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# Prototype Development of Scalable Adaptive Optics Real-Time Controller on Processor-based Platform

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## Abstract

Adaptive optics (AO) is a technology to correct for the effects of atmospheric turbulence or optical aberrations. AO systems are typically composed of a wavefront sensor (WFS), a deformable mirror (DM), and a real-time controller (RTC). The RTC is responsible for measuring the distortions in the incoming wavefront from WFS and sending signals to the DM to correct for these distortions. We developed and demonstrated an AO RTC prototype on processor-based platform. Although Digital Signal Processor (DSP) and Field-Programmable Gate Array (FPGA) have been traditionally used as an RTC platform, processor-based platforms are being used as computer architecture supports high-performance computing technology and fast interfaces with low latency. Adaptive Optics RTC developed on the processor-based platform can easily not only connect various WFSs and DMs, and but also improve performance by increasing the number of processors or applying higher performance processors. We developed a prototype of the Scalable Adaptive Optics (AO) Real-Time Controller (RTC). It is based on the Shack-Hartmann Wave-Front Sensor (SHWFS) and supports adaptive optics system for both point source and extended source. Performance in terms of the speed of AO system depends on WFS and DM, but it supports the entire process with thousands of Hz performance, from receiving WFS image to controlling DM actuators. And AO RTC is designed to provide a web-based GUI to minimize the effects of analysis and control performance, and to control RTC and display information through HTTP.

**Keywords:** AO Real, Time Controller, Processor, based, WebGUI

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