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A Practical Survey of Novel and Legacy Radio Interferometry Imaging Algorithms and Packages

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Radio interferometry software packages have grown sophisticated enough that we can now begin to address some of the imaging issues that are posed by the next generation of radio telescopes, most notably the MeerKAT and Square Kilometre Array (SKA). The main objective of this project is to develop a framework that allows the evaluation of deconvolution algorithms and imaging techniques using a platform independent pipelining tool. We use MeerKAT L-band simulated visibility data to perform the evaluation of the radio interferometric packages. Using the framework, we compare the performance of imaging tools such as CASA, DDFacet, LWImager and WSClean. Using these images we recovered source flux density, morphology, angular position and spectral index. Therefore, by comparing the model inputs and the recovered source properties with their corresponding measured uncertainties, we can infer how well each imager performs the deconvolution process for a given set of observational parameters. It was found that at flux densities below 20σ, there is a significant scatter in the measured properties as a result of the decrease in signal to noise ratios of the sources, and at higher source flux densities there is a clear correlation which was simply described statistically.

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