Imaging Pipeline Software

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Abstract

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Acknowledgements

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1. Introduction

## 1.1 Aperture Synthesis

The resolution of radio telescopes can be increased by using pairs of telescopes (baselines) and taking the product of the received signals. This resolution can be changed by increases the separation of the baseline, rather then increasing the size of the individual telescopes. This method popularized by the work of (Ryle & Hewish, 1960) states that using these baselines it produces “exactly the same result as that obtained by using the complete large aperture”. This technique allowed for cheaper production of much larger apertures and the eventual development of the techniques used now. These techniques gather Fourier domain data in the form of a visibility, however the way in which they are sampled is non-uniform, so we must place it on a rectangular grid. This process is known as gridding and the methods used now are based on the work by (Brouw, 1975).

## 1.2 Fourier Transform

For the performance of the pipeline an inverse Fast Fourier Transform will be used. Using such a method is based upon the work of (Hogg, MacDonald, Conway, & Wade, 1969) where the values from the visibilities are averaged across grid points. The algorithm used was first discovered by Gauss and later rediscovered by (Cooley & Tukey, 1965) which also notes that “Wherever possible the use of N == rm with r = 2 or 4 offers important advantages” which impacts the design of the pipeline.

## 1.3 Gridding

## 1.4 Deconvolution

2. Methods

3. Results

4. Discussion of Results

5. Conclusion

**References**

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Hogg, D. E., MacDonald, G. H., Conway, R. G., & Wade, C. M. (1969). Synthesis of Brightness Distribution in Radio Sources. *Astronomical Journal*, 1206-1213.

Ryle, M., & Hewish, A. (1960). The synthesis of large radio telescopes. *Monthly Notices of the Royal Astronomical Society, Vol. 120*, 220-230.

(Brigham, 1988)

Appendix

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