Automation and Machine Learning for Robust and Self-Tuning Magneto-Optical Traps

In recent years the Magneto-Optical Trap (MOT) has become a standard technology used in almost every AMO laboratory (Atomic, Molecular, and Optical Physics). While technology of individual components has improved over time, the alignment of the trap still requires tedious maintenance performed hands-on by skilled experimentalists. The project focuses on developing a custom control system for piezoelectric mirror mounts responsible for the position adjustment of the lasers beams in the experimental setup. The implementation consists of LabVIEW interface and python algorithms, supported by rotary encoders to correct for hysteresis of the devices. The control system's efficiency is tested through fiber coupling, typically performed manually, with the overall goal to fully automate it.