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Art 385

Final Project Ideation

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Document Info

I will be prototyping a gaming peripheral for consoles that does not require the use of the fingers and thumb. Basing it on the control scheme of the 5th generation consoles (Xbox one, PS4 and Nintendo Switch. While the possibility of this prototype can extend to PC gaming, keyboard and mice controls are not supported. This prototype will attach to the user's body like clothing and will detect subtle movements of the upper arm as inputs. As such, the following control scheme has been ideated:

D-pad/Joystick: Controlled by circumduction movement of the arms. Assuming the user is using their right arm, moving the arm forward will read "up", moving it away from the body will simulate "right" and moving it towards the torso will simulate "left" and so on. Thoughts of adding functionality to the opposing d-pad/joystick on the same side of the controller were present in the previous stage of development by adjusting the user's shoulders but implementation at this point is difficult.

L1/R2: Controlled by pronation of the arm, meaning inward twisting of the arm. Left arm will control L1, and the right arm will control R1.

L2/R2: Controlled by subnation of the arm, meaning outward twisting of the arm.Similarly to the last control set, left arm will control L2, and the right arm will control R2.

L3/R3: Controlled by flexing of the muscles picked up by myoelectric sensors. .Similarly to the last control set, the left arm will control L3, and the right arm will control R3.

Audience

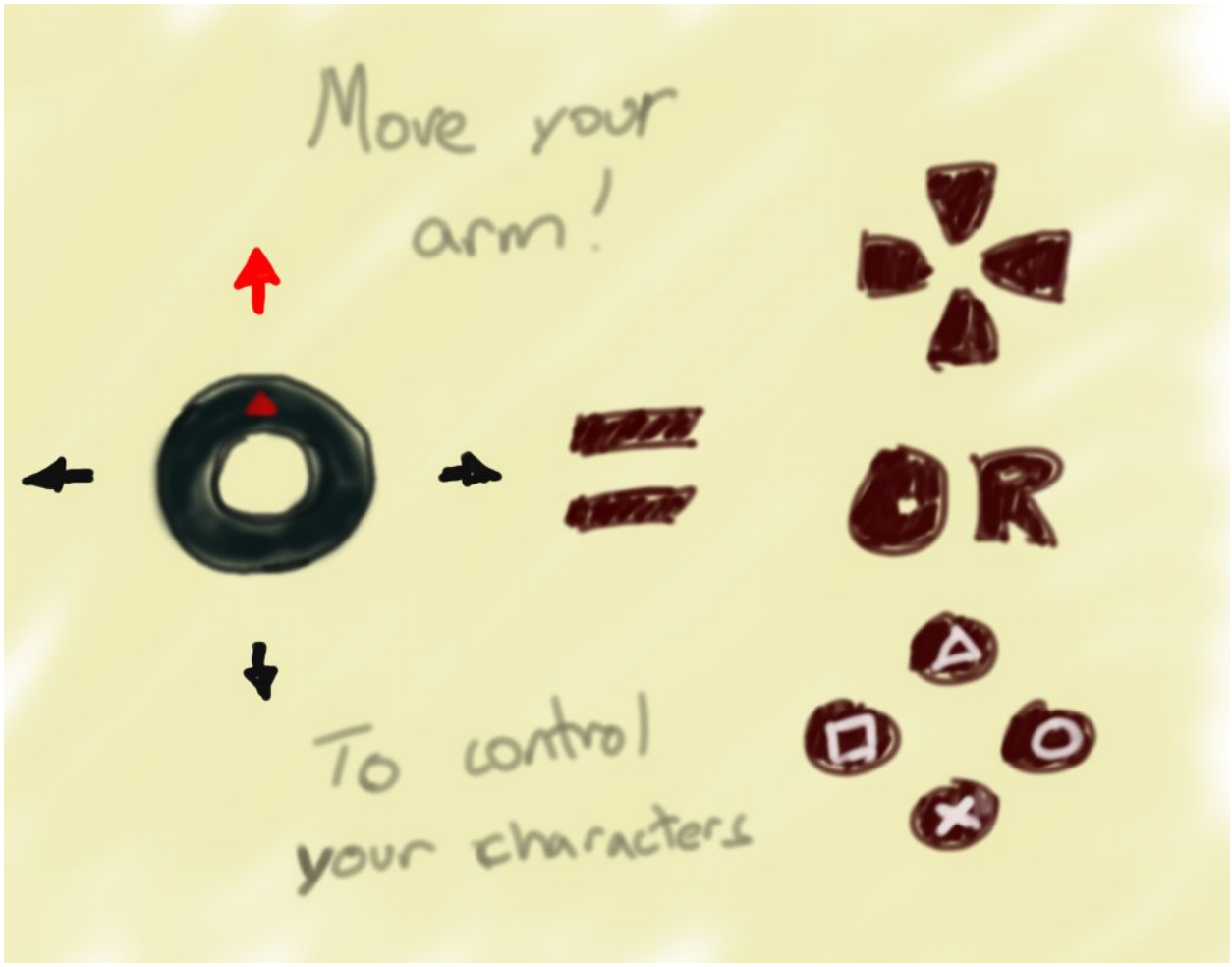
The specific audience targeted by this project idea are for individuals without the ability to operate a console controller with their hands. This project seeks to remove the necessity of using hands to operate a complex control scheme and instead focuses on the user's upper arms. This project is directed at those without forearms whether it is caused by a birth defect or an accident since many people within this demographic play games yet find it difficult to do so due to the necessity of finger dexterity for some genres. However, those outside of the target audience may also use this product as it can be controlled solely through the use of the upper arm. Originally,

this product would require the use of a myo electric sensor, which is a surgical implant for people with prosthetics used to control motorized prosthetics by sensing electrical impulses in the muscles. However, I have decided to let it sense a person “flexing” since it is a broader action and doesn't require surgery.

Interaction Diagram (Interface Design)

Due to the complexity of the prototype, and the limitations of the sensors, I can only create a limited model of the prototype. As such, I have divied up the resources so they can reflect each of the control schemes:

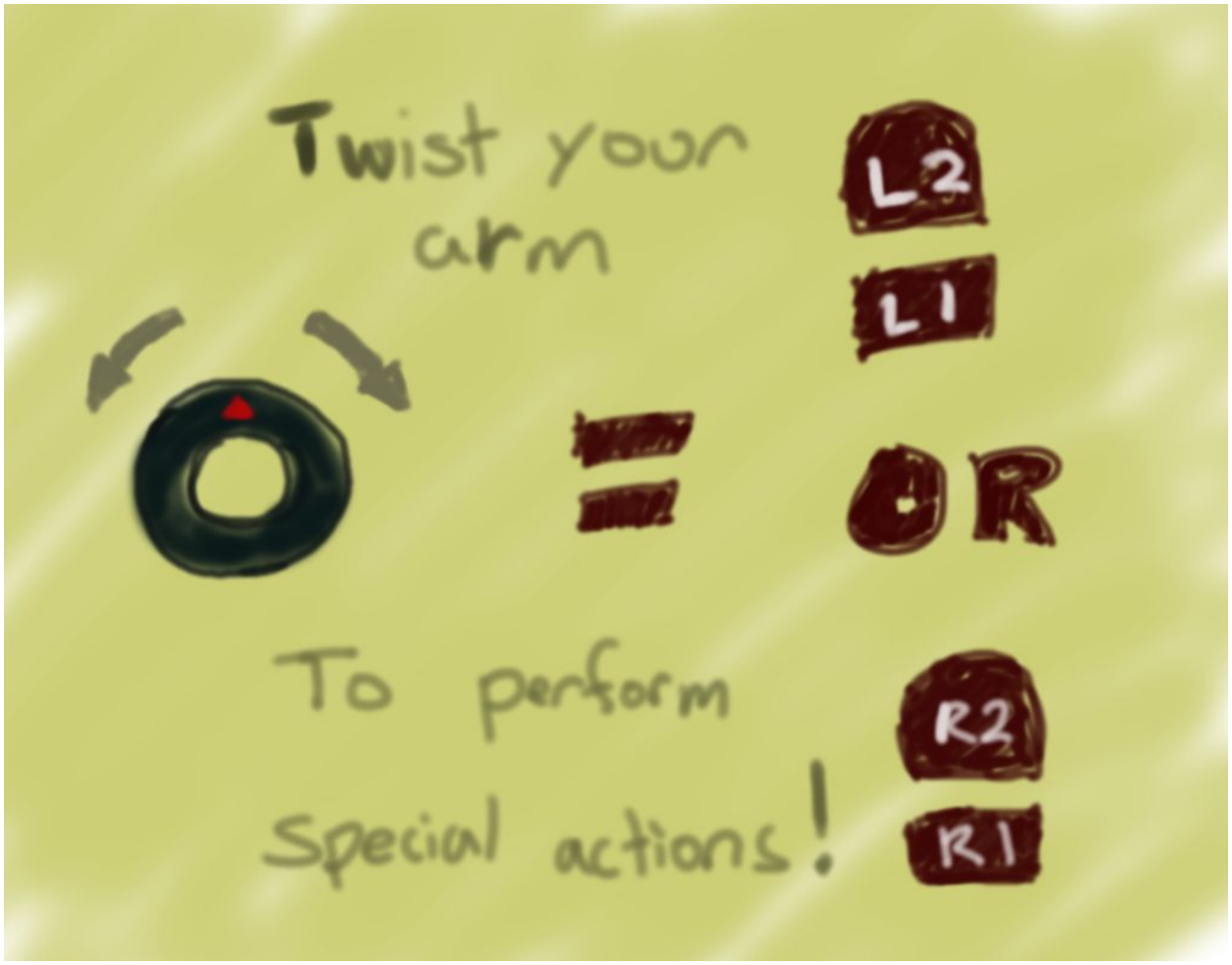
Button: Buttons were to be used to represent the actuation of the D-pad/Joystick when the user is circumducting their arms. Based on the layout of a JLF arcade stick, button presses was going to represent a single switch being actuated. However, due to the lack of buttons (I only have one), I just moved the entire layout to the keyboard keys instead. The keyboard keys will represent the 4 directional buttons on the keypad as well as the “triangle,”square”, “circle” and “cross” button on the right side of the controller.



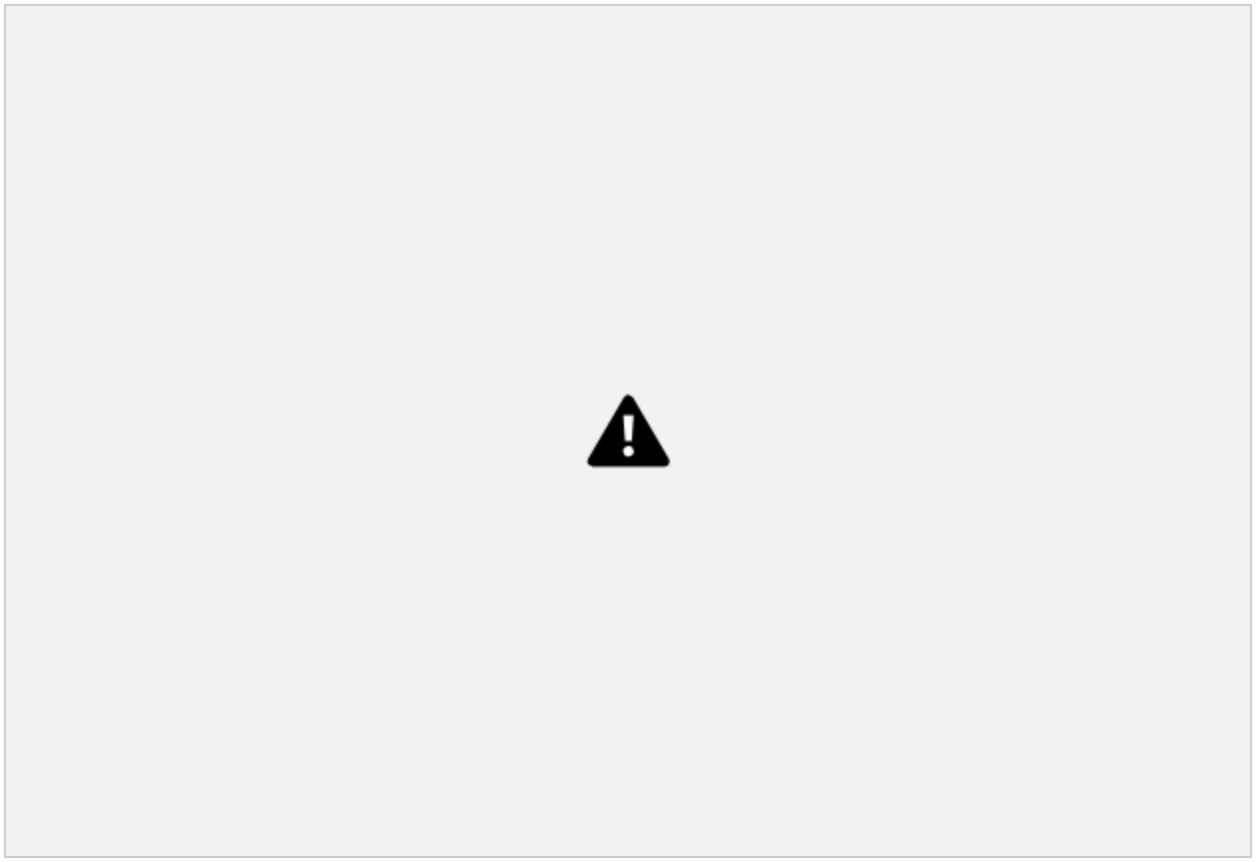
LDR: This project was going to use myoelectric impulses to check for muscle contractions. The reason being that the LDR seemed like the perfect tool to check this as neural impulses travel as energy (like light) and the LDR can pick up the absence of presence of light. After much consideration, I have changed the input from a neural impulse to flexing because it just seems more user friendly. Same concept however, as the flexing is just a more prominent neural impulse than something as subtle as the ones a myoelectric sensor can pick up.

Potentiometer: Lastly, the potentiometer will be used to represent the pronation and subnation of the arms since this is the only sensor you can twist. I will base the arduino on the “left side” of the controls so twisting the potentiometer clockwise will be pronatio and twisting it counterclockwise will be subnation. Obviously, since the user is twisting their arms, its like a potentiometer where it changes values based on how much the user twists the knob. Instead of

having a range of 4095, there will just be 3 distinct interactions: off, L1 input and L2 input.



While all of the inputs are from different sensors, the output will be relatively the same for all of them:



Hand-drawn sketches