

Internal JIVE BlackHoleCam meeting

Date: 17 March 2015, 11:00 in Arpad's office

Subject: fringe finding old and new developments, software pipeline WP

Present: Ian Stewart (Allegro, Leiden), Arpad Szomoru, Des Small, Mark Kettenis, Ilse van Bommel

Ian Stewart is visiting to share his knowledge and experience on fringe finding. He has been working on a fringe finder for LOFAR for several years. This is Python based code, which he is happy to share, but it is not finished.

LOFAR specific issues in the fringe finder are that the short baselines are not fitted (short means that the errors are smaller than a turn of phase within the coherence time). The core stations are used as a single station to boost the signal to noise.

The algorithm in the CASA fringe finder should be able to handle both global and baseline based fitting. Ian has a strong preference for global fitting, since it boosts the signal to noise. He believes he has a method to retrieve realistic errors using a Bayesian approach and proper function. However, this may not be the fastest or most practical method to implement.

The code base for the fringe finder will be Python, which is acceptable for CASA development. We will resort to C++ only in cases where a significant improvement in performance can be achieved.

We briefly discuss the bandwidth issues that are a concern for the ongoing EHT campaign. The existing HOPS fourfit and AIPS FRING cannot handle the large bandwidth. A basic, quick CASA implementation would boost the visibility of our project.

Ian points out that in principle a fringe fit is a process identical to self-calibration: it attempts to remove errors in the phase assuming a source model. He has been thinking about doing a two-in-one approach. This would be a long term idea for this project.

The current fringe finder algorithms assume the source is unresolved. This is not the case for mm-VLBI. The question comes up how to fringe fit with non-Gaussian sources (such as the Galactic Center).

To test our new implementation, a figure of merit is needed to compare it to the performance of AIPS and HOPS. Ian has a document for this and will share it with Des.

We discuss differential Faraday rotation, which is a big deal for LOFAR, but the effects drops off to higher frequencies. It may not be an issue for mm-VLBI, but it could be important for cm-VLBI. Something to keep in mind when discussing polarization calibration.

Items to ponder:

- On what timescale can we have a rough CASA based task for fringe finding?
- How to do fringe finding on non-Gaussian sources
- Do we want to develop a Bayesian approach to fringe finding
- Combination of fringe finding and self-cal
- Differential Faraday rotation

Actions:

No specific actions came out of this meeting