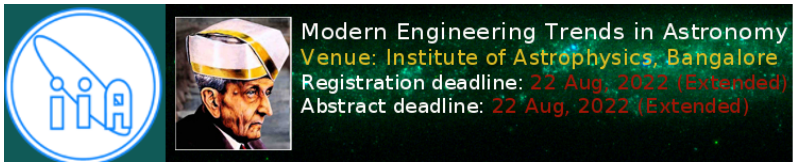

Contribution ID: **8** Type: **not specified**

FPGA Accelerated Cross Correlation of Digital Images: Application to Solar Adaptive Optics

Cross-correlation of two-dimensional digital images is fundamental to solar adaptive optics computations. It can be used in a simple tip-tilt correction system as well as in correlating sub-aperture images of a Shack-Hartmann wave-front sensor. While the software-based optimized cross-correlations may be sufficient when a small number of sub-apertures are used, hardware-accelerated (FPGA) correlations will be required when a large number of sub-aperture images are involved. In this presentation, we present our FPGA implementation of a basic two-dimensional cross-correlation of two images. We present four incrementally better architectures to accelerate the FPGA-based design. We achieve this by pipelining the individual components of the cross-correlation process, and thereby increase the speed. We implement our algorithm on several sets of 128x128 images and 32x32 images on a Xilinx Zynq based ZCU104 FPGA. Compared to existing work, our design performs a 2D FFT on a 128x128 image 9x faster while our cross correlation on a 32x32 image is 5x faster. This demonstrates that our method of FPGA based acceleration is beneficial in solar adaptive optics applications.

Presentation type

Oral

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