

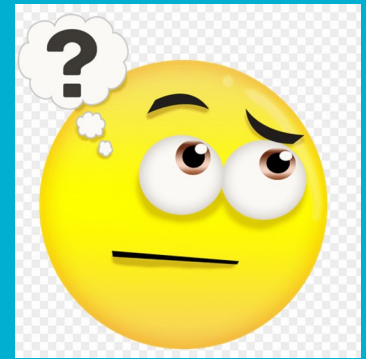
Shifting your images

Tiina Liimets (tiina.liimets@asu.cas.cz Office nr 209)

Research workshop on evolved stars

02.09.2022

To shift or not to shift?



- Any shifting is interpolation of pixel values. You will see that shifted images are slightly different. The peak and FWHM values have changed perhaps a bit more than you feel comfortable, but the integrated flux values are the same within 1%.
- This is a trade-off. You will have to decide yourself if this is acceptable for your science.

Primitive shifting

- We use pixel coordinates, which is enough for your current work. Simple IRAF tasks are used (`display`, `imexam`, `imshift`), which are combined into a self-made task. We use also a short python program to calculate the shifts.
- In the future, you might want to start using the WCS (astrometry), then shifting is not needed.

IRAF task align

- This is self-made IRAF task (similar to Mauricio). It is in a file align.cl
- Copy align.cl into the directory where you have the images you want to align.
- Copy to the same directory the little python program pre_shifts2.py which is calculating the shifts.

pre_shifts2.py **uses python2.7!** It is available in the virtual box. Later pythons may not work.

In virtual box before starting IRAF, in terminal type: **conda activate iraf27**

- You have to let IRAF know that you have your own task. In IRAF terminal:
task align=align.cl

THIS HAS TO BE DONE EVERY TIME YOU OPEN IRAF!!!

If you do not do it, you get the following error:

```
ecl> align
```

```
ERROR: task `align' not found
```

Preparation

- Create a list of your images. The name of the list has to be “list”, otherwise the script will not work!!!

```
ec1> ! more list
Object_3__R_0001.fits
Object_3__R_0002.fits
Object_3__R_0003.fits
Object_3__R_0004.fits
Object_3__R_0005.fits
Object_3__R_0006.fits
Object_3__R_0007.fits
Object_3__R_0008.fits
Object_3__R_0009.fits
```

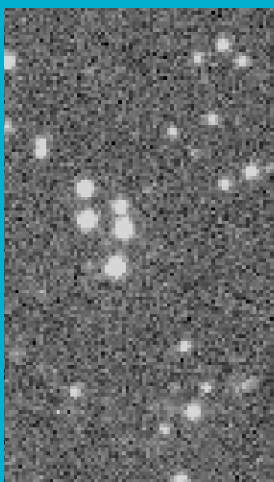


- The first image of the list is the reference image. All other images will be aligned with this frame.
- If you have a long list of images (> ~50), I recommend splitting the list into smaller portions because the task requires manual clicking on a star on each image. If you make a mistake, you will have to start from the beginning. Keep the reference frame the same!!! The first image of each list has to be the same.
- Ds9 has to be open.

align *in action*

- In IRAF terminal type: **align list**
and follow the instructions on the screen

```
ecl> align list
///// INSTRUCTIONS /////
In the ds9 window, on top of your reference star
click 'a' to measure the star and click 'q' to go to the next frame
///// INSTRUCTIONS /////
Object_3__R_0001.fits
z1=2097.995 z2=2606.514
Log file precheck_out.txt open
```



```
///// INSTRUCTIONS /////
Object_3__R_0001.fits
z1=2097.995 z2=2606.514
Log file precheck_out.txt open
# COL LINE COORDINATES
# R MAG FLUX SKY PEAK E PA BETA ENCLOSED MOFFAT DIRECT
544.80 361.82 544.80 361.82
8.17 11.88 177804. 2386. 14986. 0.05 65 3.55 2.74 2.82 2.72
Object_3__R_0002.fits
z1=2084.489 z2=2630.057
Log file precheck_out.txt open
# COL LINE COORDINATES
# R MAG FLUX SKY PEAK E PA BETA ENCLOSED MOFFAT DIRECT
544.45 362.03 544.45 362.03
8.24 11.88 177002. 2398. 15206. 0.04 -80 3.11 2.76 2.81 2.75
Object_3__R_0003.fits
z1=2092.874 z2=2637.671
Log file precheck_out.txt open
# COL LINE COORDINATES
# R MAG FLUX SKY PEAK E PA BETA ENCLOSED MOFFAT DIRECT
544.40 362.09 544.40 362.09
7.75 11.88 176988. 2404. 17276. 0.04 -78 3.12 2.57 2.62 2.58
Object_3__R_0004.fits
z1=2104.949 z2=2619.566
Log file precheck_out.txt open
```

align: outputs

- Shifted images: fits files which have “s.fits” in the end.

```
ecl> cat listout
```

```
Object_3__R_0001s.fits
```

```
Object_3__R_0002s.fits
```

```
...
```

- Check what you got!

In ds9 display and blink few frames (e.g. first, middle, last)

align: additional outputs (just for information)

- Files that are created during the process:

precheck_out.txt (imexam output (text) file with the information about the clicked stars)

pre_shifts.txt (text file with the shifts to be applied to the frames. This is the output from the python program `pre_shifts2.py`)

listout (text file with the filenames that will be shifted)