Project: Metaglass
Senior Design 2021–2022

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Executive Summary

Metaglass is a demonstration of transparent interfaces in a simulated window frame. It is a wooden frame with indium tin oxide (ITO) glass panels fitted. The wooden frame is used to play Simon Says in which touching the glass panes turns on LEDs. This is to demonstrate a working glass interface in a imagined smart-home environment.

Conceptual Design Phase

The main material constraints involved in designing and fabricating the frame are mostly constrained by the dimensions and material properties. First, ITO as a resource is limited so we utilized precut glass pieces from Adafruit. These pieces determined the proportions and requirements for the other materials such as the wood. We also required programmable LEDs and other connective materails such as copper tape. Altogether, we designed and prototyped in Autodesk Fusion, but we evidently iterated on our laser-cut wood parts in Adobe Illustrator.
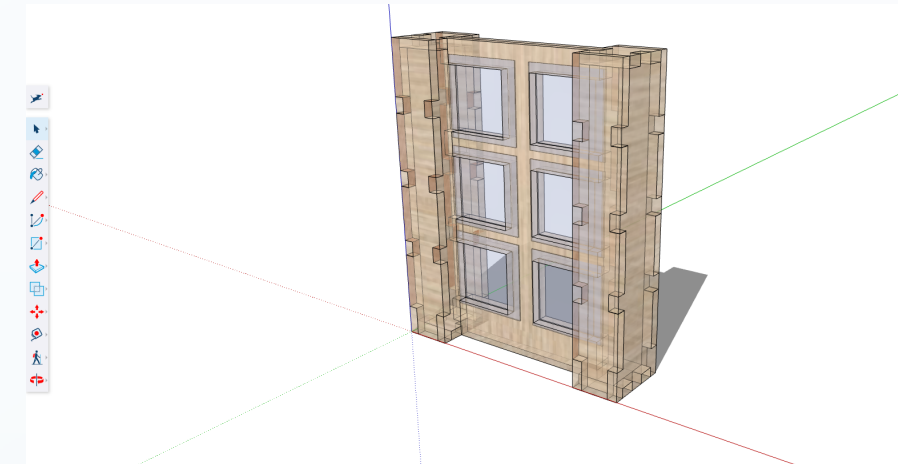
Prototype & Test

To fit the glass panes in slots, we had to iterate multiple wood pieces. The wood pieces were rastered with the laser-cutter, but only a certain power and speed setting would afford fitting the ITO glass pieces. We also had to test fitting the wood box and the proper dimensions around that.


Background

Glass is a material that is commonly used and available in many places. It has unique interactive properties of being transparent, clear, and rigid. Currently, much work is focused on glass as a projective medium, but less on glass as an interface itself. This is what would enable our interactions. All this together presents a common problem: in what ways can glass be maximized as a medium? That is what this project is hoping to explore. By creating rich interactions by game, it may be possible to outline and facilitate the creation of these glass interactions.

Detailed Design Specification

Our system has three layers: Input, Processing, and Output. Input usually goes to the processing unit which outputs touch-input to LED output.
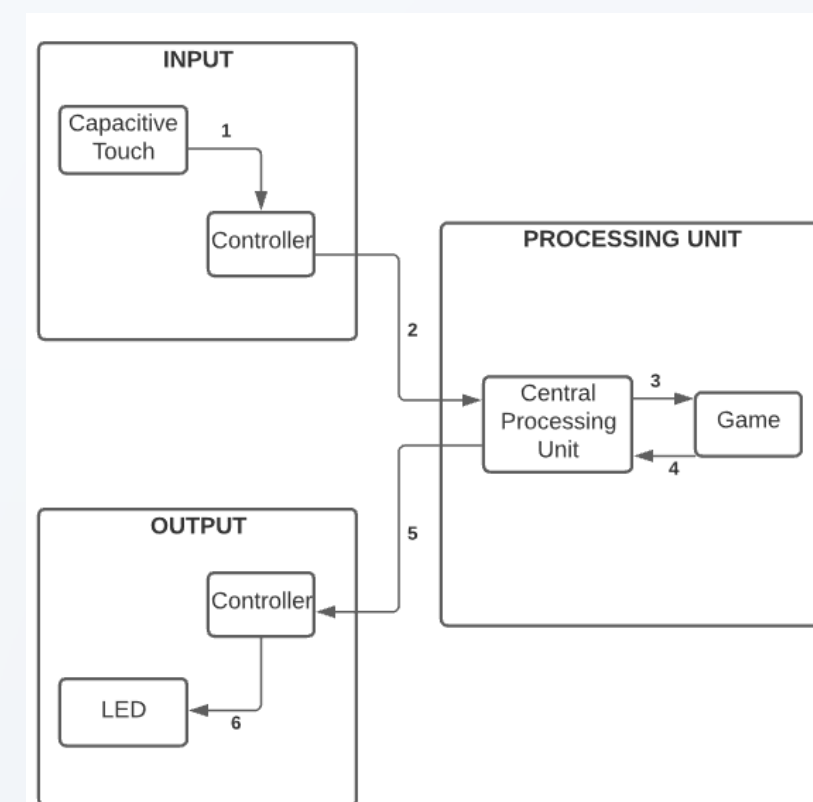
Conclusion

This project while componentally and logically simple was complex in terms of the fabrication and manufacturing front. ITO is a flexible material to work with, but deploying to real-world systems proved to introduce complexities in structure. Getting the wiring to connect from ITO to a seamless window appearance proved to be complex on the fabrication front. Building the frame itself was much more difficult than assembling the transparent interface. In conclusion, the system performs as expected but is difficult to integrate.