先端科学技術研究科　修士論文要旨

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要旨

We design the computational sunglasses as an assistant device for individuals with *Autism Spectrum Disorders* (ASD) who have hypersensitive visual perception caused by abnormal neuronal development. The abnormal neuronal development leads to a larger static baseline pupil size that yields photophobia. Based on the atypical pupil mechanisms, we propose smart sunglasses that use a single spatial light modulator (SLM) which is capable of per-pixel transmittance adjustment, and a camera for scene detection and output a control signal with the response of the sensor irradiance. We develop a suitable modulation function based on the requirement of the desired effect. In practice, the occlusion mask created on the SLM, which possesses low transmittance to block the incoming light rays, appears blurred from the eye since the focal plane is not on the SLM and blocks the light stimulation insufficiently. While the aperture-based expanded mask is often applied in previous studies, the excessive large expansion ratio leads to over-blocking (occlusion leaking). We propose an optimization approach to obtain the optimum processing parameters for an occlusion mask. We first define the appropriate occlusion for our system and simulate the imaging process with an out-of-focus (OOF) point spread function. We test the mere expansion and expansion with blurring as the preprocessing method. With the OOF simulation, we finally arrive at the preprocessing parameters that are closest to the appropriate mask. While the non-processed mask cannot contribute sufficient occlusion and the aperture-based expanded mask causes occlusion leaking, the proposed mask processing with the modulation function demonstrates better scene contrast and occluding effect evaluated by the camera system.