



ABSTRACT IDE0757

## Architectural Challenges in Memory-Intensive, Real-Time Image Forming

to be presented at the *36th Annual International Conference on Parallel Processing*, XiAn, China, September 10-14, 2007

A. Åhlander<sup>1</sup>, H. Hellsten<sup>2</sup>, K. Lind<sup>2</sup>, J. Lindgren<sup>2</sup>, and B. Svensson<sup>1</sup>

<sup>1</sup>: Centre for Research on Embedded Systems, Halmstad University, SE-301 18 Halmstad, Sweden

<sup>2</sup>: Saab Microwave Systems, SE-412 89 Gothenburg, Sweden

### ABSTRACT

The real-time image forming in future, high-end synthetic aperture radar systems is an example of an application that puts new demands on computer architectures. The initial question is whether it is at all possible to meet the demands with state-of-the-art technology or foreseeable new technology. It is therefore crucial to understand the computational flow, with its associated memory, bandwidth and processing demands. In this paper we analyse the application in order to, primarily, understand the algorithms and identify the challenges they present on a basic architectural level. The processing in the radar system is characterized by working on huge data sets, having complex memory access patterns, and doing real-time compensations for flight path errors. We propose algorithm solutions and execution schemes in interplay with a two-level (coarse-grain/fine-grain) system parallelization approach, and we provide approximate models on which the demands are quantified. In particular, we consider the choice of method for the performanceintensive data interpolations. This choice presents a trade-off problem between computational performance and size of working memory. The results of this "upstream" study will serve as a basis for further, more detailed architecture studies.