Contribution ID : **97** Type : **Parallel talk**

Multivariate Correlated Sampling Using Extended Alias Techniques

Monday, 5 September 2011 15:15 (25)

Monte-Carlo technique enables one to generate random samples from distributions with known characteristics and helps to make probability based inferences of the underlying physical processes. Fast and efficient Monte-Carlo particle transport code particularly for high energy nuclear and particle physics experiments has become an important tool starting from the design and fabrication of detectors to the modelling of the physics outcome as close as the reality. Quite often Monte-Carlo simulations require multivariate random numbers to be generated from correlated data both from normal and non-normal distributions. Although several techniques exist for multivariate correlated samplings of varying degrees of success, the most elegant method is the technique that uses the principal component analysis of the given correlation matrix R for generating multivariate random numbers with specified inter-correlations. While the component analysis is suitable for multivariate normal distribution, it may not work always particularly when the distribution is non Gaussian. In this work, we propose an extended alias sampling which was originally proposed by A. J. Walker in 1977 to sample from an one dimensional distribution. This method is quite fast , efficient and reproduces the original distributions quite accurately (verified through chi-square as well co-variance test). It may be mentioned here that this method is quite robust and is applicable to all type of multivariate distribution irrespective of whether the distribution is Gaussian or Non-Gaussian.
Although this method is quite general and can be applied to any dimensions, in this work we have restricted sampling only from a two dimensional correlated distribution. The motivation behind this study has been to develop a ROOT based Monte-Carlo application package for low energy neutron transport down in energy to a few keV using the evaluated nuclear data file (ENDF) which is available in ROOT format. Work is in progress to apply this new method of alias technique to the ENDF data set where the angle and energy distributions are strongly correlated.

Primary author(s) : Mr. MOHANTY, Siddhant Ajit (CERN)

Co-author(s) : Dr. MOHANTY, Ajit Kumar (CERN); Mr. GOYAL, Dushyant (CERN); Dr. CARMINATI, Federico (CERN); Mr. BANERJEE, Subho Sankar (CERN)

Presenter(s) : Dr. CARMINATI, Federico (CERN)

Session Classification : Monday 05th - Data Analysis – Algorithms and Tools

Track Classification : Track 2 : Data Analysis - Algorithms and Tools