
Durham Adaptive Optics (DAO) RTC solution

Sylvain Cetre^{*†1}, Barr David^{‡1}, Tim Morris¹, Dimoudi Sofia¹, Matthew Townson¹, Dunn Andrew¹, Staykov Lazar¹, and Nazim Bharmal¹

¹Department of Physics [Durham University] – United Kingdom

Abstract

Durham Adaptive Optics (DAO) is a powerful and flexible software solution for adaptive optics systems developed at Durham University in the United Kingdom. DAO enables real-time correction of wavefront distortions caused by atmospheric turbulence and optical aberrations, improving the image quality of ground-based telescopes.

DAO can be used with both GPU and CPU processing and is highly flexible, allowing it to be integrated with a range of hardware systems and configurations. DAO can work with several types of wavefront sensors, including Shack-Hartmann and pyramid sensors, and can support both deformable mirrors and tip-tilt mirrors.

The team in Durham has extensive experience building adaptive optics systems, including the widely used Durham Adaptive Optics Real-Time Controller (DARC). The experience gained through the development and operation of DARC has informed the development of DAO. Systems at other observatories such as Subaru and Keck are also using similar solution.

We will present the architecture of DAO and use cases for HARMONI and MOSAIC demonstrating its capabilities to solve ELT-scale AO system problems. The presentation will cover the software's flexible architecture, which enables it to be integrated with a variety of hardware systems and configurations. The use cases will demonstrate the real-time correction of wavefront distortions in an adaptive optics system, highlighting the software's efficient data handling, parallel processing techniques, small latency, and low jitter performances.

DAO-like systems have been successfully implemented in several adaptive optics systems and have contributed to breakthrough discoveries in astrophysics, such as high-resolution imaging of planets, stars, and galaxies. With their efficient data handling and parallel processing techniques, DAO-like systems are valuable tools for researchers and astronomers looking to improve the resolution and quality of their ground-based telescope observations.

Keywords: Real time computer, Flexible, HRTC

*Speaker

†Corresponding author: sylvain.cetre@durham.ac.uk

‡Corresponding author: david.barr@durham.ac.uk