FH University of Applied Sciences TECHNIKUM WIEN

Custom-Game-Station

HEIDI - Designing and implementing Assistive Tools for people with disabilities

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PROJECT OVERVIEW

Project results of "ASSIST HEIDI - Designing and implementing Assistive Tools for people with disabilities" course.

Our Team

The Trentino Team *"For this project, we embraced the challenge to better understand the possibilities that assistive technologies offer. Our journey focused on bridging the gap between technical constraints and human-centered design."*

Problem Statement and User Request

The primary challenge regards the fact that conventional gaming controllers require fine motor precision, which results inaccessible to the user. The goal was to design and develop a multifunctional adaptive system to replace standard joysticks and triggers. Specifically, the user requested a customized interface to play "Blue Prince", a game requiring strategic navigation and interaction that, in its original form, exceeded the physical reach and coordination capabilities of our co-designer.

The user is affected by Cerebral Palsy, characterized by poor coordination, muscle stiffness (spasticity), weakness, and tremors. These factors make traditional button-mapping or holding a controller impossible.

Despite these limitations, the following residual functions were identified as inputs for the adaptive system:

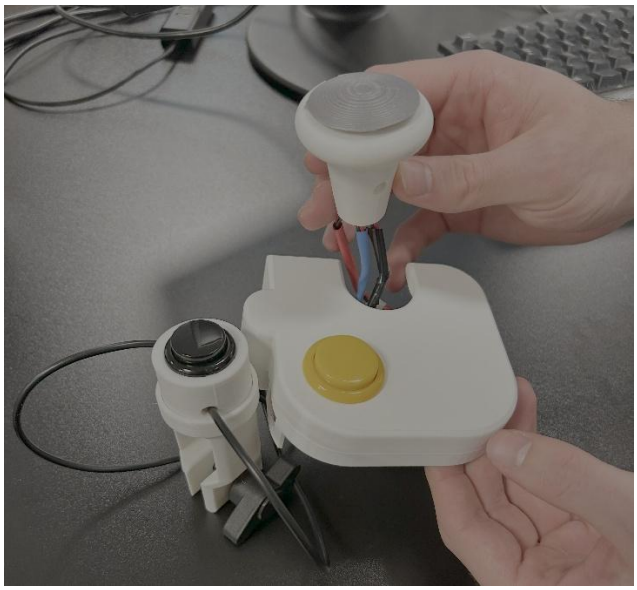
- Upper Body: Control of the left arm (though movements are stiff).
- Motor Skills: Sufficient dexterity in the left hand to operate a communication device keyboard and a wheelchair joystick.
- Lower Body: Capability to extend both legs from a sitting position and perform seated knee raises and lateral movements.
- Ocular Control: High proficiency in using eye-tracking systems.

Solution developed

The implemented solution is a custom Assistive Game Station designed to translate physical actions into digital gameplay. It consists of:

- **Smart Joystick:** Equipped with a Puck.js microcontroller that senses physical tilts and translates them into in-game perspective and movements.
- **Dual-Button Interface:** Includes two mechanical switches to replace basic game functions, specifically designed for games that do not require high-speed or fine motor control.

Our project builds upon the foundations of the "*Wheely-Joystick-Mouse*", an open-source initiative, available here: https://github.com/inclusion-international/Wheely-Joystick-Mouse.git



Accessories and Instructions

Cost Estimation

The final product, including the Puck.js microcontroller, mechanical buttons, 3D printed components, and connectors, is estimated to cost between **€42 and €43**. This makes the device a cost-effective assistive solution compared to commercial alternatives.

System Usage

Following the instructions provided in the “User manual“, alongside a detailed “Electrical scheme“ it is possible to mount and run the final system.

Once mounted, the system operates wirelessly via Bluetooth. The user can interact with the game by tilting the joystick (sensing movements through the Puck.js) and using the two mechanical buttons for primary game functions. The side knee button is specifically positioned to allow for accessible triggering without requiring fine hand motor control. The details about the translation of the commands are also available in the ”User manual”.

Acknowledgments

This project was developed within the framework of the ASSIST HEIDI initiative, drawing inspiration from and building upon established open-source assistive controller concepts. We would like to express our gratitude to our co-designer for their participation throughout the co-creation process; their continuous feedback and testing were fundamental in shaping the final prototype to meet real-world accessibility needs