text "SHOCK-PROOF" is visible on the caliper.</p> <p>Figure 3</p> <p>Length: 2.0611</p>

	Ratio: Approximately 2.99 times the length of the Fusion 360 model
 <p>Figure 4 1 Edge Length : 0.714 in</p> <p>Width: 0.714 inches</p>	 <p>Figure 5</p> <p>Width: 2.1301 inches</p> <p>Ratio: Approximately 2.98 times the length of the Fusion 360 model</p>

What Was Learned

Through this project, key features of software systems Fusion 360 and Inkscape were learned, Such as the ability to upload an image on Fusion 360 and editing certain lines of the image to be different thicknesses and colors on Inkscape. Using Inkscape was extremely difficult as the lines that needed to be cut would only appear on specific conditions. Due to



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this, the designer had to scrap certain parts of the project as it heavily interfered with the desired product. These parts were puzzle piece aspect that had not allowed the engraved lines to be shown clearly as well as created great difficulty in selecting certain lines on Inksapes and the smaller details of the engraved image, the raindrops. While these issues were faced, the designer is quite satisfied with the final product, but the only disappointing factor was that the final product had burn marks around the engraved areas; which, due to the intensity of the laser, could not be avoided.