SPEEDING UP LIQUID CRYSTAL SLMS USING OVERDRIVE WITH PHASE CHANGE REDUCTION

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Nematic liquid crystal spatial light modulators (SLMs) are widely used for light shaping in a variety of applications [1], such as aberration control, adaptive optics, advanced contrast methods in microscopy, or beam shaping and steering. They offer high resolution with millions of pixels, where each individually addressable element allows one to modify the phase of the light with high precision. However, these devices show a comparatively slow response time on the order of 10 ms. We present the implementation of a method for reducing the effective response time of a phase-only SLM based on nematic liquid crystals [2]. There are two key components. The first is an implementation of a real-time multi-frame overdrive method. The second component is an algorithm to reduce the phase changes when switching from one SLM pattern to another.

![Figure 1: Measured dynamic response of SLM phase shift (a) without overdrive (b) with overdrive.](image)

We present the experimental implementation of these methods as a pure software solution, applicable to commercially available SLMs and ready for real-time applications. We demonstrate a significant increase in speed, see Fig. 1, leading to a reduction of the effective transition times, e.g., for holographic image projection from about 10 ms to 1 ms.

[1] C. Maurer, A. Jesacher, S. Bernet, and M. Ritsch-Marte: „SLM-Microscopy: what spatial light modulators can do for microscopy“, Lasers and Photonics Reviews, 5, 81-101 (2011)
[2] G. Thalhammer, R. W. Bowman, G. D. Love, M. J. Padgett, and M. Ritsch-Marte: „Speeding up liquid crystal SLMs using overdrive with phase change reduction“, submitted to Optics Express