Development of a vibrotactile stimulation system for cognitive rehabilitation

Master Thesis

In partial fulfillment of the requirements for the degree

"Master of Science in Engineering"

Study program:

Mechatronics & Smart Technologies

Management Center Innsbruck

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Schlagwörter: Schlagwort 1, Schlagwort 2, Schlagwort 3, Schlagwort 4, Schlagwort 5

Abstract

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Keywords: Keyword 1, Keyword 2, Keyword 3, Keyword 4, Keyword 5

Contents

1 Introduction

1.1 Motivation and Problem Statement

[1], [2]

[3]

[4], [5], [6]

1.2 Objectives of the Thesis

Erl"autern Sie an dieser Stelle *genau* was ihre Aufgabe ist. Gegebenfalls grenzen Sie auch die Teile aus, welche nicht im Umfang der Arbeit liegen. Dies kann Ihnen gegen Ende ihrer Arbeit bei der Argumentation helfen.

1.3 Structure of the Thesis

Geben Sie in diesem Abschnitt eine grobe Vorausschau auf den Aufbau der Arbeit. Die Arbeit k"onnte empirisch motiviert sein und mit der Auswertung eines Experimentes beginnen oder theoreitsch und somit logischerweise mit einem Theoriekapitel beginnen.

2 Theoretical Background

2.1 Cognitive Rehabilitation: Concepts, Methods, and Target Groups

Multidisziplinäre Ansätze [3] EEG-Biomarker wie der Brain Symmetry Index (BSI) und der Laterality Coefficient (LC) erlauben eine objektive Bewertung des funktionellen Zustands des Gehirns. Die EEG-Analyse ermöglicht eine individualisierte Rehabilitationssteuerung, indem sie Veränderungen in der Hirnaktivität erfasst – insbesondere im Zusammenhang mit Motor Imagery, einer etablierten kognitiven Rehabilitationsmethode. Die Zielgruppe der Studie sind Schlaganfallpatienten, die oft sowohl motorische als auch kognitive Beeinträchtigungen aufweisen.

[7]

Table 2.1: ergleich verschiedener Studien zur taktilen niederfrequenten Vibration in der Demenzbehandlung

Studie (Autor, Jahr)	Vibrationsart
Clements-Cortes et al., 2016	Vibroakustisch (40 Hz, Musik, physioakustisc
Clements-Cortes et al., 2017a	Vibroakustisch (40 Hz, tägliche Heimanwe
Kim und Lee, 2018	Mechanisch (WBV, Frequenzsteigerung von 2
Lam et al., 2018	Mechanisch (WBV, 30 Hz, 2 mm Amplit
Heesterbeek et al., 2019a	Mechanisch (WBV, 30 Hz, 1–2 mm Ampl

2.2 Vibrotactile Stimulation: Principles and Therapeutic Applications

[7]

[8, 9, 10, 11, 12, 13, 14, 15, 16]

2.3 Actuation Technologies for Haptic Feedbacks

2.4 Voice Coil Actuators for Vibrotactile Stimulation

2.5 Overview of Existing Vibrotactile Stimulation Systems

[14]–[22] zeigen Wirksamkeit bei AD

3 Analysis of the Current VCA-Based System

3.1 Hardware Components (Voice Coil Actuators, Control Electronics, Sensors)

3.2 Software Architecture and Control Strategies

3.3 Limitations and Identified Challenges

4 Formeln

5 Referenzen und Zitate

6 Zusammenfassung und Ausblick

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