StarBugII Manual

JWST PSF photometry in dusty crowded fields. Last updated: v0.2.14

Installation

```
pip install starbug2
```

After the package is installed, there are a few steps required to initialise Starbug.

WEBBPSF Is a dependency of Starbug that has its own initialisation process. The full installation is documented on https://webbpsf.readthedocs.io/en/latest/installation.html however it requires two main steps. Download the data file on the website, named something like webbpsf-data-X.X.X.tar.gz and expand it into a directory, then append to your .bashrc (or equivalent) `export "WEBBPSF=PATH/TO/DIRECTORY"`.

StarbugII has a command that should initialise everything else. It will create the folder `${HOME}/.local/share/starbug` and download/generate relevant files. It will take approx. 5 minutes to complete.

```
starbug2 --init
```

TAB Completion

StarbugII has a bash completion script `starbug2/extras/starbug2.completion`. This can be installed directly into `/etc/bash_completion.d/` or `source /PATH/TO/COMPLETION/FILE` can be place within your .bashrc. Unfortunately this completion script works only in bash shells.

Usage

```
Starbug II - JWST PSF photometry
usage: starbug2 [-ABCDfhMPv] [-b bgdfile] [-d apfile] [-o directory] [-p file.param] [-s opt=val] image.fits ...
   -A  --apphot          : run aperture photometry on a source list
   -B  --background      : run background estimation
   -b  --bgdfile         : load background (-bgd.fits) file
   -C  --clean           : run source cleaning before photometry
   -d  --apfile  ap.fits : load a source detection (-ap.fits) file to skip the source detection step
   -D  --detect          : run source detection
   -f  --find            : attempt to find associated -ap -bgd files
   -h  --help            : display uasage information
   -M  --match           : match outputs from all input image files
   -n  --ncores      num : number of CPU cores to split process between
   -o  --output      dir : output directory
   -p  --param   a.param : load parameter file
   -P  --photom          : run psf photometry
   -s  --set      option : set value in parameter file at runtime (-s SIGSKY=3)
   -S  --subbgd          : subtract background from image
   -v  --verbose         : display verbose outputs

   --> Single run commands
       --init                     : Initialise Starbug (post install)
       --generate-psf             : Generate ALL the PSF files to "PSFDIR"
       --local-param              : Make a local copy of the default parameter file
       --generate-region   a.fits : Make a ds9 region file with a detection file
       --clean-table       a.fits : Clean up an individual table
       --generate-run      *.fits : Generate a simple run script
       --version                  : Print starbug2 version
```

Parameter File

The parameter file is where any dataset specific parameters can be tweaked. Ideally the default values should be sufficient however if the diffuse dust emissions cause a very complex background or the field is very crowded, certain parameters may need tuned. Additionally differing sensitivities between photometric bands may require different parameters to detect on.

To generate a local parameter file, run `starbug2 --local-param`, This will create `./starbug.param`, a file which will be loaded by default when starbug is ran from the folder that contains it. However it can be named anything and explicitly loaded at

runtime with `-p file.param` in the command. It may be the case that you keep several parameter files on hand to conduct slightly different routines, this is how you would load them.

For quick testing or tweaking of certain parameters, starbug can override a file setting with the addition of `-s PARAM=VALUE` OR `--set PARAM=VALUE` in the command. This will not change the parameter file but will use this parameter value instead.

Settable Parameters

As of the current version. If your parameter file doesnt fit the template of the current version of the default file, starbug will warn you but may crash later if you dont update the local parameter file.

VERBOSE NULLVAL PSFDIR OUTDIR SIGSKY SIGSRC BOX_SIZE FILTER_SIZE DOBGD2D SHARP_LO SHARP_HI ROUND_LO ROUND_HI APPHOT_R ENCENERGY FIT_APP_R SKY_RIN SKY_ROUT ERROR_CUT SHARP_HI_SIG SHARP_LO_SIG ROUND_HI_SIG ROUND_LO_SIG BGD_R AP_FILE BGD_FILE CRIT_SEP MATCH_THRESH MATCH_COLS RM_MATCH NUMBER_ARTIFICIAL_STARS SUBIMAGE_SIZE MIN_FLUX MAX_FLUX SEPARATION_THRESH REGION_COL REGION_SCAL REGION_RAD REGION_XCOL REGION_YCOL REGION_WCS

A Typical Run

param detect 1 ++ test detect dither ++ test run.sh bgd psf

FAQ