Linking Vision Science and Applied Research

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Meta

Introduction

Vision Science

Using behavioral measurments to understand visual perception and brain processes

Informs

Models

Tool

Display Research

Using behavioral measurments to improve image quality and develop display designs

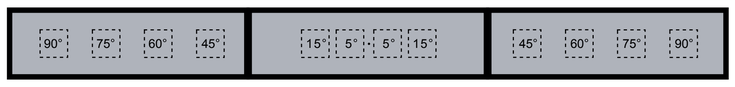
Project 1: Describing Visual Sensitivity in the far Periphery

Background

- Contrast sensitivity function is essential to descibe the limits of the visual system
- Has been mostly tested for achromatic stimuli and in the fovea
- Modern HMDs have wider and wider field of view

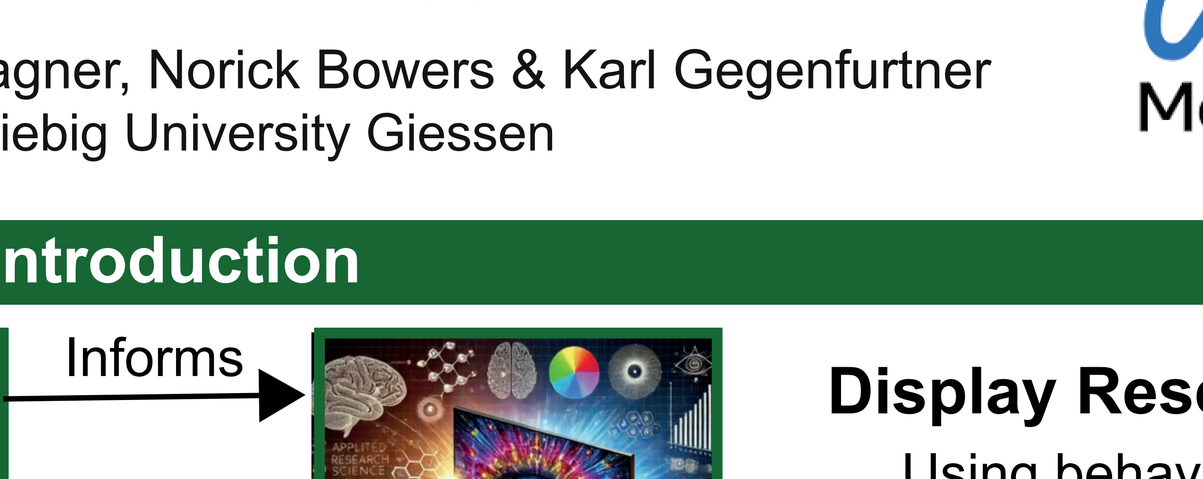
Goal: Describe visual sensitivity in the far periperhy

Method

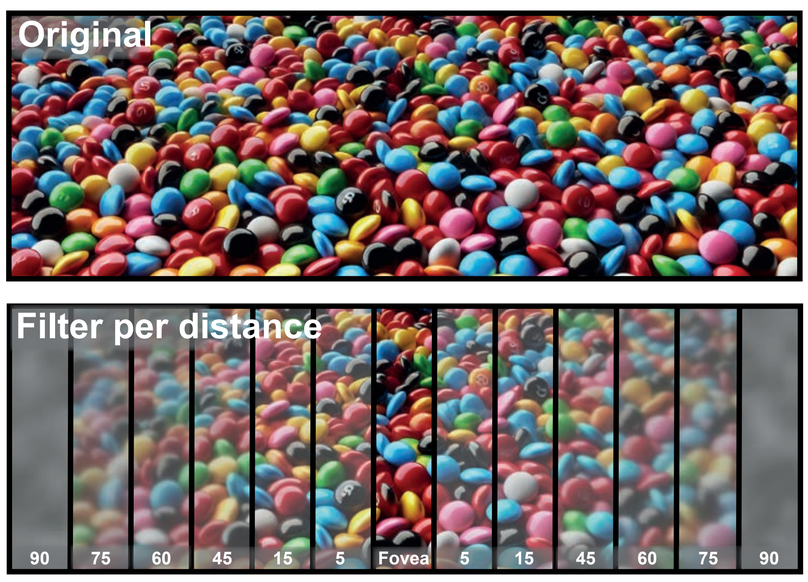


- Curved displays cover 210 dva visual field
- 2AFC Task to measure sensitivity
- Different types of stimuli (Achromatic, Red-Green & Yellow-Violett)

Results



Peripheral Sensitivity in the periphery decreases and shifts to lower spatial frequencies. Chromatic vision is still possible till at least 75 dva.



We can use measurments to predict appearance in the periphery

Vision Science

Sensitivity in periphery is underestimated. This is especially true for chromatic stimuli.

Display Research

Measurments can be used to improve models of visual perception. These are critical for techniques like **foveated rendering**.

Project 2: Using oculmotor control as image quality marker

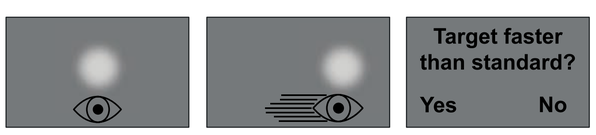
Background

- Continous visual motion in the real world is sampled on monitors
- Most applied research relies on questionnaires and perceptual data
- Perception and oculomotor control use information differently

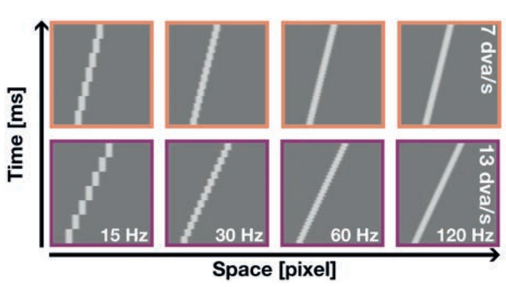
Goal: Compare the impact of sampled motion on motion discrimination and oculomotor control

Method

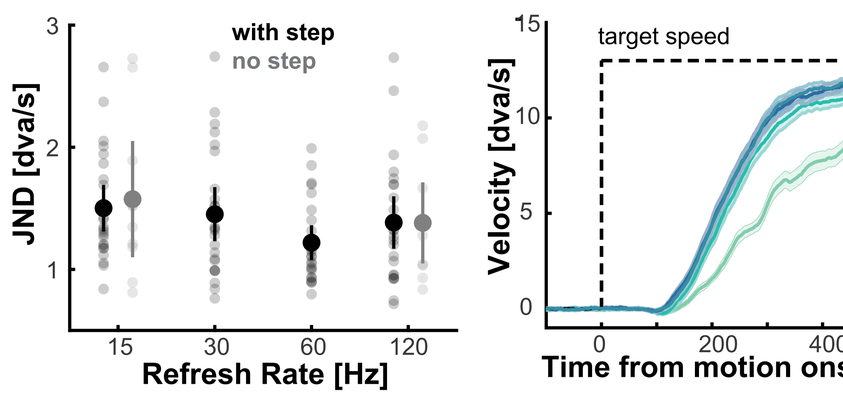
Trial procedure



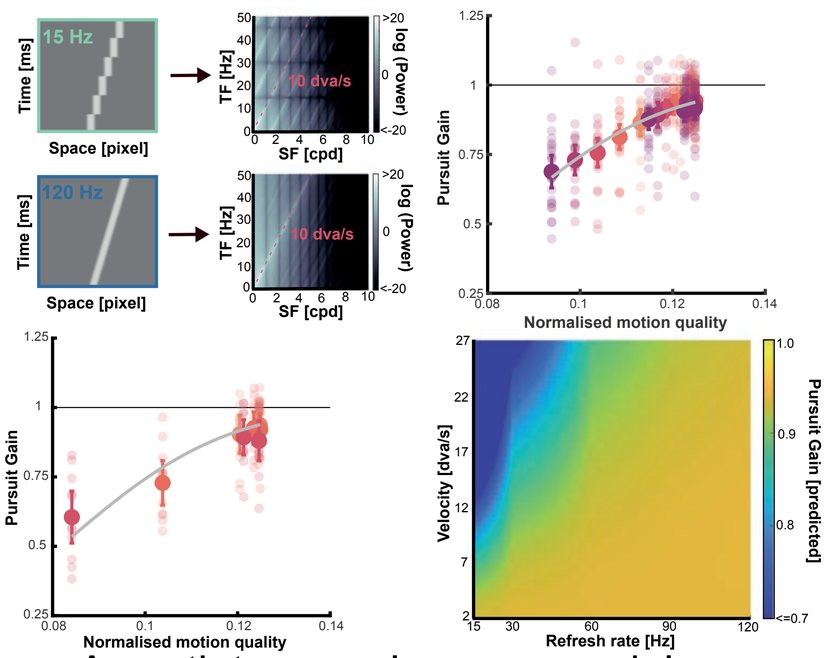
Independent Variables:
Target Speed: 7, 8.5, 10, 11.5, 13 dva/s
Refresh Rate: 15, 30, 60 or 120 Hz



Results



Motion discrimination is not influenced the refresh rate of the stimulus. Oculomotor behavior is affected by an interaction of refresh rate and velocity.



A spatiotemporal energy model can explain oculomotor behavior

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Empirical evidence for the different readouts of sensory info for perception and oculomotor control

Display Research

Predicted pursuit gain can serve as objective and implicit marker for display quality, which is more sensitive than perception.