Computer Mouse with Analog Stick (Assignment 1)

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I. Project Description

Our product is designed for people who would like to game with one hand whether it be from a disability, an injury, or just for convenience. In order to be able to meet those needs we created a computer mouse packed with all the necessary inputs for a simple first-person shooter game. Adding an analog stick onto the side of the mouse along with the side mouse buttons on a typical mouse should provide the player with the inputs to play a simple first-person shooter with only one hand. Although that is our main target, we believe that our product can have alternative uses evident from other similar products. Other mice that are similar have analog sticks that are fully rebindable and we believe that our mouse will serve well for binds in either gaming or productivity. First person shooter players that play with one hand typically utilize the many single-handed controllers that exist on the market. Most gamers especially PC gamers would prefer to use a mouse for PC shooters and thus we believe that our product would be able to fill that void for one-handed gamers on PC.

An article from a website dedicated to one-handed accessibility (III-A) talks about the gaming peripherals of a one-handed gamer. To quickly summarize, this particular person who plays games with one hand utilizes a handful of peripherals as well as software and rebinds a number of them to perform different tasks such as a racing sim foot pedal is rebinded for using potions in certain games as an example. With our product, hopefully we can reduce the amount of software or peripherals required to perform those tasks by having as much as those additional needed inputs packed into the computer mouse.

Another website reviews gaming mice for first person shooter games (III-B) and this is useful information as we're also gearing our mouse towards first person shooter players. Some common trends I noticed in the mice talked about in the review are the fact that most of them are built to be light, most of them are wireless, and there's an emphasis on low latency. Obviously comfort is also a major concern as nobody would want to use a mouse that's extremely uncomfortable. Even though comfort is important I noticed that none of these mice that first person shooter players use are vertical mice. Taking all of this into account our mouse will be more traditional, to make our mouse lighter we will have it wired and latency all depends on the sensor.

A short journal article speaks about assistive technologies (III-C) and we think that our product falls under that category of assistive technologies. Although the article mainly speaks about disabled workers that are unemployed it can also be said that within the country's disabled workforce there are people who could utilize a product that allows you to use a lot of the computer's functions with only one hand. Having more inputs in one hand allows for greater efficiency in any task someone would have to perform and perhaps that would be able to help those that's included in the disabled workforce.

One of the papers that we referenced (III-D) talks about the impact of different controllers on FPS games. This article is relevant in the sense that it can be compared to other controllers that are studied in this paper. Some controllers referenced are Wii remotes, computer mouses, and Xbox 360 controllers. Things like computer mouses obviously out perform other controllers in terms of precision and speed when aiming in FPS games. Our product idea would be something akin to a combination of a computer mouse and an Xbox controller as there's a combination of the joystick for movement and the mouse precision for aiming. Although the precision of our product may be inferior to traditional mouses as now there is an extra input to control and perhaps the analog stick inputs will throw off the aim of a player, our controller is still vastly better in terms of precision to Wii remotes, Xbox controller aiming, or even older keyboard aiming. With better precision than some of those modern controllers, our product can be relevant and could potentially be a good way for people that play with one hand to compete with the users of all those other controllers.

The patent that we have found is a mouse with a joystick (III-E). Although it's similar to our product idea, it isn't exactly the same, as the function of the joystick on the patent seems to be the thing that manipulates the cursor and the joystick itself is meant to be compact and fold into the mouse when not in use.

II. System Architecture and Prototypes

Our initial product circuit shown in **Fig. 1.** features only the basic mouse buttons with 2 side buttons and the joystick which is substituted with potentiometers in the circuit to act as the XY plane that the joystick would be in. When idle the current passes through the button and straight to ground so nothing happens. Once the button is pressed, the current alternates and enters the wire that's attached to the Arduino. Any excessive current passes through the resistor to prevent overloading the components. After the inputs are received by the Arduino, it communicates with the computer and the output that the

player will see is whichever input they initially put in, such as: if they hit mouse 1 in a shooter then they would probably see the output of their character shooting something in the game. That's how the circuit itself works.

As for the system architecture **Fig. 2.**, we have the user inputting commands to the system. Everything they would input would be through the mouse. The mouse has a multitude of inputs such as the buttons, the sensor, and the analog stick. Each of those communicate with the Arduino which would then translate into actions on the computer and those actions are the outputs/visual feedback that the user would then experience.

In **Fig. 3.**, this is a rough sketch of roughly what we had thought for our product. Similar to the circuit simulation, this sketch lacks buttons as our initial idea only had the basic mouse buttons as mentioned earlier. The shape and placements are also very rough but will be adjusted in the future to see what is the most ergonomic.

Fig. 4. is an image of what our paper prototype of our product is. The cylindrical paper sticking out of the mouse is roughly where we think the analog stick would fit in. The buttons and mouse wheel are drawn on and the placements are rough as mentioned from the rough sketch. The size of the prototype is the size of an average mouse roughly. The ergonomics of the mouse and the actually size will all depend on when we actually do physically designs for the shell as it's quite difficult to tell whether or not something actually works until we get our hands on something more solid. But as for what we have so far and the feedback we've gotten from the other 2 groups we collaborated with, they said that the shape, size and analog stick placement is alright so far.

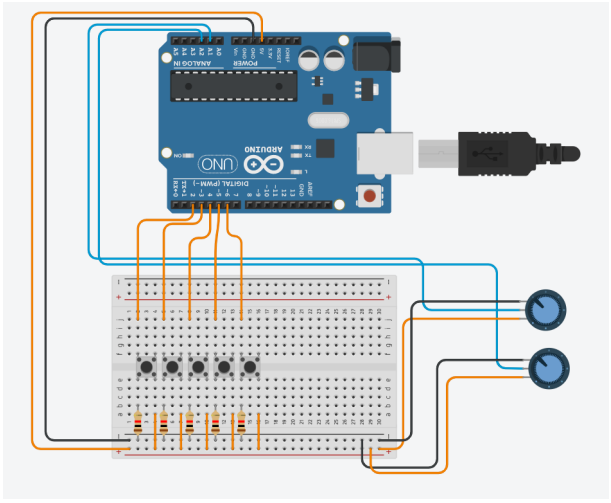

Fig. 1. Our simulated product circuit

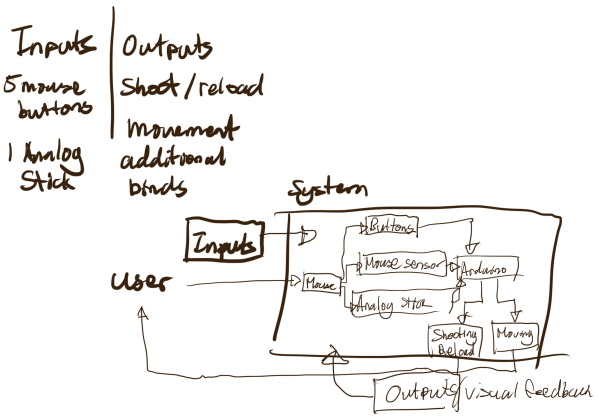

Fig. 2. System Architecture

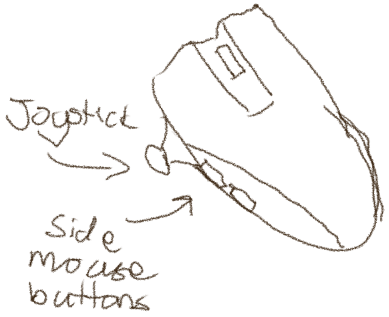

Fig. 3. Rough sketch of our product idea

Fig. 4. A paper prototype of what we envision for our product

III. Sources

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