

Development of Spatial Light Modulators and Applications for Optical Parallel Processing

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An optical parallel processing technique is an attractive way to treat vast information and spatial light modulator (SLM) has been developed actively as a key device. However, an effective application has not appeared because of the miss-match between performance of the device and requirements of the system. In this research, the important feature of the SLM developed by our group has been discussed and some effective applications with these devices have been developed. Also, improvements of the devices have been done.

To improve the maximum read out light intensity of the micro-channel spatial light modulator (MSLM) and to overcome the trade off between it's speed and resolution, a liquid crystal MSLM (LC-MSLM) has been developed. The optical parallel logic operation system and 2D lock-in amplifier system has been discussed as effective applications of the MSLM. Ferro-electric liquid crystal SLM (FLC-SLM) and parallel-aligned nematic liquid crystal SLM (PAL-SLM) has been developed for a practical use. A real time velocity measurement system and an optical correlator have been discussed as effective applications of these devices. An analysis of a diffraction efficiency of the PAL-SLM has been done and the theoretical limitation can be obtained. The electrically controllable PAL-SLM has been proposed and the analysis of the diffraction efficiency has been done. Also, influence of the scan addressing has been discussed and the equal modulation performance can be obtained.