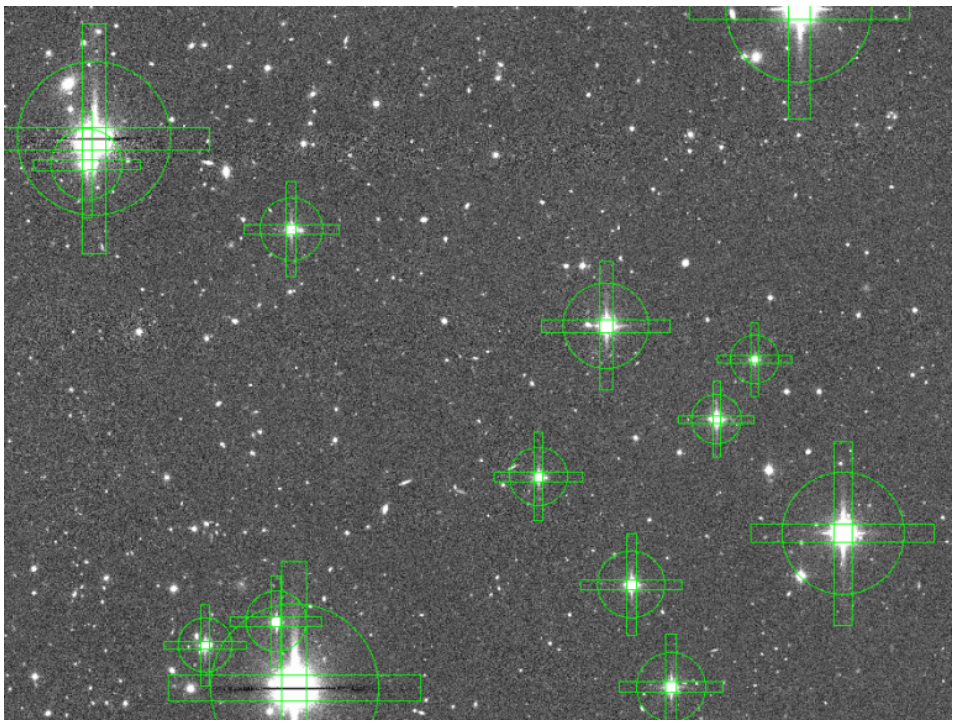
THE BRIGHT-STAR MASKS FOR HSC-SSP

April 17, 2017 coupon 0 Comment Astronomy

The masks to flag objects in the HSC-SSP area can be found here. The archive contains the masks and tools to flag objects potentially affected by a nearby star in the HSC-SSP footprint, as illustrated below:



(Y-band image from the PDR1. The green shapes are the bright-star masks).

Version history

Current version:

- "Arcturus" (April 21th, 2017): identical to Canopus, with tract- and patch-based region files included.

Previous versions:

- “Canopus” (April 2017): new masks, Gaia-dr1, Tycho-2 and SDSS, pure star sample, a few areas with lower Gaia-star density due to low scanned areas.
- “Sirius” (March 2016, S15B, S16A, PDR1): 8% of bright galaxies, size of mask over conservative below mag ~ 5 for a dozen stars.

How to use it?

Uncompressing the archive:

Run:

```
$ tar xzvf HSC-SSP_brightStarMask_VERSION.tgz
```

Installing venice

venice is a mask utility program that reads a mask file (DS9 or fits type) and a catalogue of objects to:

- create a pixelized mask,
- find objects inside/outside a mask,
- or generate a random catalogue of objects inside/outside a mask.

The code sources are in HSC-SSP_brightStarMask_VERSION/venice-v.v.v/

To compile it, you first need to install the gsl and cfitsio libraries (gsl, cfitsio).

Then, go to venice directory

```
$ cd HSC-SSP_brightStarMask_VERSION/venice-v.v.v/
```

and run:

```
$ make
```

or, if gsl and cfisio libraries are installed in a different directory than /usr/local:

```
$ make PREFIX_GSL=DIRECTORY_NAME PREFIX_CFITSIO=DIRECTORY_NAME
```

If you want to use a different compiler than gcc, type (only tested with gcc and icc):

```
$ make CC=my_favorite_compiler
```

The compiled program is installed in HSC-SSP_brightStarMask_VERSION/venice-v.v.v/bin/

The star catalogue

The star catalogue is in HSC-SSP_brightStarMask_VERSION/star. It contains the following information:

Columns: 9
Rows: 1812106

Columns
— —-
1: source_id(Long) – source_id
2: ra(Double)/Angle[deg] – ra
3: dec(Double)/Angle[deg] – dec
4: G_Gaia(Double)/Magnitude[mag] – phot_g_mean_mag
5: origin(String)
6: G_Gaia_SDSS(Double)
7: G_Gaia_HSC(Double)
8: extended_HSC(Short)
9: ipsf_FWHM(Double)

Flagging a catalogue using venice

Run:

```
$ venice \
-m reg/masks_all.reg -f all \
-cat MY_INPUT_CAT \
-xcol RA_COLUMN_NAME -ycol DEC_COLUMN_NAME \
-o MY_OUTPUT_CAT
```

Note: venice can read both fits files (default) and ascii files.

For ascii files, set: “-ifmt ascii” and “-ofmt ascii”

See gitHub venice directory for more information.

Tract and patch version

The archives “reg/patches.tgz” “reg/tracts.tgz” contains the masks split per tract and patch for the five filters. To untar it, run:

```
$ cd HSC-SSP_brightStarMask_VERSION/reg
$ tar xzvf tracts.tgz
$ tar xzvf patches.tgz
```

WARNING: tracts expand into 5715 files and patches expand into 356550 files!

The file path and names are the following:

tract: HSC-SSP_brightStarMask_VERSION/reg/tracts/BrightStarMask-9000-0,0-FILTER.reg
patch: HSC-SSP_brightStarMask_VERSION/reg/tracts/TRACT/BrightStarMask-TRACT-PATCH-FILTER.reg

Note: currently, the mask is the same for each filter, so g, r, z, and Y filter masks are symbolic links pointing to the i filter mask.

Example: flagging objects in the tract 9376

First create a catalogue of random points for the example:

```
$ venice -r -xmin 221.476 -xmax 222.967 -ymin -1.5014 -ymax 0.044
  -coord spher -o tract_9376.fits
$ venice -m reg/tracts/BrightStarMask-9376-HSC-I.reg \
  -cat tract_9376.fits -xcol ra -ycol dec \
  -f all -flagName isOutsideMask -o tract_9376_flagged.fits
```

Options:

- -m reg/tracts/BrightStarMask-9376-HSC-I.reg: masks in region format
- -cat tract_9376.fits: catalogue to flag
- -xcol ra -ycol dec: names of the input coordinates columns
- -f all: keep all object, 1: oustide the mask, 0: inside the mask
- -flagName isOutsideMask: name of the flag column
- -o tract_9376_flagged.fits: the output file