Durham Adaptive Optics (DAO) real-time controller

Barr David*[1] and Sylvain Cetre[2]

[1]Durham University – United Kingdom
[2]Wakea Consulting – Wakea Consulting – France

Abstract

Durham Adaptive Optics (DAO) is a powerful and flexible software solution for adaptive optics systems. DAO enables real-time correction of wavefront distortions caused by atmospheric turbulence and optical aberrations, improving the image quality of ground-based telescopes. DAO takes a hardware-agnostic approach to processing pipelines, supporting distributed heterogeneous compute environments. Its high flexibility allows seamless integration with various hardware systems and configurations, accommodating different wavefront sensors (such as Shack-Hartmann and pyramid sensors), actuators (including deformable mirrors, tip-tilt mirrors, and spatial light modulators), and other components. We will present the architecture of DAO and how it can be used as the building blocks for AO systems of any size. From, fully software simulation, lab bench systems all the way to ELT scale systems such as HARMONI and MOSAIC.

We present DAOs flexible architecture, which enables it to be integrated with a variety of hardware systems and configurations. We will showcase DAO's user base and how DAO has been used to solve their adaptive optics real-time control needs. These examples will demonstrate DAO's efficient data handling, parallel processing techniques, low latency, and minimal jitter, whilst emphasising its capacity to scale to AO systems of all size, from laboratory-based research projects to ELT-scale facility class systems.

Keywords: adaptive optics, real time control

*Speaker