

## 1 Configuration

Create a simple configuration files for SExtractor:

```
>sex -d > default.sex
```

or download these files from pages of the lecture. You will need `default.sex`, `default.param`, one of convolution matrixes `default.conv` and neural network weights `default.nnw`, if you are going to use sextractor for classification.

### 1.1 default.sex

Following parameters should be checked before running sextractor:

```
CATALOG_NAME temp.cat # name of the output catalog
CATALOG_TYPE FITS_1.0 # "NONE", "ASCII_HEAD", "ASCII", "FITS_1.0"
# or "FITS_LDAC"

PARAMETERS_NAME default.param # name of the file containing catalog contents

#----- Extraction -----

DETECT_TYPE CCD # "CCD" or "PHOTO" (*)
DETECT_MINAREA 4 # minimum number of pixels above threshold
DETECT_THRESH 2.0 # <sigmas> or <threshold>,<ZP> in mag.arcsec-2

FILTER N # apply filter for detection ("Y" or "N")?
FILTER_NAME default.conv # name of the file containing the filter
```

The output of the sextraction will be put into `temp.cat` in the format you've selected.

### 1.2 default.param

```
NUMBER # running number of object

FLUX_ISO # flux
FLUXERR_ISO # with error
MAG_ISO # and magnitude
MAGERR_ISO # with error

X_IMAGE # coordinates of
Y_IMAGE # the detected object, in px
ALPHA_J2000 # and coordinates in J2000
DELTA_J2000 #

CLASS_STAR # classification star(1)/galaxy(0)
```

## 2 Running sextractor on image

The simplest way to run sextractor is to have all configuration files described above in the same directory. In this case

```
>sex 2MASSJ.fits
----- SExtractor 2.5.0 started on 2010-10-05 at 06:50:56 with 1 thread
```

```
Measuring from: "Unnamed" / 512 x 1024 / 32 bits FLOATING POINT data
(M+D) Background: 0.118312 RMS: 1.05576 / Threshold: 3.16729
Objects: detected 114 / sextracted 30
> All done (in 0 s)
```

30 objects were sextracted and stored in `temp.cat` file.

Try to run `sextractor` on the file with overcrowded field changing minimum detection area and threshold.

### 3 Coordinates and magnitudes

In this set of exercises you have to create catalogs with coordinates and magnitudes from the test image.

#### 3.1 Image with zero point for magnitude

Use the image `SA105WFCSloanG.fits`. Look at the header of FITS file to find `ZEROPOINT` value and ingest this value in the `default.sex`. Ensure, that the output contains `MAG_APER`, `MAG_ISO` and `MAG_AUTO`. Compare three type of magnitudes and find differences between them.

#### 3.2 Image with a reference frame

As you can see from the result of sextraction, there is no proper magnitudes (as there is no zero point for magnitudes). Run `sextractor` on the crowded image with `DETECT_MINAREA=6` and `DETECT_THRESH=5.0` Using the result find an area on the sky and select the same area from 2MASS catalog. Assuming that in the wide range of magnitudes the dependence is linear, find zero point and put your magnitudes on 2MASS magnitudes. Select from sextracted catalog only stars with the best photometry.