

A Controller Using Your Feet To Increase Immersion in Video Games

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Abstract—The purpose of this document is to outline our idea for a controller that can be used with your feet. We will be presenting a problem statement, and going through our justification of our problem. Finally we will show our system architecture.

Index Terms—foot, feet, controller, immersion, accessibility, VR, system architecture

I. PROBLEM STATEMENT

The gaming world of controllers has focused primarily on interaction using hands. However, there are some situations in games where the in game characters use their feet. There is then a lack of immersion as the player can only feel that interaction using their hands. This immersion break can worsen the experience of the player. Feet have a wide potential for interactability as they have a large movement range and can move in more ways than a hand. This could open new ways of playing to gamers, which they may prefer to the traditional hand controllers. There are some solutions that exist, like foot pedals, but they do not make full use of a foot's range of movement. To increase player immersion and offer controller diversity, we will be seeking a hardware solution of a foot controller.

II. JUSTIFICATION

A. What will happen if the problem is not solved?

The entry barrier of the video game world will persist for people who are unable/have limited usage of their hands, and people who want to utilize more interactive controls/immersion by using their feet.

B. Who will feel the consequences?

- People who have limited usage of arms/hands.
- People who want an immersive experience with a foot-based controller.
- People who have an experience of games using their feet (Soccer, American Football, pedaling)

C. Does the problem have wider relevance (e.g. are similar issues found in other contexts)?

People without access to their hands due to accidents or disabilities will find daily tasks such as eating, or using technology difficult. There are not a lot of solutions for these people since many products are focused on the hands. In terms of immersion, VR has had this issue in gaming and outside gaming, as a VR experience typically either only uses the

headset, or the headset and controllers together. Solutions do exist such as a VR treadmill; however, they are typically just as expensive, if not more expensive than a VR headset, making a full immersive experience quite inaccessible. Feet are one of the most dexterous part of the body, just after our hands, so there is a lot of potential for them to be used in the same ways as our hands or even new and different ways.

D. Data Which Backs Up Our Statement

There is a clear gap for foot based controllers, which some people may depend on. For example, there's a case of a gamer who lose their hands due to illness and had difficulty playing games afterwards [1]. This person, along with some other engineering students, built their own controller designed for feet. This allowed them to play games again, which is a valuable part of their life.

Immersive tools have also been used in the rehabilitation of post-stroke patients. Ferreira, Lourenco, and Menezes proposed an immersive tool to aid the traditional motor rehabilitation therapies, in order to both motivate and encourage the patients to perform therapeutic exercises [2]. Immersion can distract patients from their disabilities/handicaps, and the research provided positive results [2]. Most of the participants (87.5 percent) answered positively the question if they had enjoyed the game, and 100 percent found the game easy to play. Moreover, they added that it met its purpose, being an useful aid for the current motor therapies and encouraging patients to perform more therapeutic exercises.[2]

According to a study done by J.Clement, published on Statista, 53 percent of male gamers and 44 percent of female gamers in the United States expressed interest in playing immersive games, as of December 2021 [3]. While this is a small sample size, it does indicate (at least on the male side) that more than half of gamers want immersive games. This means that there is a big market and demand for our idea which has not been tapped into yet.

The level of immersion being developed for the entertainment industry has left many curious about how much immersion can be iterated upon. Virtual reality devices (e.g, Oculus, Vive, Morpheus etc) in particular has been gaining popularity in recent years[4]; however, virtual immersion can also have negative side effects such as migraines, eyestrain and motion sickness[4]. The impact of immersion on both enjoyment and health is a topic that can clearly still be iterated and improved upon. Since our solution is focused on the legs

and feet, eyestrain and migraines are unlikely to happen, but we'll have to be careful about motion sickness.

The Wii Remote was created to be used with Nintendo's Wii game system, and by using an internal sensor, converted the player's wrist, arm and hand movements as inputs for games, allowing for a more immersive experience.[5] With our foot controller, we plan to achieve a similar result; however, this time, our goal is to base the system off of using feet motions, rather than hand/arm movements. Using internal sensors for the feet is a possibility as well. We can improve and optimize immersion by using more modern systems as reference, prime examples being Virtual Reality and other foot-based controllers.

III. SYSTEM ARCHITECTURE

Presented in "Fig. 1" is our system architecture diagram, along with some explanations. Our system architecture is comprised of two "controllers", one for each foot. One of them will be focused on x, y, z movement, and the other is focused on button inputs, using the foot position to instead trigger button inputs.

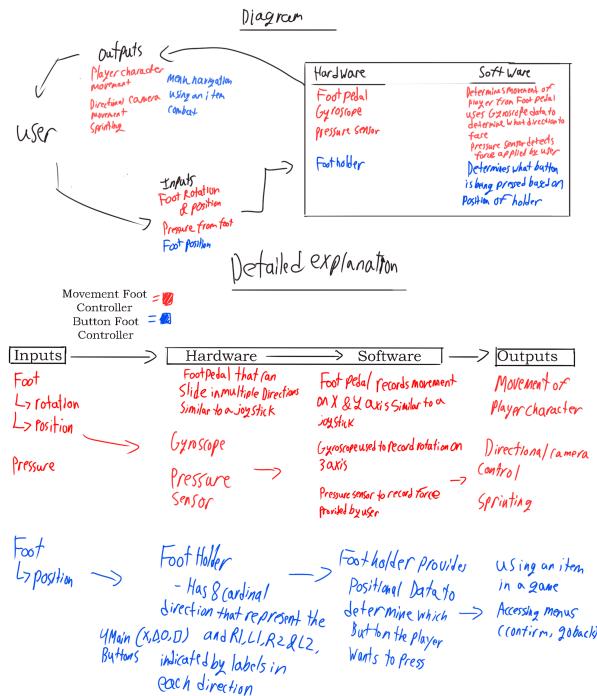


Fig. 1. System Architecture for our Foot Controller

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