

# The Helping Hands

Eric Aivaliotis

*Game Development and Entrepreneurship*  
Ontario Tech University  
Oshawa, Canada  
eric.aivaliotis@ontariotechu.net

Hao Tian Guan

*Game Development and Entrepreneurship*  
Ontario Tech University  
Oshawa, Canada  
haotian.guan@ontariotechu.net

**Abstract**—Video games are a form of entertainment that is enjoyed by lots of people. However, for some people this may not be the case. For the most part, game hardware is designed, manufactured and sold with the intention that able bodied people will make use of them. This motivated us to design a controller that can be used by a person with a physical disability. There are multiple kinds of physical disabilities but we only mainly choose to do a controller for those who have one working hand. There is honestly no specific reason as to why we choose to design our controller for this specific type of condition. It just sort of happened. In this report, you will see the progression of our design and the outcomes.

## I. INTRODUCTION

Hardware is an essential component when interacting with software. This is true for video games. Hardware designed for video games is important as players need an effective way to interact with the game. However, game hardware is designed mostly for those who do not have physical disabilities. People with physical disabilities may feel left out and there are those who have resorted to coming up with creative ways to playing video games working around their disability to play video games. This is what motivated us to created The Helping Hands prototype for the game hardware course. The Helping Hands is essentially a controller designed for the Xbox that is broken up into 2 separate parts, the foot controller and an arm joystick. The idea was that a person can use their functioning hand to hold one side of an Xbox controller and use one side normally while their arm with the disability uses the arm joystick and their feet controls the foot controller. The arm joystick is meant to take the place of the thumbsticks you find on an Xbox controller while the foot controllers take the place of the directional pad or the ABXY buttons on an Xbox controller. For this course, we made a paper prototype alongside with an low fidelity interactive scene in Unity. For the paper prototype, we had no electronics so we resorted to using Tinkercad to make a digital electronic layout.

## II. LITERATURE REVIEW

As a requirement, we had to look at references when coming up with ideas and designs for our prototype. A lot of our inspiration comes from the Microsoft accessibility controllers[1].

The designs of that controller were what inspired the foot controller. Such design characteristics being that the controller was big and flat like a plane like surface with large buttons. Also, on that same web page where we saw the Xbox adaptive controller, there was a YouTube video showcasing gamers with physical disabilities at a hospital. The video showed off the Xbox adaptive controller along with other devices that I don't believe are available on the market. One of the devices shown in that video inspired the arm joystick. In addition to the Xbox adaptive controller, the controller boxes created by RJ Cooper and Associates were also an inspiration to us in coming up with our design[2]. While looking for inspiration, we were looking at research papers to find more inspiration. From reading "Who Gets to Play? Disability, Open Literacy, Gaming" by Katie Ellis and Kai-Ti Kao, it turns out that there is a whole online community of disabled gamers. There exists an online forum called "r/disabledgamers" on the website Reddit [3]. On this forum, disabled gamers can discuss their needs and on any advice on controllers, specific needs or just about accessibility. Also, reading "Game Accessibility: a Survey" by Bei Yuan, Eelke Folmer, Frederick C. Harris, Jr., the paper discusses how other types of controllers that exists for players who are physically disabled. Such controllers being switch inputs, brain wave controller, head tracker, eye controllers, mouth controllers and one hand controllers[4]. We never really took inspiration from any of these (except for a bit of the design from a few pictures shown) but it was interesting to see the ideas that are thought of.

## III. METHODS

You can see our simple diagram in figure one which represents the iteration process. The blue circle represents our initial design. The orange circle represents added improvements (iterations) and add to to our initial design. We repeated this process multiple times throughout the semester until we reached our final design which is represented by the green circle. We modified our design multiple times throughout the semester. The reason for this is because we found faults in our current design. One notable change was shrinking down the size a bit. Other differences being simplifying the controllers. The original controller had more buttons than the four main

ones. There were going to be buttons to represent the trigger buttons that would be on the back of a normal controller.



Fig. 1. simple flowchart

#### IV. RESULTS

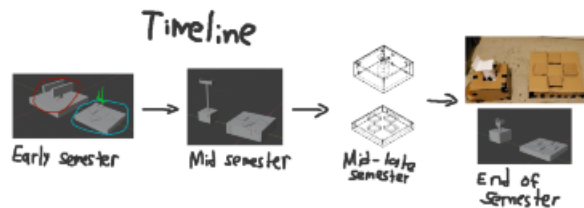


Fig. 2. Timeline

SUS score	
	85
	77.5
	75
	82.5
	60
	82.5
	77.08333333

Fig. 3. SUS score

As you can see in figure 2, we made changes over the semester. Some of these changes were already explained in the previous section but this section will go into more detail. As you can see on the timeline, our idea was just a rough mock up of what we initially had in mind. Over the course of the semester, we changed it up. Later on, things became more formal. We had to choose final measurements as for assignment requirements (such as setting it up in a software to be 3D printed). On the right hand side of the timeline is our final end product. During the April 7th lecture, the professor advised the class to bring our paper prototype so other classmates could get to analyze each other's projects. We got to do a System Usability Scale (SUS). The Helping Hands did a good job on the SUS results with a score of 77 with mostly good comments from classmates.

#### V. TAKEAWAYS

Working on our project was a good and interesting experience. It got us thinking more about the disabled gamer

community. To be perfectly honest, coming up with ideas was kind of difficult. Its kind of hard to come up with a controller that is going to be efficient and easy to use for those with physical disabilities. However, it was kind of an interesting experience of going through the process engineers do when making and inventing products. Also, it was interesting to see our classmates reactions to our product and got some feedback because it was pretty much the 2 of us who were exposed to the product (because we were the creators). One thing that we should defiantly change if we were going to do this again is to not have our controller be two separate bodies. Thinking back, our controller was pretty clunky and inconvenient, especially compared to the products our classmates came up with. I guess it a learning process to see what works and what does not. In conclusion, that is The Helping Hands.

#### REFERENCES

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