Replacing the IRAF/PyRAF Code-base at STScI: The Advanced Camera for Surveys

Ray A. Lucas, Tyler D. Desjardins, and Norman A. Grog
Space Telescope Science Institute, Baltimore, MD

Abstract

IRAF/PyRAF are no longer viable on the latest hardware often used by HST observers, therefore STScI no longer actively supports IRAF or PyRAF for most purposes. STScI instrument teams are in the process of converting almost all of our data processing and analysis code from IRAF/PyRAF to Python, including our calibration reference file pipelines and data reduction software. This is exemplified by our latest ACS Data Handbook, version 9.0, which was recently published in February 2018. Examples of IRAF and PyRAF commands have now been replaced by code blocks in Python, with references linked to documentation on how to download and install the latest Python software via Conda and AstroConda. With the temporary exception of the ACS slitless spectroscopy tool aXe, all ACS-related software is now independent of IRAF/PyRAF. A concerted effort has been made across STScI divisions to help the astronomical community transition from IRAF/PyRAF to Python, with tools such as Python Jupyter notebooks being made to give users workable examples. In addition to our code changes, the new ACS data handbook discusses the latest developments in charge transfer efficiency (CTE) correction, bias de-striping, and updates to the creation and format of calibration reference files among other topics.

Introduction:

- IRAF/PyRAF was “black box” code; written by astronomers, but often no immediate insight into what it was actually doing
- IRAF/PyRAF no longer maintained; few/no resources for help; documentation no longer updated
- IRAF/PyRAF has some known/advertised problems/bugs in basic tasks which will not be fixed, and possibly unknown ones, too → Example: imstat: sums of exponentially large numbers of pixel values may encounter roundoff errors, significant when standard deviation is small compared to the mean
- IRAF/PyRAF increasingly difficult to compile on machines popular with users, and may eventually become impossible to compile
- IRAF/PyRAF has small user base of only astronomers which means little funding for maintenance and growth of capabilities
- Python is open source; much larger user community for many applications; critical astronomical coding can still be done by astronomers, but much of more general utility can be done by programmers
- Python more interoperable with new concepts such as downloadable interactive Jupyter notebooks (make changes to code and immediately see effects); more effective teaching tool by its nature
- Python more interoperable with new data visualization tools like Glueviz, etc. which can link different datasets, plot quantities from them all, rotate in 3-D space, etc.; also more active documentation

Using IRAF/PyRAF, and START using Python!