ALPEN-ADRIA UNIVERSITÄT KLAGENFURT

INVITATION TO THE DOCTORAL SEMINAR

Real-time control for Adaptive Optics systems of Extremely Large Telescopes

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ABSTRACT

Astronomical imaging with ground-based telescopes suffers from quickly varying distortions causing blurring and loss of contrast. Sharpness and contrast of these images are essential for astronomical observations, hence, so-called Adaptive Optics (AO) systems need to be applied. These systems are based on wavefront sensors, deformable mirrors and appropriate control algorithms. For the next generation of Extremely Large Telescopes (ELTs) the demands to the AO systems are getting much higher. Recent AO systems require the tomographic estimation of the 3D atmospheric wavefront disturbance, which is an ill-posed problem. In real-time huge amounts of data have to be processed and thousands of actuators have to be controlled. This talk is split into two parts. In the first part we focus on the Finite Element Wavelet Hybrid Algorithm (FEWHA), which is an iterative real-time reconstructor for atmospheric tomography. We provide a parallel implementation of the algorithm on the high performance hardware of the company Microgate. Besides high performance computing, our industrial partner Microgate is engaged in the final design and construction of the adaptive

mirrors for ELTs, which requires accurate and demanding simulations of the mirror dynamics. In the second part of the talk we focus on the optimization of Microgates Digital Twin of the electromagnetically secondary mirror using model order reduction techniques.

We hope to see you there!