

Accessible inputs using foot control

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Abstract—Racing games have become a very popular genre for video game players. As such, many more people are exposed to racing games. However, some players cannot afford to purchase racing accessories or have mobility issues that prevent them from using traditional racing accessories. Designing a cheaper, more accessible version of racing accessories would allow more players to have a more immersive gaming experience.

I. PROJECT DESCRIPTION

A. Description

When using racing accessories to play racing games, players often use accessories that mimic a cars steering wheel and pedals. For players with financial constraints, such accessories can be very expensive and prevent them from playing racing games. For players with mobility issues, it can be challenging to use such hardware. This can negatively affect the gaming experience for certain players. This project seeks to create a cheaper, configurable, and more accessible alternative to the standard racing pedal and steering wheel.

B. Justification

This project seeks to help players who either cannot afford to buy a complete racing wheel and pedal setup, those who don't have the room for such a setup, and those who cannot use racing accessories due to motor disabilities. Currently, all racing peripherals require a large amount of space and a permanent setup. This project seeks to provide an alternative to the standard racing peripherals by shrinking down the footprint into a small box that would be laid on the ground. This could also help players who don't play racing games by providing an alternative analogue input method.

II. IDEATION

A. Thought Process

The aim of this project is to provide players with an alternative way of providing a game with an analogue input. This will be done through the feet of the user. As such, the project must be small enough to fit under a desk near the user's feet, and still be large enough to fit all the required hardware. While software and accessibility settings in racing video games can help certain gamers, it may not be enough for certain physical disabilities.

B. Prototype Ideas

Prototypes for this project included using a potentiometer to measure the foot rotation of the user. Other ideas included using an accelerometer to measure the foot's rotation. These were deemed to be far too cumbersome and difficult to wear for someone with limited mobility. A solution would

need to be one where the user does not need to wear any accessories. As such, the prototype will use an ultrasonic proximity sensor to detect the distance of the foot from the sensor. The distance of the foot would then be converted to an analogue signal based on the user-defined sensitivity of the sensor. The proximity sensor will be housed in a shoebox-sized enclosure where the user can easily place their foot.

III. COMPARASON

A. Racing Wheels and Pedals

Most racing wheel and pedal accessories sold nowadays feature a wide array of buttons and features to help make racing games more exciting and easy to use [4]. However, these buttons and features may be inaccessible for those with disabilities. Compared to today's racing pedal accessories, this project does not require the user to press down on any pedals. This can help those with mobility issues, or those who suffer from joint pain like arthritis. This project will also allow the user to place the sensor on its side in order for the user to move their foot from side to side instead of up and down. This is especially useful for those who use prosthetics or are missing parts of their feet as racing pedals only allow for vertical movement of the foot. Since every disability is unique, even certain modified racing wheels cannot help all disabled gamers. For example, the Ford Adapta HSB Adapts Steering Wheel requires the user to use their fingers in order to press levers on the steering wheel to replace the use of pedals [1]. This requires the user to have dexterity in their fingers for precise inputs on the pedal lever. Other alternatives require the user to push on certain buttons using their hands or feet [2] [5]. While both the racing accessories mentioned can help certain gamers with disabilities, this project seeks to be an option for those who cannot use the alternatives mentioned previously.

B. Game Controllers

Today's controllers feature a wide range of analogue inputs. However, many of these inputs can be difficult for someone with mobility issues to use. For example, using a controller for extended periods of time can be very stressful on the muscles and joints of the hand [3]. Modern controllers also have a very short travel distance whilst using their analogue sticks. This makes it difficult to perform precise inputs. The benefit of this project is that users don't need to hold anything in order to generate an analogue input. Users can play with their limbs in a relaxed position and still have the sensitivity and precision they need when playing games.

REFERENCES

- [1] Melillo, J. (2022, May 4). Team Fordzilla, HiSpeedSim unveil accessibility-forward racing wheel and Rigs. Traxion. Retrieved September 28, 2022, from <https://traxion.gg/team-fordzilla-hispeedsim-unveil-accessibility-forward-racing-wheel-and-rigs/>
- [2] Leading the push for Accessibility. Project CARS 3. (2020, October 15). Retrieved September 28, 2022, from <https://www.projectcarsgame.com/three/news/leading-the-push-for-accessibility/>
- [3] Proma, F., Imrhan, S., & Ricard, M. (2019). Quantifying Finger Strain In Video Gaming.
- [4] Houle, J. M. (1998, November 3). Video game control unit with self-centering steering wheel.
- [5] Davis, W., Reese, J., King, J., & O'Brien, D. (2021). Sim Wheel Hand Controls For Disabled Users.