Digital Fabrication HW1

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Project Documentation and Description: **The Cornell Tech Music Box**

The project we created is a Cornell Tech themed music box. The music box is designed to be interactive and playful with the red bus circling around Cornell Tech campus while there are music playing.

Figure 1: The two sides of our music box

Video: https://youtube.com/shorts/SCqQvCODOw8?feature=share

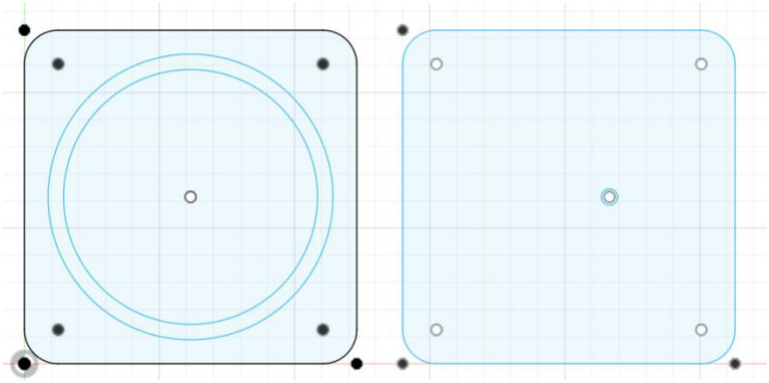
Components:

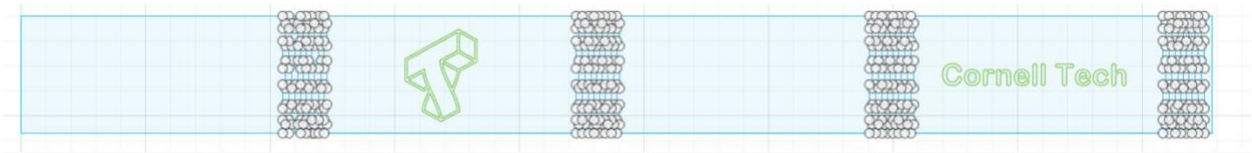
Winded Music Box Mechanism	Ordered from Amazon
The Outer Box	Laser Cutting + Engraving
Spinning Plate	3D Printing
Red Bus	3D Printing
Bloomberg	3D Printing
TATA	3D Printing

The House	3D Printing
Trees (in two sizes)	3D Printing
The C beside the house	3D Printing
Legs of the Music Box	3D Printing

Screenshots of our design:

The Outer Box

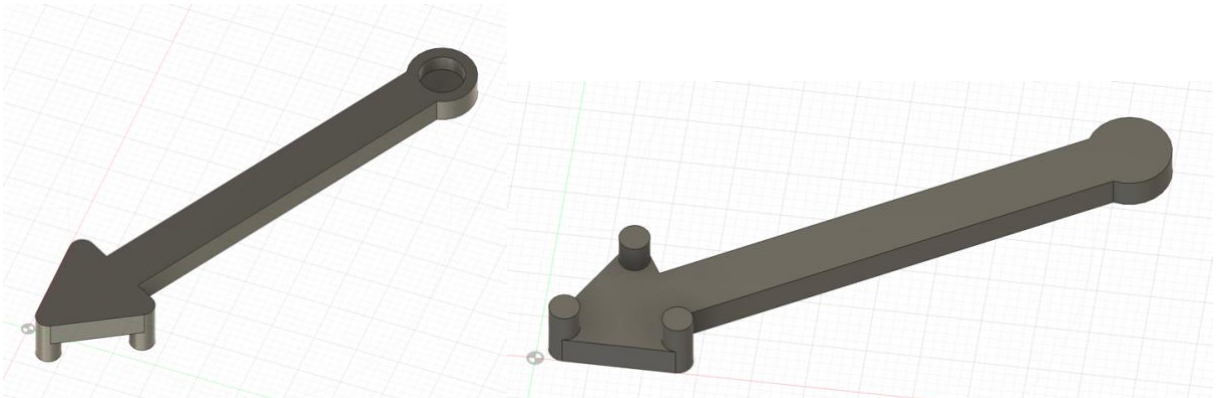




We wanted to bring a softer and relaxing vibe to our design, so we applied the rounded corners to the box's design. That requires the side of the box to be bendable, therefore we applied flexible patterns to achieve this. The top side of the box has an engraved track for the bus to follow, and the bottom side has a hole for the wind to stay out of the box.

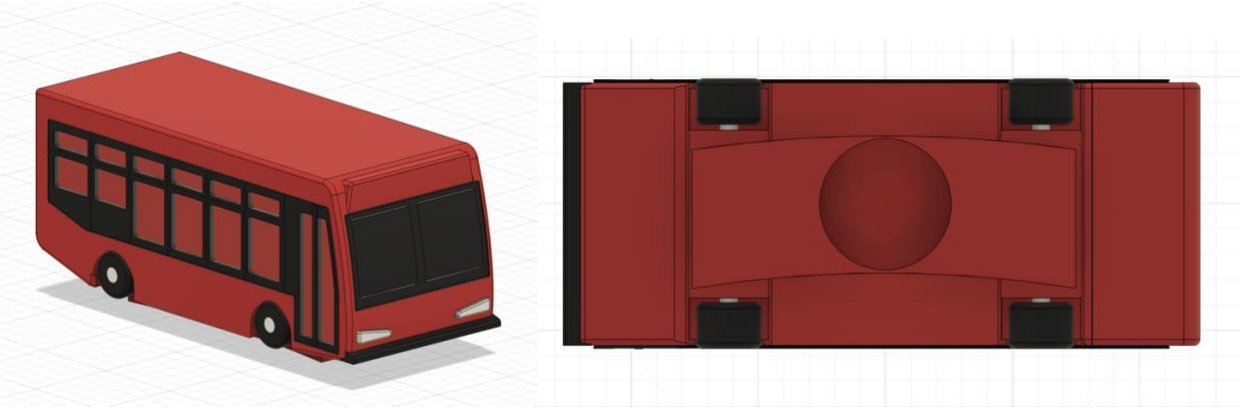
Note: This is the screenshot of an early version, we added finger joints in our final version to strengthen the structure.

Spinning Plate



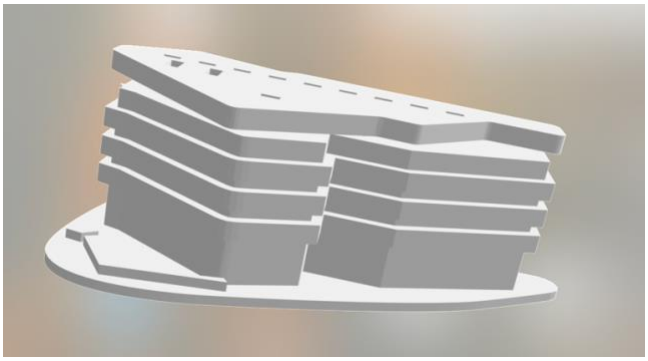
This spinning component is attached on the music box mechanism. With an spinning arm and a magnet holder, the magnet will circle and guide the bus.

Red Bus

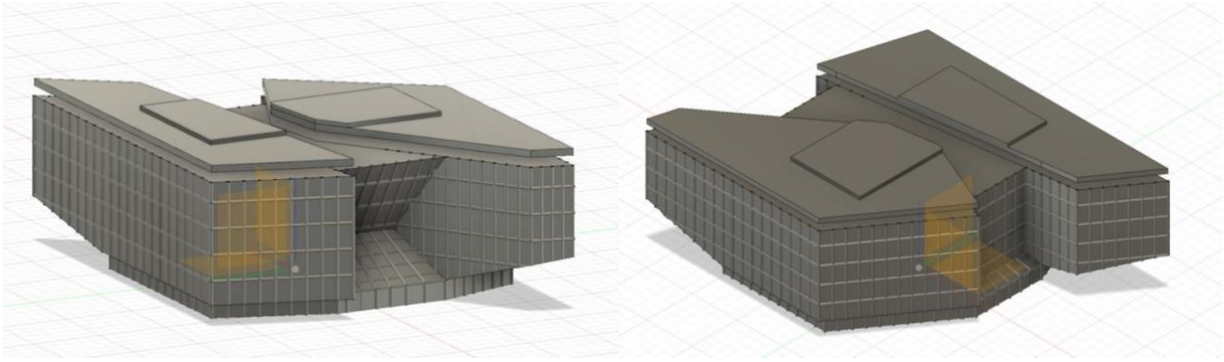


The bottom of the red bus has an arc part and a magnet holder. This is to ensure the bus follows the track while circling and always face the right direction.

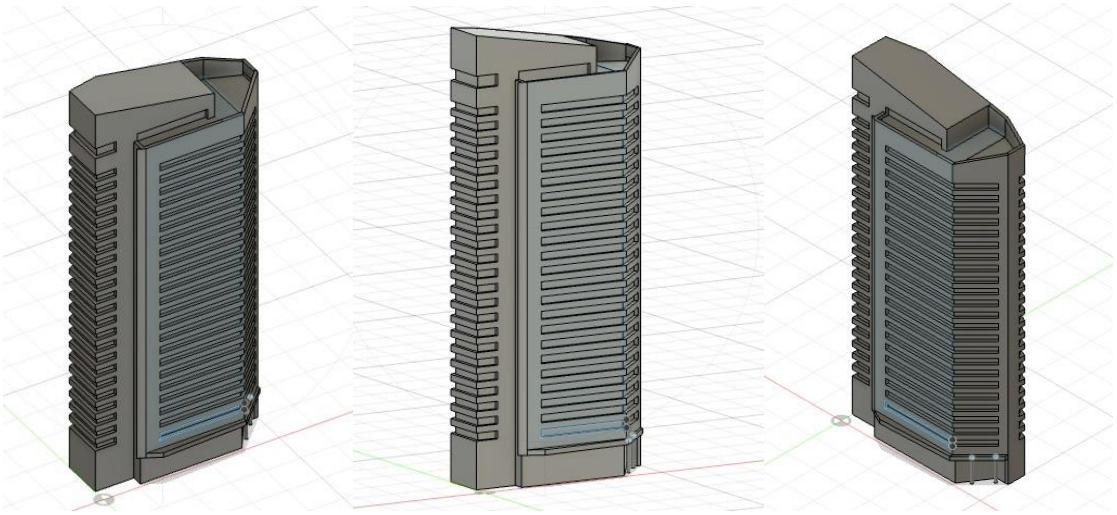
Bloomberg



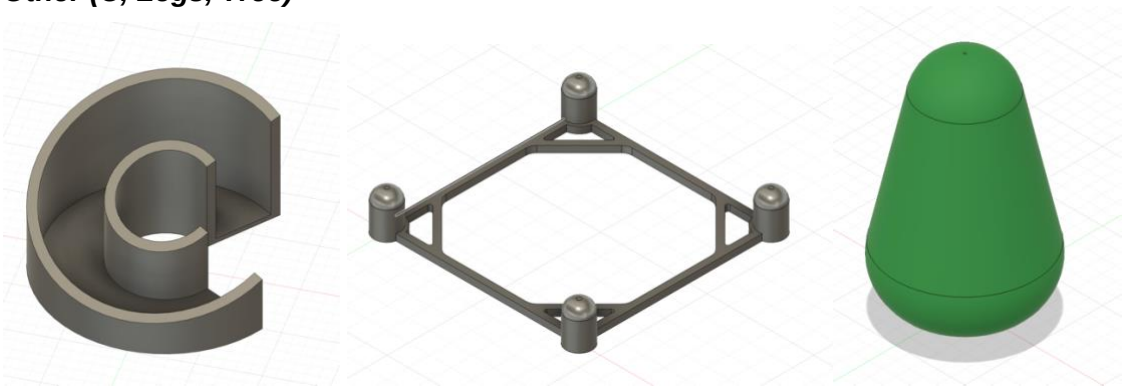
TATA



The House



Other (C, Legs, Tree)



Ambition:

Our goal in this assignment is to build a Cornell Tech-themed music box. This is challenging since: first of all, the music box itself is hard to produce since we want the corners of the box to be rounded. This simple design largely increases the difficulty of making a normal box. We've spent lots of time fine-tuning it. Another challenge in this project is to craft those buildings and print them out using 3D printing. To make those buildings, we had to carefully measure the size of the buildings first (we don't want the relative scale between buildings to look weird). Next, since the buildings on the Cornell Tech campus are creative, we spent quite a lot of time on Fusion 360 crafting the creative buildings.

Depth/Execution:

Overall, we did it pretty well. We achieved around 90% of our ambition. Due to the limited time, we are not able to finish all buildings on the campus (e.g. Verizon, Graduate). The buildings are modeled with great details even though the final printed products are small. The details we preserved make the buildings look realistic. Another thing we really like is our music box (Credit

to Amber). The production process of the little box was extremely hard, and the flexible side required a lot of trial and errors. The fitting parts are not perfectly fabricated and might need more adjustments if we are rebuilding it.

Relevance:

In our project, we combined 3D printing and laser cutting techniques to bring our vision to life. Using Fusion 360 software, we crafted the designs for the Cornell Tech buildings and the surrounding scenery, employing tools like sketching, chamfering, and rectangular patterns. With BambuStudio, we fine-tuned these models and prepared them for printing, exporting them as plate-sliced files. Utilizing a 3D printing machine, we then materialized our creations. Additionally, we utilized laser cutting to craft the music box. With the techniques of adding joints and engraving, we incorporated details like the bus track on the box's lid and the Cornell Tech word and logo on its sides.

Process:

The two main challenges we encountered was the bending side of the box and the moving bus. When we tried to use magnetic force to move the red bus on our music box, although the bus could move with the magnet, the orientation of the bus kept changing. To deal with this, we curved round tracks on the lid of the box and redesigned the bottom of the moving bus to fit the track. In this way, the orientation of the bus is controlled. Another obstacle that we've encountered was the bending patterns of the outer box. We used laser cutting on one piece of wood to construct the four sides of the box, but it couldn't be bent to 90 degrees in the beginning. We tried to adjust the width of the laser cutter and the bending patterns. Finally, we successfully completed the box.

Teamwork:

After deciding to recreate a miniature of Cornell Tech, we allocated specific responsibilities based on individual expertise. Jou-An, Tingrui, and Shu-Wei, who possess a passion for 3D modeling, meticulously crafted detailed replicas of the Tata Innovation Center, Bloomberg Center, and The House, respectively. Drawing upon her talent for creative design and skill with fabrication tools, Amber took charge of creating intricate elements like the bus, music box, and surrounding scenery, infusing the project with interactive features. Amber's guidance in fine-tuning the models and machine parameters was instrumental in achieving a high level of detail. By working together smoothly and making the most of our different skills, we were able to bring our idea to life and achieve a great result.