Todo list

Visual Cortical Prostheses: Bridging Technology, AI and Human Vision for the Future

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Summary

Visual cortical prostheses represent a revolutionary technology within the field of neuroprosthetics, aimed at restoring vision for individuals with visual impairments through direct neural interfaces. This proposal. . . ABSTRACT WORK IN PROGRESS!!!

Keywords: Visual cortical prostheses, neuroprosthetics, artificial intelligence, phosphene patterns, real-time image processing

Introduction

Visual cortical prostheses represent a revolutionary technology within the field of neuroprosthetics, aimed at restoring vision for individuals with visual impairments through direct neural interfaces. These devices function by converting external visual information into neural signals that the brain can interpret, thereby bypassing damaged visual pathways. A key component of these prostheses is the generation of phosphenes—perceived spots of light produced by electrical stimulation of the visual cortex. The challenge lies in organizing these phosphenes into coherent visual patterns that the brain can understand. The development and optimization of visual cortical prostheses necessitate a multidisciplinary approach, combining insights from neuroscience, biomedical engineering, and artificial intelligence (AI).

In the past 10 years there have been significant advancements that have contributed to the development of complex visual prosthetic devices, starting with retinal and optic nerve implants, moving towards direct neural interfacing in the visual cortex (de Ruyter van Steveninck et al., 2022).

Research

Objective

This study aims to develop a novel approach to generating phosphene patterns in a way that dynamics environments can be visualized in real-time. These systems as of yet, do not exist and are crucial for the development of visual aid systems that can adapt to more complex and real-world scenarios. If successful, these improved prosthetic systems hold potential of increasing the blind user's experience dramatically.

Approach

Explain the experiments and why they are important. Concretely explain how they will be performed.

Explain the three phases of the study.

Innovation

Explain how the research is innovative and how it will contribute to the field. Briefly go over the cutting-edge technology involved in the study. Maybe go over the caveats and limitations of previous work and how this study will find solutions.

Future Impact

Explain the main goal of the study and why future research will be beneficial.

Timetable

The Gannt-chart goes here with a brief explanation of the different phases.

References

de Ruyter van Steveninck, J., van Gestel, T., Koenders, P., van der Ham, G., Vereecken, F., Güçlü, U., van Gerven, M., Güçlütürk, Y., & van Wezel, R. (2022). Real-world indoor mobility with simulated prosthetic vision: The benefits and feasibility of contour-based scene simplification at different phosphene resolutions. *Journal of Vision*, *22*(2), 1. https://doi.org/10.1167/jov.22.2.1

Rebuttal

After the first review of the draft, the proposal was revised to address the reviewers' comments. The main changes will be listed below: