

# Adaptation of Driving Videogames for People with Physical Disabilities

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*Abstract:* Video games can serve as highly beneficial forms of therapy and exercise for people with disabilities, yet they are often inaccessible due to their control schemes. In particular, driving games offer experiences that cannot be replicated in real life, but the steering wheels, gamepads or keyboards typically used are not usable by individuals with very limited mobility. This paper examines the accessibility challenges faced by such users when using both specialized and generic hardware and software—including an analysis of the games themselves and the existing assistive solutions. Based on this analysis, a solution is designed and proposed that relies exclusively on the mouse, without support from other devices or third parties.

## 1 Introduction

Hypotonia is a condition in motor and intellectual disabilities characterized by low muscle tone and low endurance (Physiopedia, 2024), which in the most severe cases makes conventional use of keyboards, controllers, and even specialized hardware difficult or impossible. The mouse is a much more compact, lightweight, and simple device that can be used even in severe cases of reduced mobility.

Many people with disabilities have difficulties carrying out daily activities or socializing, conditions that are closely related to mental health and well-being. So much so that the incidence of depression, anxiety, and other illnesses is higher in people with disabilities (Tough et al., 2017). Video games and, above all, the communities that form around all kinds of titles are, in addition to tools for emotional disconnection and rest, very important forms of socialization for those with few opportunities to do so otherwise, which can have a very positive impact on their mental health. It is also an activity that, when accessible, can be mastered and competed in with non-disabled people, feeling progress and achievement. This can have a positive impact on their self-esteem and quality of life (Redepenning et al., 2023). It has also been shown that there is a relationship between the employability of people with disabilities and adapted gaming (Redepenning et al., 2024).

Video games can have a positive impact on the treatment of problems such as anxiety, depression, or stress (Pine et al., 2020), but they can also serve as physical exercise. There are multiple success stories in the use of *exergames* or virtual reality games as exercise treatments for users with disabilities (Peláez Vélez et al., 2023; Polizzi et al., 2024). The underlying idea of these treatments is to *gamify* physical exercise that is beneficial for patients. These types of games require broad movements, but for people with reduced mobility, fine motor exercises are also essential, and the use of video games can be very beneficial.

This work proposes a software adaptation that allows the use of the mouse as an input method for driving video games that do not support it. It is designed for people with severe hypotonia who cannot use other input devices. The goal is for these people to be able to play autonomously and easily, without needing help for installation, configuration, or use of the program.

## 2 Methodology

First, the accessibility problems faced by a potential user when trying to play driving games were defined. A systematic analysis was carried out: the hardware used on computers was analyzed and the problems and advantages of each device were described; multiple driving games, from arcade to simulators, were analyzed based on a series of parameters for both menu navigation and in-game; existing software tools that allow the use of the mouse as a virtual joystick were also analyzed.

Based on these analyses, the design objectives and functions to be included were defined, as well as different implementation approaches. The software was developed iteratively, adding and testing new functionalities until the defined objectives were achieved.

## 3 Problem Specification

### 3.1 Defining Accessibility

Before starting to analyze the access problems faced by users, we need to define what accessibility is. Alistair Duggin (2016) makes two very interesting points:

1. An activity is accessible when a person with a disability can perform it with similar effort and time as a non-disabled user.
2. Accessibility is a spectrum; something accessible for one person may not be for another, even with similar conditions.

To meet the first criterion, aids must guarantee:

- **Usability:**
  - **Suitability:** adapt to the needs of the target user.
  - **Ease of use:** be understandable and easy to install and use.
- **Availability:**
  - **Low cost**
  - **Ease of distribution**
  - **Ease of maintenance:** should work for as long as possible with minimal maintenance.

The implication of Duggin's second point is that a universal aid cannot be made, as the range of necessary adaptations is very broad. That is why the solution presented here is designed for users with very severe hypotonia and limitation even in finger movement.

### 3.2 Hardware Analysis

Here, the most common input devices on computers and their suitability for users with severe hypotonia are analyzed.

- **Controllers/Gamepads:** Since they are designed for use by people with mobility, their size and ergonomics, along with the rigidity and position of the buttons, greatly hinder their use. Even lighter and smaller designs like those of the Nintendo Switch may be unusable.
- **Keyboard:** it is a wide, flat surface covered with buttons that requires the use of, preferably, both hands and does not allow resting on the device itself or keys would be pressed accidentally. The possibility of reassigning keys is an advantage, but its usefulness depends on the number of actions required by the game and whether they need to be used in parallel. Additionally, as buttons, they only allow discrete, not continuous, inputs.

- **Steering wheel:** Simulator steering wheels are very bulky devices that require considerable muscle strength and, like controllers, their ergonomics and buttons are designed for non-disabled people. Furthermore, their price (50–300 €) can be a barrier for many users.
- **Mouse:** devices that stand out for their low weight and simplicity, having only 3 soft buttons. Their sensitivity can be adjusted and the required range of movement reduced. This same movement allows precision similar to that of a steering wheel. Its main drawback is its limited number of inputs, but these fit the needs of many driving games.

**Adaptive controllers:** There are controllers specifically for users with physical limitations, but they share two critical barriers: very high cost and high configuration complexity. Here we analyze three devices:



Figure 1: User using an Xbox Adaptive Controller system



Figure 2: Xbox controller modified by Evil Controllers



Figure 3: Azeron Cyborg V1 controller

- **Xbox Adaptive Controller:** device to which buttons and joysticks are connected. Each of these modules must be purchased separately, and finding and choosing the right ones can be difficult.
- **Evil Controllers:** Playstation and Xbox controllers modified for some types of physical limitation. These adaptations are not sufficient for users with severe hypotonia and have a very high cost, starting at 140 €.
- **Azeron Controllers:** ergonomic controllers with many soft buttons but with great preparation and configuration complexity and a very high cost (200–300 €).

### 3.3 Game Analysis

Nine driving games were selected considering their popularity and relevance within each of their respective subgenres. These include everything from realistic circuit simulators to arcade top-down view games.

A systematic analysis of short sessions ( $\approx 15$  minutes) was carried out, observing gameplay using only the mouse and, when this was not possible, the possibility of adapting game mechanics for mouse use. The data are summarized in Table 1.

Table 1: Accessibility observations with mouse in driving games

Game	Required in-game mechanics	Menu navigation	Navigation	Mouse limitations	Accessibility with mouse
Project Cars 2	Steering, Acceleration, Brake, Pause	Mouse, controller, board	controller, key-	Mechanics not assignable	Native
Assetto Corsa Competizione	Steering, Acceleration, Brake, Pause	Mouse, controller, board	controller, key-	Mechanics not assignable	Native
F1	Steering, Acceleration, Brake, Pause	Controller, board	key-	Mechanics not assignable	Yes
Forza Horizon 5	Steering, Acceleration, Brake, Pause, Interaction, etc	Mouse, controller, board	controller, key-	Too many mechanics for mouse use	No
MudRunner Saga	Steering, Acceleration, Brake, Pause, Manual shift, Winch, etc	Mouse, controller, board	controller, key-	Too many mechanics for mouse use	No
Circuit Superstars	Steering, Acceleration, Brake, Pause	Controller, board	key-	Mechanics not assignable	Yes
Trackmania (2020)	Steering, Acceleration, Brake, Pause, Respawn	Steering, Accelerator, Restart	Accelerator, Brake, check-point	Mechanics not assignable	Yes

#### Common observations:

- **Menu navigation:** In almost all titles, it is possible to navigate with the mouse or, failing that, an adaptation that emulates it.
- **Driving mechanics:** Most games allow playing with just acceleration, brake, steering, and at most one or two more mechanics. This allows an external adaptation using only the inputs available on a mouse. Others, such as the *Forza Horizon* or *MudRunner sagas*, require more inputs than are available on a mouse.

### 3.4 Analysis of Mouse Driving Software

There is software that allows the mouse to be used as a virtual joystick. An analysis of different options was carried out, revealing various problems. The findings are summarized in Table 2.

Table 2: Limitations identified in mouse driving software

Tool	Identified limitations
MouseToVjoy v1/v2	CLI interface. Splits vertical axis between right click and mouse movement. Menus not accessible without keyboard.
mouseSteering	Immediate mouse lock on start; exit only via key combination. Lacks thorough documentation and real-time feedback.
FreePie / AutoHotKey + vJoy	Complex setup; requires scripting knowledge. No guidance or user-friendly interface.
Other solutions (videos/tutorials)	Variety of methods and scripts. Focus on specific games. Advanced knowledge required. Keyboard dependency to complete interaction.

All options share two critical errors:

1. Complex installation and configuration.
2. Unsuitable for exclusive mouse use: these programs are not designed as accessibility tools, so they depend on keyboard use for many functionalities.

### 3.5 Problems to Solve

From these analyses, it is concluded that the software must meet four essential requirements:

1. **Facilitate exclusive mouse use**
2. **Compatibility with multiple games:** it is not possible to make an adaptation for all types of games, but a correct implementation is necessary that assigns key functions and mechanics to ensure compatibility with as many titles as possible.
3. **Simple installation:** should not require technical knowledge or additional searches.
4. **Ease of use and interaction:** the interface must be clear, informative, and offer basic explanations of its operation. It should provide feedback to indicate the state of the virtual joystick and improve the gaming experience.

## 4 Design and Implementation

The software presented here converts mouse signals into the most important signals of a controller. Using mouse movement as a steering mechanic offers precision comparable to a steering wheel, which is also attractive for non-disabled players who do not have a steering wheel.

It was decided to emulate a controller or *gamepad* signal and not a steering wheel for two main reasons:

1. Compatibility with a greater number of games.
2. Maximizes the few inputs available on a mouse by assigning the left joystick and specific buttons that can be used both for menu navigation and in-game.

Button assignments are summarized in Table 3.

Table 3: Assignment of mouse inputs to game functions

Input	Game function	Comment
X/Y movement	Left joystick (steering + menu navigation)	Takes advantage of mouse continuity.
Left button	Accelerator + menu confirmation	Combines two key functions in one button
Right button	Brake + cancel/back	Combines two key functions in one button
Press wheel	Enable/disable joystick emulation	Avoids conflicts between mouse navigation and simultaneous emulation.
Wheel up/down	Game-specific function (e.g., reposition vehicle) + pause/menu	One of these functions must be reserved for the ESC key.

The A and B buttons (Xbox) or X and O (Playstation) are used for menu navigation, but here they take the place of the accelerator and brake. This means the player may need to reassign the accelerator and brake functions in the game settings. This decision is due to the fact that the confirm and cancel functions usually cannot be changed, while the accelerator and brake can. This is indicated in the program and allows the user to use the game completely autonomously, even in the menus.

#### 4.1 Accessibility of Rodenstick

Rodenstick meets the four essential requirements described in section Defining Accessibility:

- Suitability: the software is designed for users with severe hypotonia who use only the mouse as an input method.
- Ease of use: Rodenstick has an installer that includes all necessary dependencies, an intuitive graphical interface, and real-time visual feedback.
- Availability: Rodenstick is free and open source.

## 5 Conclusions and Future Work

Rodenstick<sup>1</sup> is an accessibility program that enables mouse driving in games that do not implement it. It is designed for exclusive mouse use by people with very severe mobility limitations. Ease of installation and use is key.

In the current version, it converts mouse movement into left joystick movement of a virtual controller and converts the available buttons into the most used and important ones on a controller, allowing simple and autonomous use in multiple games.

Even so, Rodenstick is still a tool with limitations and would benefit from new features such as:

- Button assignment system that allows the user to change them as needed.
- Layer system that allows changing button assignments during execution.
- Expand the configuration system to support the creation of different profiles where settings for different games would be stored.
- Add non-linear acceleration and progression to joystick movement and other buttons.

<sup>1</sup> Repository: <https://codeberg.org/hectoralvf/Rodenstick>

- Redesign the interface to a more intuitive and modern one that includes an interactive tutorial.
- Add usage tips and error-solving advice.

On the technical side, the following changes are interesting:

- Support for Linux. This implies completely rewriting the code and using multiplatform libraries and tools such as SDL for device handling or Qt6 for the interface.
- Abandon vJoy for systems that use Xinput.
- Use mouse movement instead of cursor position for joystick conversion.

## Bibliography

- A. Duggin. What we mean when we talk about accessibility – accessibility in government. Accessibility in government, May 2016. URL <https://accessibility.blog.gov.uk/2016/05/16/what-we-mean-when-we-talk-about-accessibility-2/>. Retrieved June 18, 2025.
- F. J. Peláez Vélez, M. Eckert, M. Gacto Sánchez, and A. Martínez Carrasco. Use of virtual reality and videogames in the physiotherapy treatment of stroke patients: A pilot randomized controlled trial. *International Journal of Environmental Research and Public Health*, 20(6), 2023.
- Physiopedia. Hypotonia — physiopedia,, 2024. URL <https://www.physio-pedia.com/index.php?title=Hypotonia&oldid=362483>. [Online; accessed 18-June-2025].
- R. Pine, T. Fleming, S. McCallum, and K. Sutcliffe. The effects of casual videogames on anxiety, depression, stress, and low mood: A systematic review. *Games for Health Journal*, 9(4):255–264, 2020.
- A. Polizzi, S. Rinella, M. Ruggieri, A. E. Gentile, C. M. Verrelli, and M. Iosa. Efficacy of videogames and exergames in pediatric neurorehabilitation: a systematic review. *Minerva Pediatrics*, 76(4):690–702, 2024.
- D. H. Redepenning, S. A. Huss, and S. Maddali. Influence of adaptive video gaming on quality of life and social relationships. *Assistive Technology: The Official Journal of RESNA*, 35(4):339–346, 2023.
- D. H. Redepenning, M. Bell, O. Adenaiye, and B. E. Dicianno. Relationship between employment and adaptive video gaming in individuals with physical disabilities. *Disability and Rehabilitation: Assistive Technology*, 19(8):3023–3030, 2024.
- H. Tough, J. Siegreest, and C. Fekete. Social relationships, mental health and wellbeing in physical disability: a systematic review. *BMC Public Health*, 17(414), 2017.