CHARACTERIZATION OF MEMS DEFORMABLE MIRRORS FOR WAVEFRONT CONTROL IN EXTREME ADAPTIVE OPTICS
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Adaptive Optics
AO improves image resolution and contrast by compensating for turbulence in the atmosphere.

Extreme Adaptive Optics
Goals of ExAO include the Direct imaging detection of extrasolar planets and the study of debris disks around stars in the context of understanding planetary systems.

ExAO Testbed
Main concept is to achieve a contrast level of $10^{-7}$
High Wavefront control and low Wavefront RMS error are needed to achieve this contrast
A 1024-actuator MEMS (Micro-Electro-Mechanical-System) deformable mirror is used to control the wavefront.

Motivation
Low Wavefront error is important since as you decrease it planet detection becomes an easier task.
These simulated images show that the ability to detect planets depends on the wavefront error and how well we can correct for aberrations caused by the atmosphere.

Project Goal and Method
Because it is vitally important to quantify how MEMS deformable mirrors work, the goal of the project is to characterize each of the 1024 actuators in the mirror.
The purpose of this test is to evaluate the performance of every actuator and see how variation in actuator response affects the overall functioning of the mirror and the ability to have a low wavefront error.