Chimera Mouse Project: Accessible Gaming Mouse Controller

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***Abstract*—This paper details the ideation and creation process of a computer mouse designed for video gaming entertainment with accessibility needs in mind. Specifically, the mouse is to be designed to primarily help those who only have the function of one hand when it comes to the usage of technological devices, and therefore, this mouse is designed to be used by these users when they are playing video games. The mouse detailed is one that will have keys and buttons that are designed for games that fall under the action-oriented role-playing games genre, as well as first-person shooter genre of video games.**

***Index Terms*—accessibility, gaming, disability, video games, controllers, ergonomic, design**

I. Project Introduction

A. Problem Definition

Accessibility in gaming is a relatively recent subject area, with games implementing various settings and options that make gaming more accessible and playable by everyone, including those with disabilities. However, while some accessibility options can be accommodated using technical methods such as coding and keybindings, there lacks a sufficient amount of options when it comes to physical accommodations for gaming.

One of the most widely used hardware in gaming is the computer mouse. There are computer mice specifically designed for gaming, called gaming mice, that have additional inputs such as buttons and joysticks that give the player access to more buttons at their disposal. Many games have taken advantage of this widely used hardware and implemented commonly used buttons on these gaming mice in their games.

The issue arises when it comes to accessibility; not many computer accessories - such as keyboards and mice - exist in the first place as accessible options for those who need it. There have been various devices created for accessibility in gaming, such as gaming controllers that can be controlled by other body parts besides hands, or for those with limited use of their hands, but these are controllers, rather than computer mice usually used for computer gaming.

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Thus, the concept of the accessible computer mouse was created. The target user for this computer mouse was for people who have the usage of only one hand when it comes to gaming. This was chosen as a specific target as there are not too many devices out there that assist with this specific type of disability, and definitely not any gaming specific like a computer mouse.

II. Justification

A. Addressing the Problem

This is an already occurring issue that exists today. Accessibility options for technology is surprisingly quite limited, despite technological capability to accommodate for disabilities, and even more so when it comes to gaming. The people who would be affected by this issue that this solution would solve would be those with disabilities that would limit the usage of one of their hands, whether this be a physical or mental disability. They would have access to a device that would allow them to play computer games using a mouse that would also grant them access to keyboard keys and capabilities.

The problem of not having more accommodating devices is a fairly widespread issue, not just in gaming specifically. For general computer use, there are limited options for those who only have control over one hand for computer usage, meaning that there are not a lot of options for those who need it.

Why should video games be accessible to more people? The answer is straight-forward: ”Video games have become an increasingly important cultural medium. At the same time, a significant portion of the population has a disability, which often leads to difficulties playing video games.” [1: ii] By allowing more people to play video games, they are able to participate in a popular entertainment activity along with others. There should be no reason why they should be excluded from playing video games solely because of their disability. With approximately 13.7 percent of Canadian adults having a disability [1:1], this is a substantial amount of people who run face this problem.

As it has been noted by Brown and Anderson in 2020, ”Video games stand out as a noteworthy part of media’s

relationship to disability, given how they are physically quite demanding and often require mastering inflexible, quite complicated, input devices and techniques." [2:3] This further highlights the need for an alternative option for users with disabilities when it comes to gaming. Video games are not as simple as creating an everyday tool that can generally be mapped for several purposes; many of them require complicated inputs and movements that are not typically used in day to day usage of computers. This is where an accessible gaming mouse comes in as an idea.

A great blog post made by Hawley details her experience with playing video games, discussing how she has turned to more mouse-only video games as using a keyboard in games requires the management of more than one button at a time as well as quick reflexes [3]. She still plays first-person shooters and similar games from time to time, but the lack of customization options for keyboard keybindings leaves her too frustrated to play them very often, she notes.

Another great blog post is by Baker, who discusses various accessibility options that he has looked into as a gamer with disabilities himself, and he highlights ones that are effective, as well as discuss further solutions to the issue at hand. He even talks about some pre-existing controllers, not necessarily designed for people with disabilities. "One-handed controllers and one-handed gaming keyboard and mouse combos might also prove beneficial for some players, even if they were not designed with accessibility as their primary goal." [4] According to him, there is definitely a need for accessible options when it comes to specifically game related controllers and devices.

III. Ideation

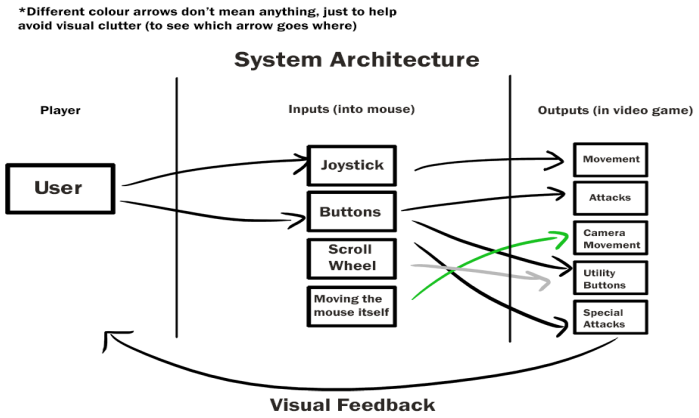
A. Design Thinking Outcome

The design concept was initiated as a gaming mouse for people who have limited mobility; more specifically, those who are only capable of the usage of one hand.

While going through the design process, friends were consulted on their thoughts and ideas on the project. These friends have experience with the types of games I wanted to focus on, being first-person shooter games as well as action role-playing games. Some of their suggestions were as follows; tasking the thumb as the finger in charge of movement for the player, using the middle finger as the "trigger" button (for attacks), using the index finger for scrolling through menu options, and also using the index finger for using special buttons (such as those for special attacks, etc.) They also expressed that an affordable gaming mouse would be a good idea, so that is a point to keep in mind while designing the gaming mouse. It was also brought up that adding additional ports for the users to attach their own buttons, switches, or other input devices would be a good idea to have as a customizeable option, as well as the ability to customize their own keybindings.

B. System Architecture

Based off of the suggestions and ideas from friends, a System Architecture was created.



IV. Product Comparison

There have been a few options created when it comes to accessible gaming devices.

There is the XBox Adaptive Controller, which is a device that offers several options when it comes to accessibility for those with limited mobility, designed by Microsoft. Some of its features include programmable, large buttons as well as the capability for the user to attach their own preferred gaming devices such as joysticks or switches to allow them to create their own controllers. [5]

Another example is LipSync, a mouth controlled input device that allows for a user to operate a touchscreen without the usage of their hands. The device, controlled by minimal mouth movements of the user, lets them make contact with a touch screen device using a computer cursor on screen.

These are great accessibility devices that have been created, but this still leaves a lack of computer gaming specific accessibility devices.

V. Planning

A. Gantt Chart

	Name	Start date	Deadline	Assignee	Done
1	Define problem	February 4, 2022	February 7, 2022	Tia Lee	
2	Need finding	February 4, 2022	February 7, 2022	Tia Lee	
3	Arduino and electronics	February 5, 2022	February 9, 2022	Tia Lee	
4	Designing inputs and outp...	February 5, 2022	February 9, 2022	Tia Lee	
5	Product design	February 4, 2022	February 6, 2022	Tia Lee	
6	3D printing	February 17, 2022	March 24, 2022	Tia Lee	
7	User testing	April 7, 2022	April 14, 2022	Tia Lee	
8	Final Presenting of Product	February 5, 2022	April 17, 2022	Tia Lee	
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B. Roles and Responsibilities

- Researching design ideas for the mouse (Tia)
- Designing the gaming mouse prototype (Tia)
- Designing the logo and name (Tia)
- Developing the controls of the mouse (Tia)
- 3D printing and physically creating a prototype of the mouse (Tia)
- Testing the prototype of the mouse (Tia)
- Finding playtesters and running playtests with the mouse (Tia)

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