Increasing Tactile Sensations for Virtual Card Games by Creating a Controller that Simulates Immersion

Andrew Oster and Chia Lo Chen

***Abstract*—While playing physical card games, there's an extra layer of tactile feedback and immersion to the experience that is missing from virtual card games. This problem effects players that can only play the virtual version of card games since they don't get to experience these extra layers while also being ergonomically viable and comfortable to allow the user to fully immerse themselves. We aim to create an ergonomic controller that delivers these extra layers of immersion and enjoyment while playing virtual card games. We aim to achieve this goal by designing the layout of the controller inputs in a way that is comfortable and easy to use while also representing the physical layout of a card game as best it can. Our results include the current design for the controller that incorporates ergonomic features and an intuitive input layout that delivers the specifications needed to solve the problem. The takeaway is how we needed to not only incorporate the extra layer of feedback in the controller design but also ergonomics.**

I. Introduction

TO properly showcase the correct feeling of playing physical card games on our controller, we reflected on our previous iterations and designs. The context towards the current design is how to get this feel as well as how to make it a comfortable controller for use in a virtual card game. After conducting research on ergonomics we decided to go for a restrictive design as players don't need much freedom of control and it will make it easier to pick up and play with minimal practice required. After creating initial concepts we used a breadboard as a guide and built the layout on top, then after being satisfied with the physical part we measured everything and modeled it in Fusion 360, then using the dimensions measured and component model we built the case to the desired specifications.

II. Results

Cable management for this design will be approached by first color coding the cables and after having written down a legend for the cable colors we will group together the cables using tape organizing them into what they're connected to. For example, all of the RFID sensor cables will be grouped together, joystick cables will be grouped together, etc. We've incorporated extra room on the inside sides of the case that we will use to slide the wires through to neatly organize and run them through.

To ensure that the custom buttons we've designed can't be pulled through the lid we designed them to have a wide base that sits on top of the button components but are wider than the hole the custom button cap fits through so it can't be pulled out. To ensure that the RFID sensor is secured in place we've built a bridge like structure that is screwed into the sides of the case that the RFID sensor securely gets screwed onto.

We need to one one slot for connectivity. The slot is on the left hand face of the case and is required so the USB cable can feed through to connect the arduino controller to a computer.

The ergonomic designs we've implemented are rounded edges on the case, and specific button placements that allow the player to comfortably interact with them. Since the controller is meant to be placed on a table to represent a play area, ergonomics related to holding the controller do not apply. A study was done on the impacts of ergonomics in different video game controllers and they found that controllers with a less complicated design are easier play with without practice but are harder to do more complex motions with[5]. Our controller is very constrictive in nature since the player doesn't need much control over the game so This works well with the placement of our buttons to allow players to easily use the controller without much practice.

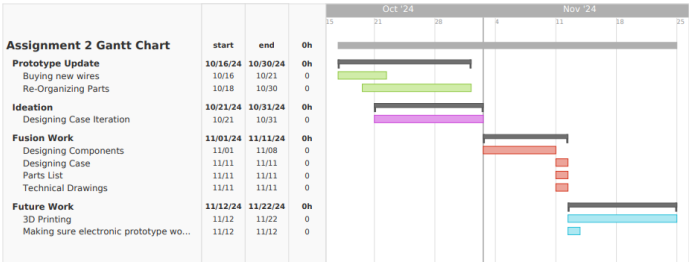
Exploded view, Assembly, Part List, and Technical Drawings can be found in the *Assembly and Technical Drawings* Appendix. B

All of the commercial components we used were a large breadboard [7], two small breadboards [2], an RFID Sensor [3], 4 small buttons [8], a joystick [1], a slider potentiometer (however, the only slider we could find was too short so we had to modify it a bit) [6], an Ardunio Uno [4], and four 6 gauge screws with a shank height of 5mm. These components can be found in the references section of this paper and they all have the Creative Commons Licensing.

III. Conclusion and Future Work

This assignment forced us to reanalyze our parts and physical prototype to create a layout of components that would allow us to build a shell over it and also feels good to use/play with as a controller. We had to reorganize the breadboard foundation as when we were completing the previous assignment, we didn't think too much about how it was all going to fit together; we just focused on getting every component connected and working with each other. After starting to design the shell we realized that there was a lot we needed

to take into account before we finally reached our finished project for the first iteration. Future work that has to be done is 3D printing the current iteration, getting user feedback during playtests, and then iterating upon the design.



Gantt Chart showcasing current progression and future work

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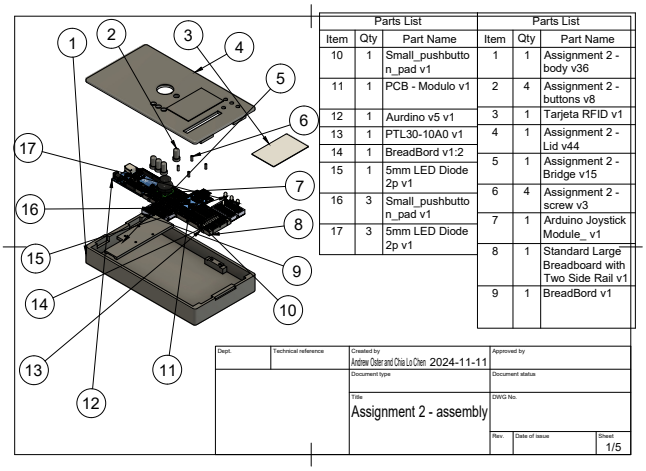
[8] Nicola Stelian Stefan. Small pushbutton SMD (6 X 6 mm footprint), 7 2024. URL: https://grabcad.com/library/small-pushbutton-smd-6-x-6-mm-footprint-1.

APPENDIX A
CONTRIBUTIONS

Chia Lo Chen's Contributions:
Design and Iterations,
Base and Bridge of Case Fusion Models,
Lid of Case Fusion Model,
Assembly Animation,
Technical Drawing Touchups,
Video Report.
Andrew Oster's Contributions:
Design and Iterations,
Components Layout Fusion Model Reconstruction,
Written Portions of Report,
Technical Drawings and Bill of Materials,
Video Report.

APPENDIX B
ASSEMBLY AND TECHNICAL DRAWINGS



Parts List			Parts List		
Item	Qty	Part Name	Item	Qty	Part Name
10	1	Small_pushbutton_pad v1	1	1	Assignment 2 - body v36
11	1	PCB - Modulo v1	2	4	Assignment 2 - buttons v8
12	1	Aurdino v5 v1	3	1	Tarjeta RFID v1
13	1	PTL30-10A0 v1	4	1	Assignment 2 - Lid v44
14	1	BreadBord v1:2	5	1	Assignment 2 - Bridge v15
15	1	5mm LED Diode 2p v1	6	4	Assignment 2 - screw v3
16	3	Small_pushbutton_pad v1	7	1	Arduino Joystick Module_ v1
17	3	5mm LED Diode 2p v1	8	1	Standard Large Breadboard with Two Side Rail v1
			9	1	BreadBord v1

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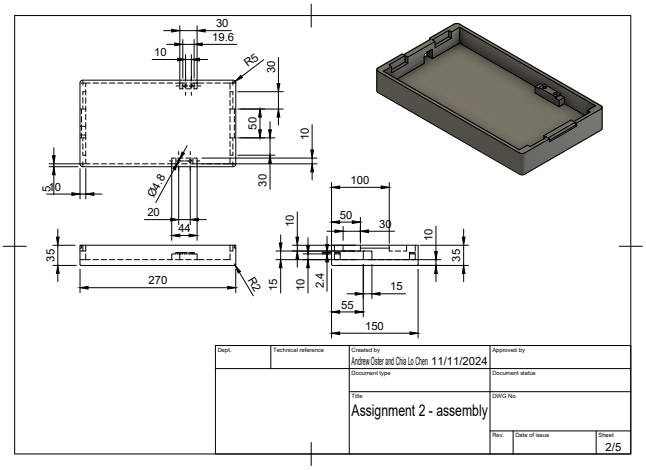
			Rev.	Date of issue / Sheet: 1/5



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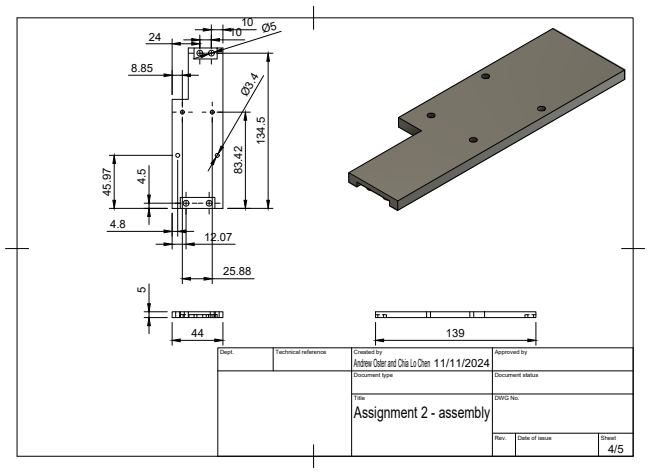

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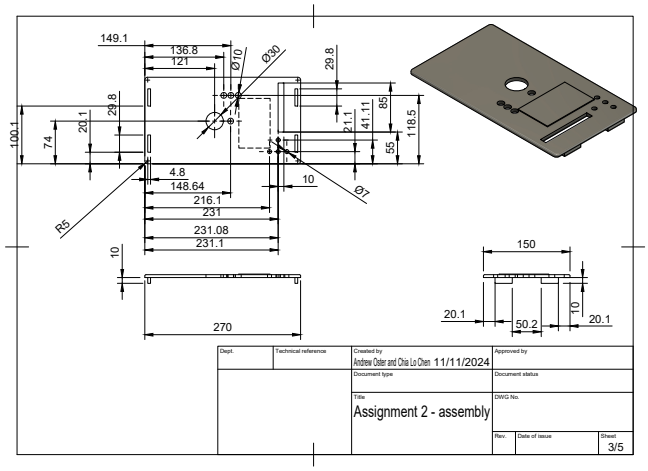

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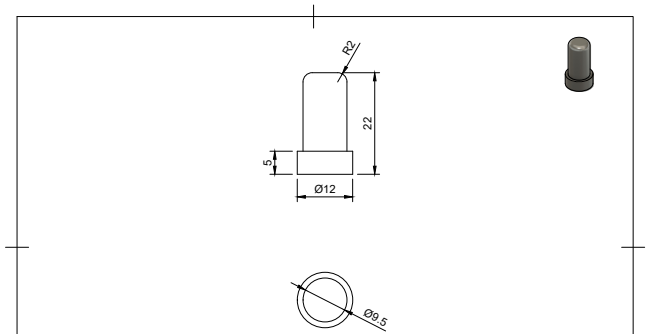

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