The astronomy & astrophysics toolbox for MATLAB - Documentation

Description

After instellation (see installation), all the linked documents are available in the manual package. To see its content, from the MATLAB prompt, type: "`manual.`" followed by <tab>. To open, for example, this document:

```
open manual.documentation
```

All the functions have their own documentation (accessible using the help or doc command). However, high level doumenation (see belos) is available for some topics. We expect that missing documents will be added in the future.

Credit

If you are using this code or products in your scientific publication please give a reference to Ofek (2014; ascl.soft 07005).

License

List of documents by topic

Documentation

- The manual package - A package containing documentation in MATLAB live script format.

Installation

- Installation document - Installation instructions.

Astronomical Image Processing

Main tools for image processing:

- The SIM class - An astronomical image and metadata container class with advance image processing capabilities.
- The HEAD class - An astronomical header container class.
- The WorldCooSys class - Container for WCS information, and WCS utilities.
- The ClassPSF class - Container for Point Spread Function (PSF) and utilities.
- The MASK class - Container for bit mask images and utilities.
- The AstCat class - An astronomical catalogs container class.
- The FITS static class - Reading, writing, header access and manipulation of FITS images and tables.
- The ds9 static class - d9 control including, display, catalog overlay, manipulate, access, and interactive examination images in ds9.
- The TranClass class - A class for astronometric image coordinates transformation.
- The AstroIm package - Low level image processing and utility functions.

- The AstroX package - Low level X-ray image processing and utility functions (see also: Poisson-noise matched filter).

Documentation for selected image processing steps:

- Bias & Flat fielding - Introduction to bias and flat fielding.
- Mask images and the MASK class - Populate and use bit mask images.
- mextractor - Source extraction and measurments, including aperture and PSF photometry
- Poisson-noise matched filter - How to apply Poisson-noise matched filter.
- Cosmic rays detection - Detection and flagging of cosmic rays.
- Absolute Astrometry - Astrometric calibration against a reference catalog.
- Relative Astrometry - Image to image astrometry.
- Registration - Image alignment.
- Image coaddition, proper image coaddition and de-spackling -
- Proper image subtraction -
- Absolute photometry - Photometric calibration against a reference catalog.
- Relative photometry - Relative phootometry and light curves.

Astronomical spectra and processing

- The AstSpec class - An astronomical spectra container class.
- The AstFilter class - An astronomical filters (bands) container and database.
- The AstroUtil.spec package - Utilities for astrophysics, including: binary stars, cosmology, galaxies, GRBs, lensing, microlensing, occultations, spectroscopy, stars, supernova.
- The AstroSpec pacakge - Utilities for spectral analysis.

Astronomical catalogs, telescopes and virtual observatory

- The AstCat class - A container and functions for astronomical calatlogs.
- The VO package - Virual observatory. Catlogs, images and data access, search and cross matching.
- The telescope package - Telescope related utilities, including telescope control, S/N calculations, optics and diffraction, and observatories.
- The cats package / database - Local repository of astronomical catalogs.
- Catalog searching and matching -

Celestial coordinates, ephemeris and time

- The celestial package - A package for coordinates and time related calculations. This package include sub packages for coordinates manipulation (`coo`), Earth related (e.g., gravity field) functions (`Earth`), Hierarchical Triangular Mesh (`htm`), the two-body problem (`Kepler`), map plotting (`map`), meteors related calculations and database (`meteors`), map projections (`proj`), Solar System ephemeris (`SolarSys`), stars and constellations (`stars`), time conversion (`time`).
- The OrbitalEl class - A container and functions for orbital elements.
- The convert static class - Units conversion.
- The AstTime class - A container and functions for time.
- The telescope package - Telescope related utilities, including telescope control, S/N calculations, optics and diffraction, and observatories.
- The plot_monthly_smap function - A function for plotting a star chart of the visible sky from a given location and time.

Time series analysis

- The timeseries package - Functions for time series analysis.

Fitting and statistics

- The Util.stat package - Functions for statistics.
- The Util.fit package - Fitting utilities.
- The Util.interp package - Interpolation utilties.
- The Util.xcorr package - cross correlation functions.
- The TranClass class - A class for astronometric image coordinates transformation.

Astrophysics utilities

- The constant static class - Physical and astrophysical constants.
- The convert static class - Units conversion.
- The AstroUtil package - Utilities for astrophysics, including: binary stars, cosmology, galaxies, GRBs, lensing, microlensing, occultations, spectroscopy, stars, supernova.
- The AstroUtil.binary package - Binary stars utilities.
- The AstroUtil.cosmo package - Functions for cosmology.
- The AstroUtil.galaxy package
- The AstroUtil.GRB package
- The AstroUtil.lensing package
- The AstroUtil.microlensing package
- The AStroUtil.Occultation package
- The AstroUtil.spec package
- The AstroUtil.stars package
- The AstroUtil.supernova package
- The telescope package -

General utilities

- The Util package - a pacakge containing matlab related functions, including the following sub packages: array, cell, code, files, filter, find, fit, fun, Geom, git, integral, interp, IO, LaTex, math, movie, OS, sql, stat, string, struct, symbolic, xcorr.
- The Kernel2 static class - 2 dimensional kernels and PSFs (e.g., Gaussian, Sersic).
- The www package - For WWW access and retrival.
- The constatnt static class - Physical and astrophysical constants.
- The convert static class - Units conversion.
- The InArg static class - Control functions input arguments.

Old directories

The new version includes some old directories that were not yet integrated as packages. These include the Catalogue, External, ImSpec, plotting, and Swift directories. In addition a package named obsolete contains additional old de-comissioned functions.