
Parallel Fully Vectorized Marsa-LFIB4: Algorithmic and Language-Based Optimization of Recursive Computations

Przemyslaw Stpiczynski
Institute of Computer Science
Maria Curie-Skłodowska University, Lublin, Poland
przem@hektor.umcs.lublin.pl

The aim of this paper is to present a new high-performance implementation of Marsa-LFIB4 which is an example of high-quality multiple recursive pseudorandom numbers generators. We propose a new algorithmic approach that combines language-based vectorization techniques together with a new divide-and-conquer method that exploits a special sparse structure of the matrix obtained from the recursive formula. We also show how the use of intrinsics for Intel AVX2 and AVX512 vector extensions can improve the performance. Our new implementation achieves reasonable performance on several multicore architectures and it is much more energy-efficient than simple SIMD-optimized implementations.

Keywords: Pseudorandom numbers, recursive generators, language-based vectorization, intrinsics, algorithmic approach, OpenMP.