MRS Project Brief: Contributions and Reflection

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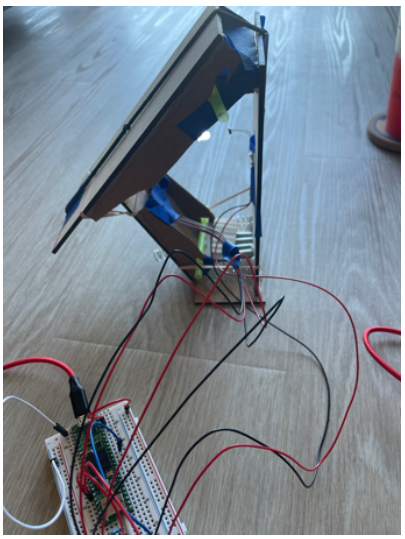
CONTRIBUTIONS

High Priority Objectives

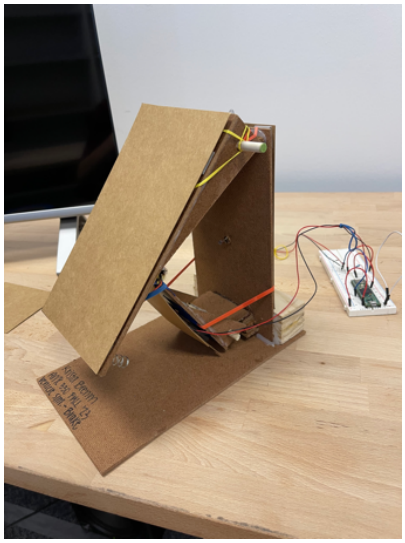
The single most important contribution I made to the simulation was the fabrication of the brake. From start to end, this process consisted of model ideation, prototyping, physical fabrication, code integration, creating the final model, and transferring the circuit to the master breadboard, which also included the gas pedal's circuit. In total, this took a little less than 1 month.

To complete the brake, numerous techniques were required including, but not limited to, physical fabrication using the laser cutter and various hand tools, electronic development and soldering in the electronics lab, as well as technological production in Fusion 360 (3D modeling) and Arduino (to write the code). The most difficult part of creating the brake was automating the resistance to where when you were not pressing down on the brake, it would bounce back to its initial state without too much force. To do so, I found that using a series of tied rubber bands provided both elasticity as well as some resistance. Another challenge came when it was time to make the final model. I found that it was more difficult than I thought to replicate this resistance as the prototype was more 'bouncier' than the final model. This is believed to be because the final model is made from heavier material and contains two top panels, not one. The combination of these factors makes it more difficult to have resistance of the same caliber.

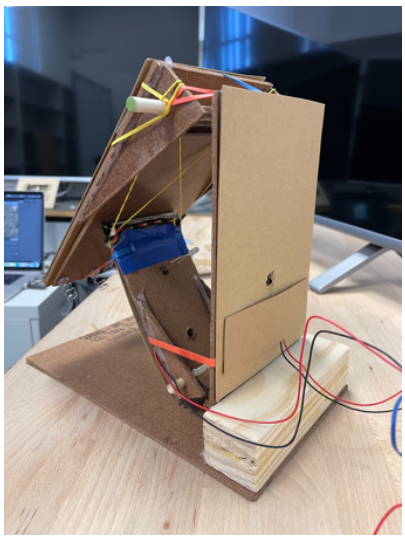
Prototype



Final Model



Resistance



To contribute to the overall objective of "creating an interactive experience that integrates and tightly couples physical and virtual features" this piece can be considered a vital component to the system. Specifically,

- Creating a strong sense of causality between the physical and virtual environment, and
- Integrating sensory modalities (visual, auditory, haptic, and olfactory into unified experiences

The brake provides a means between the physical and digital worlds by allowing users to physically push down on a brake, but see the vehicle slowdown on the screen in the game engine.

Low Priority Objectives

Next up, I took liberty to start working towards the completion of the vehicle chassis. This started out as simply making a series of measurements in the Matthew's Center room before the entire class came together to construct. I would consider this task as a whole to be a high priority objective, however the individual components and my contributions specifically would be considered low priority. I say this because once this task was turned into something the group completed, it wasn't so much up to one individual to complete a specific part of it as it was vital for the group the construct the chassis entirely. Once the chassis' foundation was built, I was then able to go in and work on aesthetics. This consisted of painting all of the encapsulation pieces black so that once the 'roof' and 'door' were added you felt as if you were actually in an enclosed space. In terms of contributing to our objective, these task(s) specifically focused on:

Encapsulation Pieces Initially

- Building highly realistic physical props/ structures/interaction element
- Creating a strong sense of causality between the physical and virtual environment, and
- Building lots of simple physical props/structures/interaction elements

Painted Encapsulation Pieces

Finally, I worked on the game-engine side of tasks attaching audio to the wheels in Unity. To do this, a script was created with an audio file that made the audio a child of the vehicle (the wheels specifically) to where the audio changed based off of the wheels moving and/or stopping completely.

REFLECTION & COURSE COMMITMENT

In terms of commitment to the class project, I would say I was very committed, however slowed down in my efforts as time passed. When we first started discussing the prototypes for all of the various elements required back in October I was still confused on where to start physical fabrication for any of the pieces, however I was eager and willing to take on the brake. Starting off by creating a working prototype, I was then able to determine what changes were needed for the final model. I very quickly produced the final model with the integrated circuit, in just one week's time. At this point in the project, you, the professor, recommended that we amp up our ambitions for each week. While this was the largest piece I worked on for the project, it is also one of the most important pieces as the vehicle could not operate without a brake. I was so committed to completing the brake as quickly as possible that even with the laser cutter being down and me being out of town that entire week, I was still able to get it completed and even went as far as to bring it on an airplane to get it back to Arizona. This all occurred and yet I was still able to get it submitted in time for the week. This accurately represents how I went about submitting all weekly plans and documentation in a timely manner. Despite the times where we, as a class, weren't entirely headed anywhere because others did not submit anything, I feel as if I did the best I possibly could at progressing forward individually.

With that being said, this project was unlike anything else I have ever worked on before. Previous to this class, I had very limited experience fabricating (I had only ever used the laser cutter once before) and have never even touched Unity. Having only experience in circuits from the previous AME 240 class, I still would consider myself an amateur in the field, however this project showed me the possibilities that lie within Arduino and the physical-integrated realm.

While I do feel that I was incredibly productive at the beginning of the project, over time, as I mentioned, I feel that I slacked off more than I planned too and found myself working on things that didn't necessarily require an entire week to complete, such as painting the vehicle MDF. This started, I believe, when I decided to work on the vehicle chassis after completing the brake. Originally when I mentioned that I was planning on working on the chassis, I thought that it I could easily complete it myself over the last few weeks. However, I was incredibly wrong and as soon as we turned the chassis into more of a group task where everyone was involved, I began to step back a bit and allowed the chassis to be completed in class, with very little outside effort put in by me. This is not what I intentionally planned, however I am glad that the chassis was turned into something everyone could work on because looking back there is absolutely no way I would have been able to complete it alone.

The project, as a whole, I would say was 90 – 95% successful. I say this because the class is a very small group and while it was impressive what we were able to achieve, there are areas we lacked to focus on such as interior décor. At the beginning of the project, we were tasked with a list: a list of subtasks ranging from vital to minor. The first few weeks of the project it felt as if everyone was consistently working on the same thing and that thing only. This made it difficult to complete as much of the list as possible. Because the physically fabricated items were the most important, this is what everyone focused on, including me, and as they were finished then, and only then, did we begin to focus on other pieces. Additionally, when we first started working on the project, oftentimes not everyone was submitting assignments on time, or at all, making it difficult to continually make progress. This, I feel, relates to everyone's individual commitment. One thing I think us as a group could have also worked on was communication outside of class. We did create a class Discord back in October, however only spoke in it one time once it was created. This only made it more difficult to understand what everyone else was working on and to know what was currently being worked on. Yes, there was the class document everyone was supposed to add comments to when planning, however because of the lack of the groups' communication outside class, that document provided very little information as to where everyone was specifically and where they intended to head next.

Overall, this project was very rewarding. When the project was first introduced at the beginning of the semester I had absolutely no idea how we would even pull it off or what it would even look like – I had never heard of such a robust task. If there was anything that I would change next time, it would be my willingness to push myself to complete tasks I would be uncomfortable in. What I mean by this is even though I pushed myself in the fabrication, I 100% avoided Unity at all possible because I have never been taught how to use it, therefore I didn't want to learn it on my own. While I did work on a small aspect in Unity at the end of the project, I had no desire to whatsoever. However, when I did actually work on it I did enjoy it and found that once I was working through it, it wasn't nearly as bad as I thought. This is definitely not the mindset I should have had (especially because I am taking a class in Unity next semester) and I want to continue to push myself. By working on this project, I can confidently say I am much more comfortable walking into both the fabrication and electronics lab and asking for help. I also have continued to work on my circuitry skills – something I don't see going away anytime soon as I plan to pursue my Master's at ASU in either electrical engineering, computer science, or media arts and sciences.