IRISA

IRISA • Campus universitaire de Beaulieu • 35042 Rennes Cedex France • Tél. : +33 2 99 84 71 00 • Télécopie : +33 2 99 84 71 71 • Internet : www.irisa.fr

Contact : Bruno Tuffin
Tél. direct : +33 (0)2 99 84 74 94
Email : Bruno.Tuffin@irisa.fr

Title :

Random perturbation of low discrepancy sequences to extend the domain of application of Quasi-Monte Carlo simulation

Quasi-Monte Carlo method is a deterministic analog of Monte carlo simulation technique where pseudo-random sequences are replaced by low discrepancy sequences that have the property to be ‘’more quickly’’ uniformly distributed over the domain of interest, allowing a better sampling.

By introducing a small random perturbation to the sequence (more precisely by scrambling independently each point a little bit), it has been proved in [1] that quasi-Monte Carlo could be made convergent for all Borelian function.

The goal of this internship is to study this scrambling technique and to determine the degrees of freedom u user can play with or parameters that should not be touched in order to keep the convergence speed of quasi-Monte Carlo methods. In order to look at the resulting variance, the method could be combined with a randomization by random-shift as done in classical randomized quasi-Monte Carlo techniques.

[1] N. Bouleau. A remark on random and equidistributed sequences. *Journal of Potential*, 1:379-384, 1992.

[2] B. Tuffin. Randomization of Quasi-Monte Carlo Methods for Error Estimation: Survey and Normal Approximation. *Monte Carlo Methods and Applications*, Vol.**10**, Num.3-4, pages 617-628, 2004.