examples

Here you can find many fully elaborated examples demonstrating the most important features of the FITSH package. Most of these examples are related to published scientific articles.

Optical lightcurve of (20000) Varuna

This example demonstrates a data reduction process in which the optical lightcurve of the fastly rotating trans-Neptunian object (TNO), (20000) Varuna has been measured.

A composite image of the M74 galaxy

In this example we demonstrate how the tasks in the **FITSH** package can be exploited to create a color composite astronomical image from individual scientific frames. In principle, a nice colorful image requires low noise, so either we need long exposure frames or multiple images should be combined in order to obtain this sufficiently low noise level. Since both the guiding errors of the telescope mounts and the presence of the atmospheric refraction impede us from longer exposure times, we focus on now methods based on multiple image combination. Additionally, this method also has the advantage that small but explicit dithering in the telescope position allows us to reject bad pixels or flat errors from the final image by taking a median average of the individual frames.

Astrometry

Here we demonstrate how the astrometry of a target object can be done using the tasks of the **FITSH** package. This example relates to the example shown above, regarding to the optical photometry of Varuna.

Analysis of transiting extrasolar planets

In this example, we demonstrate how the **FITSH** task can be used to completely reduce a data series acquired for a transit of the extrasolar planet HAT-P-13b [1]. These observations were made on the night of 2010 December 27/28, between 23:21 and 04:28 UT using the [ccdsh.konkoly.hu/wiki/Schmidt_telescope 60/90/180 cm Schmidt telescope] located on the Piszkés-tető Mountain Station [2] of the Konkoly Observatory, Hungary [3]. The nominal length of the transit of this planet is approximately 3.5 hours, and this series of observations were almost scheduled for the predicted mid-transit time, 01:49 UT (using the available ephemerides at that time). All in all, 460 individual frames were taken with a net exposure time of 20 seconds, thus one cycle was approximately 42 seconds (i.e. adding the 22 seconds of overhead yielded by the camera readout). See the paper Transit timing variations in the HAT-P-13 planetary system [4] for more details about the physics of this planetary system (and where these measurements have been published shortly after this observation).

Implementation of the IMEXAM features

Although one of the primary design concepts of the **FITSH** package was to provide a robust set of command-line driven utilities and to provide a shell-hosted environment for massive batched image processing; the individual **FITSH** tasks can be exploited easily to create interactive applications as well. In this example we show how the tasks firandom, fiphot and lfit can be used to implement the well-known IRAF task, imexamine [5] (that is usually referred as simply as **imexam**, see also this [6] or this [7] references).

Isotropic and anisotropic pointing models

This example demonstrates how a simple construction can be given in order to create isotropic and anisotropic telescope pointing models. This practical example evaluates and expects a series of four-column data containing instrumental and celestial hour angle - declination coordinates. Note that the full mathematical description is available in this paper [8], this example above focuses only on the practical implementation of the pointing model evaluation.

References

[1] http://exoplanet.eu/star.php?st=HAT-P-13
[2] http://ccdsh.konkoly.hu/wiki/Piszk%C3%A9stet%C5%91_Mountain_Station
[3] http://www.konkoly.hu/index_en.shtml
[4] http://adsabs.harvard.edu/abs/2011MNRAS.413L..43P
[5] http://stsdas.stsci.edu/cgi-bin/gethelp.cgi?imexamine
[6] http://www.astro.washington.edu/courses/astro480/IRAF/iraf1_tutorial.html
[7] http://noao.edu/kpno/manuals/ice/node31.html
[8] http://adsabs.harvard.edu/abs/2016ExA....41....1P