

Monte Carlo Method for Numerical Integration based on Sobol' Sequences

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An efficient Monte Carlo method for multidimensional integration is proposed and studied. The method is based on Sobol' sequences. Each random point in d dimensional domain of integration is generated in the following way. A Sobol' vector of dimension d ($\Lambda\Pi\tau$ point) is considered as a centrum of a sphere with a radius ρ . Then a random point uniformly distributed on the sphere is taken and a random variable is defined as a value of the integrand at that random point. It is proven that the mathematical expectation of the random variable is equal to the desired multidimensional integral. This fact is used to define a Monte Carlo algorithm with a low variance. Numerical experiments are performed in order to study the quality of the algorithm depending of the radius ρ , and dimensionality of the problem.