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Title: Visible-light laser-adaptive-optics imaging of thousands of exoplanet hosts with Robo-AO
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Abstract: Robo-AO is the first autonomous laser adaptive optics system and science instrument operating on sky. With minimal human oversight, the system robotically executes large scale surveys, monitors long-term astrophysical dynamics and characterizes newly discovered transients, all at the visible diffraction limit, ~0.1".

The prototype Robo-AO system at the Palomar Observatory 60-inch (1.5 m) telescope went live in June 2012, and has performed 9,000 robotic observations as of August 2013 during 78 nights. The average target-to-target operational overhead, including slew time, is a mere 86 s, enabling approximately twenty 90-s observations per hour. The system obtains residual wavefront errors in the 160 to 200 nm RMS range in <1.5" seeing for targets as faint as mI~16. This allows the system to detect and characterize stellar
companions in the Kepler bandpass at contrasts of up to 5 magnitudes at separations of 0.5".

The prototype Robo-AO at Palomar will be augmented with a small-format infrared APD array in the spring of 2014 which will allow the system to tip-tilt guide in the J and H bands while imaging at visible wavelengths. This will allow us to augment our current survey of Kepler exoplanet host stars (currently exceeding 1,700) as we will be able to observe a lager fraction of the fainter and/or cooler hosts.

A facility-class Robo-AO system is being planned for the University of Hawai'i 2.2-m telescope which will exploit the already excellent native seeing at Mauna Kea, benefit from a larger aperture which will enable angular resolution approaching that of HST, and with a greater amount of telescope time, programs requiring tens of thousands of objects will now be feasible. Specifically, the new facility Robo-AO system will be uniquely poised to vet a majority of TESS identified exoplanet host candidates which may exceed the number of KOIs by an order of magnitude. Additionally, those TESS fields with a significant temporal overlap, i.e. the North Polar region and the equator, may be vetted prior to launch.