

Automatic Astrometry using autoast and intast

Eran O. Ofek

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Description

AUTOAST.CL and *INTAST.CL* are IRAF tasks designed for automatic plate solution and astrometry. These programs are running under UNIX/LINUX - IRAF. *AUTOAST.CL* was designed to automatically find reference stars in the image (by stars pattern recognition) and then find the plate solution of the image, writing the recognition keyword to the image header and converting coordinates from/to the image coordinate system. *INTAST.CL* is an interactive version designed to find the equatorial coordinate and magnitude (relative to USNO-A magnitudes) of objects in the image selected using the mouse. The programs are identifying the reference stars from the USNO-A catalogue without user interaction. The sole requirements of the programs are: (1) north-aligned images, (2) guess coordinates (manual or from header) good to about one field of view of the image.

1 Installation

1. Copy the *IRAF* scripts: `autoast.cl`, `intast.cl`, `usno_cd.cl`, `autodaofind.cl` and the fortran programs: `match_list.f`, `xyshift.f`, `project.f`, `find_zero.f`.
2. Compile the fortran programs.
3. Add the following lines to your `login.cl`, with the full path of the script/binary file, e.g.
 - (a) `task intast = /home/wise-cdr/eran/iraf/script/intast.cl`
 - (b) `task autoast = /home/wise-cdr/eran/iraf/script/autoast.cl`
 - (c) `task $find_zero = /home/wise-cdr/eran/iraf/bin/find_zero`
 - (d) `task $match_list = /home/wise-cdr/eran/iraf/bin/match_list`
 - (e) `task $xyshift = /home/wise-cdr/eran/iraf/bin/xyshift`

- (f) task \$project = /home/wise-cdr/eran/iraf/bin/project
 - (g) task autodaofind = /home/wise-cdr/eran/iraf/script/autodaofind.cl
 - (h) task usno_cd = /home/wise-cdr/eran/iraf/script/usno_cd.cl
4. Install WCSTools- scat program. Copy and compile the wcstools - scat program (D. Mink 1998), *URL : <http://tdc-www.harvard.edu/software/wcstools.html>*.

2 Parameters

I list here **only** the most important parameters.

2.1 Autoast parameters

1. **imname** - Image name
2. **racen** - Gussed R.A. for field center, in sexagesimal format. If **use_key** keyword is “yes”- The R.A. is taken from the header.
3. **deccen** - Gussed Dec. for field center, in sexagesimal format. If **use_key** keyword is “yes”- The Dec. is taken from the header.
4. **equinox** - The equinox for field center. If **use_key** keyword is “yes”- The equinox. is taken from the header.
5. **use_key** - Take coordinate from header or from task parameters.
6. **ra_key** - R.A. header keyword
7. **dec_key** - Dec. header keyword
8. **equ_key** - Equinox header keyword
9. **fwhm** - Estimate for the FWHM in pixels.
10. **scale** - Image scale in arcsec per pixel.
11. **width_as** - Width of extracted catalog in arcsec. (*Recommended value:* FOV + Maximal error in guess coordinate)
12. **xytol** - Matching tolerance in pixels.
13. **catalog** - Astrometric catalog to use, usnoa2 — usnos1 — usnos2.
14. **wcsupdate** - Write/update WCS keywords in header.

15. **input_cf** - File of coordinate to convert.
16. **pre_cf_out** - Prefix for coordinate output file. (e.g. The result will be written to `input_cf.pre_cf_out`)
17. **dir_xy2rd** - Conversion direction. “yes” for X/Y pixel position to R.A. and Dec. “no” for visa-versa. The coordinate output are in the equinox of J2000.0.
18. **interac** - Interactive rejection of stars with large residuals. (Plots residuals histogram and/or opens *emacs* and let the user to delete stars with large residuals).
19. **scat_path** - Path for the scat search program
20. **path_usa1** - Path for the USNO-SA1.0 catalog.
21. **path_usa2** - Path for the USNO-SA2.0 catalog.

2.2 intast parameters

intast.cl uses *autoast.cl*. Before running *intast.cl* check out the critical parameters in *autoast.cl* (e.g. **scale**, **ra_key**, **dec_key**, etc.)

1. **imname** - Image name
2. **buf** - Buffer number in saotng/saoimag/ximtool
3. **sumfile** - Name of summary output file.
4. **ftype** - Format of summary output file. “no”- coordinate/magnitude/epoch + errors. “yes”- MPC-like file.
5. **catalog** - Astrometric catalog to use, usnoa2 | usnosa1 | usnosa2.

Remark: The magnitude in the MPC like file format is calculated relative to the E band of the USNO-A catalog while in the coordinate/magnitude/epoch (“no”) option it is calculated relative to E and O bands.