dasp Documentation

Release 2.0

Alastair Basden

Sep 07, 2021

Contents

Contents:

CHAPTER 1

Introduction

DASP is a Monte-Carlo end-to-end simulation facility for adaptive optics. A modular, flexible design means that almost all AO systems can be modelled, up to ELT scale.

1.1 Installation

See the INSTALL file.

1.2 Pre-built documentation

Some pre-built PDF documentation is available at http://community.dur.ac.uk/a.g.basden/daspDocs/ The source code for these documents is included within the dasp source code.

CHAPTER 2

Wavefront sensors

Several wavefront sensors are available, including Shack-Hartmann and Pyramid.

2.1 Shack-Hartmann

2.2 Guide Stars

Structures to hold information about wavefront sensors.

2.3 Pyramid

2.4 Solar AO

CHAPTER 3

DASP modules

DASP modules are the key building blocks of a simulation. These can be connected together graphically using daspsetup.py, automatically using daspbuilder.py, or manually in a text editor. daspbuilder.py creates an xml file which can be loaded into daspsetup.py. Both daspbuilder.py and daspsetup.py create a python simulation file, which can then be executed.

CHAPTER 4

Key simulation modules

4.1 Phase screens

Generate translating atmospheric phase screens with Von Karman statistics.

4.2 Pupil phase

Generate the phase at the telescope pupil for a given direction and a given wavelength.

4.3 Zonal DM

A DM surface for a given direction (if not ground conjugate) and given wavelength. Represented by an actuator map with interpolation (various options) between the actuators.

4.4 Modal DM

A DM comprised of Zernike modes. Often used for a tip-tilt mirror.

4.5 SHS WFS

A SHS WFS. Input is phase, output are slope measurements. In between, full Fourier propagation, noise, centroiding etc.

4.6 Pyramid WFS

A Pyramid WFS. Input is phase, output are slopes. Modulation and noise sources are included.

4.7 Wide field SHS WFS (solar)

A SHS WFS suitable for solar AO modelling. Anisoplanatic effects are evident. Input is the phase screens and DM surfaces, output are the slopes.

4.8 Reconstruction

A wavefront reconstruction module, suitable for SCAO and tomographic reconstruction. Inputs are the wavefront sensor measurements, outputs are the DM values.

4.9 Science PSF generation

A science PSF module. Input is the phase at the pupil, at a specified wavelength (and for a specified direction). A Fourier propagation is then performed to give a noiseless PSF. Analysis to get Strehl, ensquared energy, FWHM, etc are then performed.

This module can also perform lucky imaging.

4.10 Physical (Fresnel) propagation

A module for physical propagation of light through the atmosphere to the telescope pupil.

CHAPTER 5

Other simulation modules

Not widely used, and may or may not work.

CHAPTER 6

Indices and tables

- genindex
- modindex
- search