FINITE PRECISION ARITHMETIC IN POLYPHASE FILTERBANK IMPLEMENTATIONS

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Radio wave readings are often most useful to scientists when presented as a spectrum. For this reason, most radio telescopes have a back-end spectrometer which transforms the incoming data from the time to frequency domain. In radio astronomy, the preferred way of doing this is through the use of a Polyphase Filterbank (PFB). The efficiency of the PFB is sensitive to its implementation, parameters, and input signal type. In my MSc, I've explored the effect of these variables, by developing both a fixed-point and floating point simulator that is widely generic. This approach allows a user to explore a range of implementation options when prototyping/testing. The fixed-point simulator was tested against a CASPER implemented PFB hosted on an FPGA and was largely in agreement therewith. My research thus far has outlined potential ways of mitigating the quantisation error present in the CASPER PFB, while further exploring floating point and posit number system implementations. A by-product of this rigorous understanding of the PFB and its essential components (documented in my thesis), has induced study into further topics such as post-channelising, shift register populating and how the PFB affects the overall accuracy and precision of the correlator. In my presentation, I look to introduce the PFB, detail the MeerKAT implementation thereof, introduce the developed simulator and report on some of the hypothesis made and results obtained.