Semi-annual report of the NRAO AIPS++ User Group

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1 Background

The past six months have seen significant improvements in aips++ in several key areas associated with VLA end-to-end processing. Detailed comparisons between data sets processed in a similar fashion in AIPS and aips++ now show good agreement in the flux scale, calibration solutions, and final noise levels in the images. Further, we are now beginning to process science data that is slated for publication, rather than just simple test data sets. However, there is still a lot to be done in order to reach the laudable goal of end-to-end VLA reduction within aips++ for any but the most expert and determined users. This goal was recently stated in the April 2001 NRAO newsletter (see below). The primary purposes of this document are to recount the progress made in the past development cycle (for 2001-05, release 1.5), to summarize the current state and focus of the NRAO testing, and to draw attention to those areas that we feel most urgently need work if the aips++ project is going to realize the goal of usability of the 2001-11 (release 1.6) for VLA continuum data reduction for general users.

From the April 2001 NRAO Newsletter (p. 4):

"On the synthesis side, many types of VLA observations can now be filled, edited, calibrated and imaged entirely within the package. Our work has concentrated on debugging the path for various types of data, adding extra facilities as necessary, and improving the documentation. We expect that at the time of the release 1.5 [May 2001], the package will be usable by experienced interferometrists for VLA reductions, but that novices would be advised to wait for the subsequent release in the fall of 2001."

2 Progress in the Past Cycle

We commend the aips++ group for their willingness to assist members of the NAUG, and for responding to a large number of defects and enhancement requests. Since the last release we have seen a significant number of achievements in aips++ including:

o The ability to fill VLA data using the vlafiller tool.

o The implementation (in msplot) of "see it, flag it" style visibility editing. Some work is still urgently needed in this area (see below).

o The ability to perform polarization calibration.

o Efforts were made to speed up some parts of aips++ including imaging and the calibrator tool. Some more work along these lines may still be needed (see below).

3 Current Status

Intensive testing is being carried out in a number of areas, with emphasis on the path for VLA continuum data.

o Processing of VLA continuum polarization calibration data (Myers, Taylor). The first tests of this path have been successful in reproducing AIPS results for C and X band data. Current roadblocks include the poor performance of flagging in msplot (the scope of editing in the X-Y plot mode, and the lack of support for many AIPS TVFLG functionality in the display mode) and lack of CLCOR-like gain-curve and opacity correction.

o Processing of other VLA continuum data (Fomalont, Taylor, Benson, Shepherd) covering all the commonly used VLA continuum bands (everything except 4-band and P-band) and including multiple/resolved sources.

A roadblock here has been the combination of VLA data from multiple configurations.

Processing of aips++ with spectral-line datasets was a goal that the NAUG did not achieve in this cycle. Thus we can make no comments or recommendations at this time. There will be a concentrated effort in this area over the next 6 months.

4 Immediate Requirements

The NAUG identifies the following tasks which must be completed for aips++ to truly be "usable by experienced interferometrists for VLA reductions". In order of priority these are:

(1) GUI driven data editing must be fully functional, and work as the user expects. Since editing will be the first significant task most users encounter within aips++ it is particularly critical that this tool be both intuitive and robust. You must be able to tell what you are editing, and what you are editing must be properly flagged. This includes the ability to undo specific flags (e.g., try out flagging some visibilities to see what their effect is). The missing functionality of TVFLG is particularly sorely felt. The raster display in msplot has never worked properly and there is no capability to edit on the basis of rms of amplitude or a running mean.

(2) The user must be able to clean complicated sources, and/or fields that include multiple sources. The ability to define multiple fields and multiple clean boxes within each is still missing.

(3) Critical enhancements are still needed for the calibration of high-frequency data, including the ability to make corrections for elevation dependent gain and opacity effects.

(4) An efficient and inclusive LISTR-like summary output is also urgently needed.

5 Requirements for the next release

For the Fall 2001 release (1.6), in order for aips++ to meet its goal of being usable by novices, the following would also need to be achieved:

(1) There must be suitable step-by-step documentation (a.k.a. a "cookbook") with supporting scripts that describe the end-to-end processing of radio continuum data over the most commonly used VLA observing bands (1.3 -¿ 43 GHz), including polarization. The documentation should have minimal aips++ jargon and design philosophy, and should concentrate on

specific calibration and imaging steps (i.e., what you do, not why you do it), and it should be specifically geared toward users of the VLA, providing frequent referrals to equivalent reduction steps in AIPS.

(2) Robustness. At the present time there are still a large number of bug reports and enhancements coming from the NAUG when bringing new datasets through aips++. All major reduction paths must be tested end-to-end against real data without incurring catastrophic failures or critical-path blockages. The NAUG group is adding data from individual members, but we feel a comprehensive "test-plan" might help delineate areas where a wider range of fiducial datasets could be obtained.

(3) Aips++ should have computational times that are competitive with AIPS, and users should not be unduly slowed down by delays in the GUI interface. This may require the combination of different tools within one execution step.

6 Long-Term Requirements

In addition to the core capabilities mentioned above, there are several enhancements for VLA end-to-end reduction that should see continued development over the next 6 months:

o Continuum subtraction and bandpass correction for spectral line data.

o Wide-field imaging. Concentrate on computing efficiency and ease of setting up the multiple fields and clean boxes. The automatic use of the RCP and LCP beam offsets in aips++ is a significant improvement over that in AIPS. Self-calibration is a must for these fields.

o Mosaic imaging of continuum and spectral-line data.

o A major overhaul of the documentation. For example putting links under the wrench to take the user to helpful documentation, and having help requests that drive a browser to the relevant part of the Getting Results or the Cookbook. Many of the little pop-up yellow help windows show trivial or obscure comments. These should be rationalized and expanded upon.

o The implementation of several Wizards to lead novice users step-by-step through VLA calibration and imaging of fairly simple datasets.

o The implementation of a Difmap-like imaging/self-calibration/editing/modelfitting environment.