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Review of High-Quality Pseudo Random Number Generators

Tuesday 5 November 2019 17:30 (15 minutes)

Pseudo random number generation (PRNG) play an important role in many areas of computational science. Highest random properties, exact reproducibility and CPU efficiency are important requirements for using them in the most demanding Monte Carlo calculations.
We are reviewing here the highest quality PRNG available, such as those based on the Kolmogorov-Anosov theory of mixing in classical mechanical systems. The theory guarantees under certain conditions that points on the trajectories of these systems can be used to produce random number sequences of exceptional quality. We outline this theory of mixing and establish criteria for deciding which RNG's are sufficiently good approximations to the ideal mathematical systems that guarantee highest quality.
We will present these type of generator and among those, RANLUX, its recent variant RANLUX++ and MIXMAX, a new matrix generator recently proposed. We will show how some of the proposed versions of MIXMAX can be modified easily to meet our criteria for highest quality.
We will present as well results of the most stringent empirical tests applied to these generators and commonly used ones and report on their CPU run time performances.

Consider for promotion

Yes

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