Research / Master Project

SS2024

Development of a Flexible Haptic Feedback Matrix Band with a Custom Control Card

Project type: ☐ Hardware ☐ Software ■ Hardware/Software ■ Simulation ☐ Modelling

<u>*Note*</u>: **This project can be done in a group of two**

Project description

Ever dreamed of truly feeling the virtual world? This project dives into the exciting world of haptic feedback technology, where touch comes alive!

Haptic feedback technology is pivotal in creating immersive user experiences by providing tactile sensations. The current state of haptic devices often relies on individual actuators, which presents a challenge in the design and control of a single, integrated wearable device. This project aims to address these challenges by developing a matrix band with a custom control system. The objective of this project is to design and develop a cutting-edge wearable haptic feedback matrix band that integrates multiple feedback actuators. The project will also involve designing a custom control card to manage and optimize the actuators' performance, enhancing haptic feedback for applications such as virtual reality (VR), gaming, and assistive devices to push the boundaries of user experience.

Methodology

• Literature review of existing tech & actuators (performance, size, cost).
• Design and develop flexible band (CAD) and control card
• Prototype the band and the control card
• Develop software for diverse haptic patterns & communication.
• Test performance and optimize control algorithms (realistic feel, power efficiency).
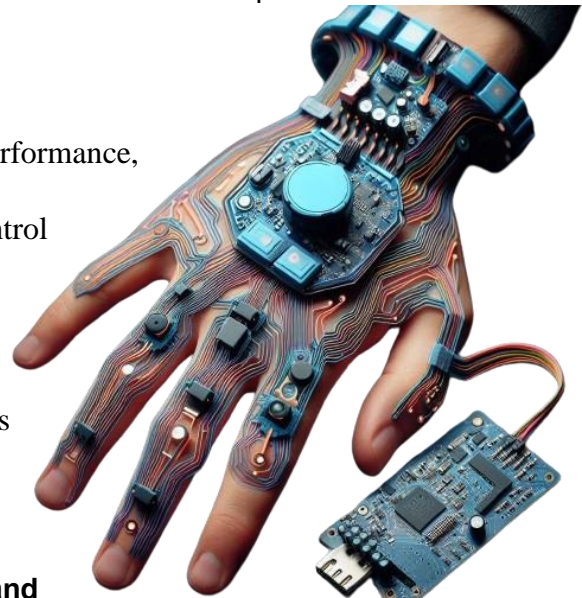
Tasks:

1. **Literature review - haptic technologies and actuators**
   • Conduct a comprehensive literature review on existing haptic feedback technologies and actuators
   • Identify key performance parameters for actuators
   • Select suitable haptic feedback actuator and determine the optimal number
2. **Custom control Card development**
   • Design the circuit schematic and simulate it (e.g., LTSpice)
   • Assemble the hardware components on a PCB
   • Develop a control algorithm, enabling varied haptic feedback patterns

3. **Design and prototyping - Flexible Matrix Band (CAD)**
   - Design a flexible, ergonomic matrix band using CAD software, ensuring it can comfortably house the selected actuators.
   - 3D-Print and create prototypes of the matrix and the control card
   - Integrate the actuators and establish secure connections
4. **System Integration and Performance Testing**
   - Conduct performance tests on the matrix band in different scenarios to evaluate haptic feedback.
   - Evaluate and improve responsive and efficiency for realistic haptic feedback
5. **Documentation: Report and presentation**

Competences:

- Proficiency in CAD software for 3D designing
- Basic knowledge of electronics, circuit design (LTSpice), and microcontrollers (e.g., Arduino C++, ESP32 …)
- Ability to work with and interpret schematics
- Self-learning ability, creative thinking, and motivation to work independently

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