CSL Lab 03 Report

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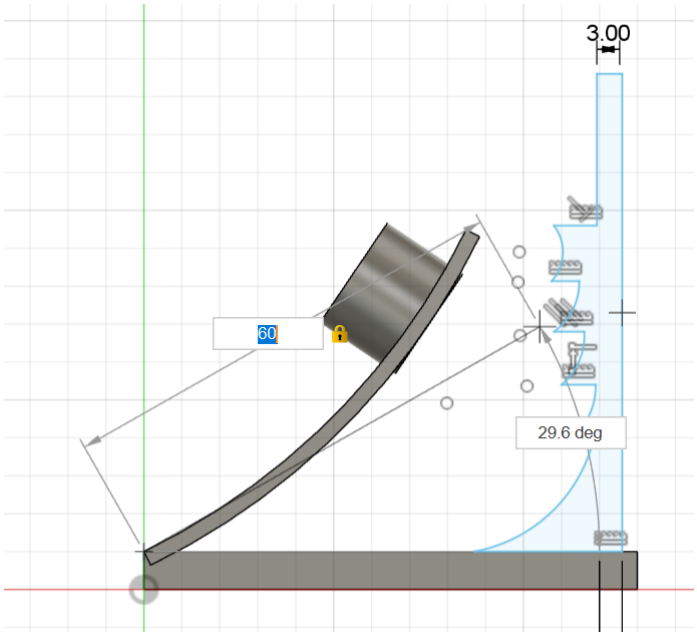
1. Summarize what you have learned in this lab.

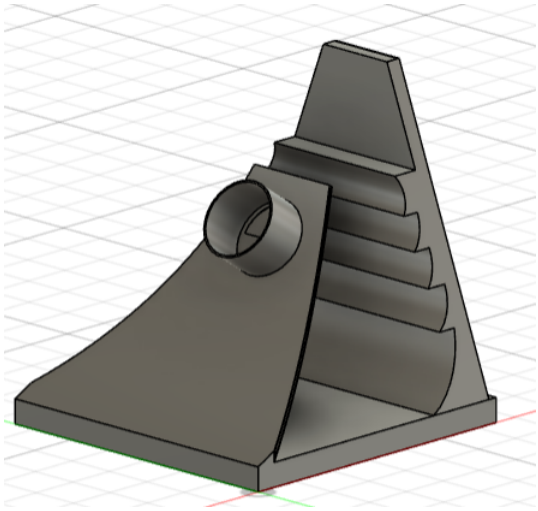
- We became more familiar with the logic of 3D modeling using Autodesk Fusion. For instance, we learned how lines can form surfaces, how to sketch on curved surfaces, how to extrude a 2D shape into a 3D solid, and how to subtract the intersection of two solids.
- We familiarized ourselves with the functions of Autodesk Fusion, for example, rotation, move/copy, cut, etc.
- Regarding the structure of the catapult, I discovered that a simple design can be just as effective as a more complex one. Initially, I envisioned a complicated structure with springs and wheels, but we ultimately settled on a design featuring a "locking bar" (discussed in Question 2), which involves less intricate modeling yet achieves the same function.

2. How you can improve the device and tell us what you did.

- What we did: The main design of our device can be shown in the image below.
    - How to store potential energy: The projectile should be placed in the hollow cylinder in the center of the frame. To store potential energy, we rotate the flexible arc around the axis at the bottom left corner, and secure it in place on the locking bar on the right-hand side.
    - Trigger: To release the arc and let the projectile fly out, we simply pull the locking bar on the right-hand side backward. Then, the arc will no longer be bounded by the locking bar and returns to its original position. We have designed the arc so that the projectile should fly out along the tangent direction of the hollow cylinder at a 45-degree angle. This is the theoretically optimal angle for the projectile to fly the farthest. The length of the bar above the locking bar is also designed based on the length of a finger.



    - The final structure of our design can be shown in the figure below:



- How we can improve:
    - Currently the locking bar on the right-hand side is drawn based on our intuition. It would be better if we design the "locks" (which consist of straight lines and arcs) more rigorously.
    - We haven't tested the printed structure yet, but we are unsure about the flexibility of the 3D printing material or whether the catapult would tilt forward upon the release of the projectile. It is also hard to imagine how the locking bar would work.

3. Some feedback for this lab to let us know what we can improve.

- I think one week is a bit short for creating and discussing the structure of the catapult.
- It would be great if there are 1-2 catapult examples so we can feel how flexible the 3D printing material is and design ours accordingly.