# Programming Real-time Autofocus on a Massively Parallel Reconfigurable Architecture using Occam-pi

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## Abstract

Adopting massively parallel reconfigurable architectures for high-performance embedded systems is constrained by the lack of a unified programming model which can express both parallelism and reconfigurability. We propose occam-pi as a high-level language for programming massively parallel reconfigurable processor arrays. The constructs of occam-pi combine ideas from CSP and pi-calculus to facilitate expressing parallelism and reconfigurability.

In this paper, we demonstrate the applicability of occam-pi for expressing various degrees of parallelism by implementing focus criterion calculation of an autofocus algorithm on the Ambric architecture. Autofocus is a key component of synthetic aperture radar systems. Two implementations of focus criterion calculation were developed and evaluated on the basis of performance. The comparison of the performance results with a single threaded software implementation of the same algorithm show that the throughput of the two implementations are 11x and 23x higher than the sequential implementation despite a much lower (9x) clock frequency. The two designs are, respectively, 29x and 40x more energy efficient.