

## Parallel Random Number Generation for the Modern Supercomputer Architectures

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**Abstract :** Pseudo-random numbers are often used in scientific computing such as the Monte Carlo Simulations or the Quantum Inspired Optimization. Requirements for a parallel random number generator running in the modern multi-core vector environment are more stringent than those for sequential random number generators. As well as passing the usual quality tests, the output of the parallel random number generator must be verifiable and reproducible throughout the concurrent execution. We propose a family of vectorized Permuted Congruential Generators. Implementations are available for multiple modern vector modern computer architectures. Besides demonstrating good single core performance, the generators scale easily across many processor cores and multiple distributed nodes. We provide performance and parallel speedup analysis and comparisons between the implementations.

**Keywords :** pseudo-random numbers, quantum optimization, SIMD, parallel computing

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