Research project proposal, Bobbie Ware, id:17962233

**Title**

Imaging pipeline Software

**Purpose**

To implement software to carry out image synthesis using Java. The software will use data readings from multiple smaller antennas “arranged in such a way to gather information equivalent to that obtained from one of much greater size” (Ryle & Hewish, 1960). This technique takes visibilities and uses three techniques, Gridding, Fourier Transform, and Deconvolution, to produce an image of a region of the sky that could not be captured using just the smaller antennas alone.. The software will mimic pipelines that will be used for the Square Kilometre Array (SKA).

**Literature Sources**

The software will use data in the form of visibilities that are generated at AUT. Sources for information of Gridding techniques include knowledge from (Romein, 2012) and (Brouw, 1975). Maybe add sources for info on fft and convolution

**Planned Methodology**

This project will start with the gathering of knowledge on the techniques used in a imaging pipeline from literature. It will also involve gaining knowledge on solutions to complications such as concurrency control and the mapping of visibilities to a grid. These issues are involved in the Gridding section of the software. Then the project will involve implementing the techniques in the form of a Java program and then to be tested. The software will be testing against other pipelines and changes will be made according to its performance.

**Expected Analysis**

The image produced by the pipeline analysed to see if the techniques are implemented properly and potentially look at its performance. Not sure what else can go here

**Expected Conclusion**

It is expected that a imaging pipeline with the capability for image synthesis. Also expected to gain knowledge in the three areas involved in the pipeline.

References

Brouw, W. N. (1975). Aperture Synthesis. In C. De Jager, & H. Nieuwenhuijzen, *Image Processing Techinques in Astronomy* (pp. 301-307). Dordrecht: Springer.

Romein, J. W. (2012). An efficient work-distribution strategy for gridding radio-telescope data on GPUs. *ICS '12 Proceedings of the 26th ACM international conference on Supercomputing*, 321-330.

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