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# A SEMI-IMPLICIT CHORD LENGTH SAMPLING METHOD FOR DISPERSION FUEL ANALYSIS


## 摘要

随着随机几何在核反应堆中的应用，隐式建模方法在随机介质中粒子输运的精确模拟中发挥着越来越重要的作用。当前 RMC 中的隐式建模方法采用弦长抽样法（CLS）。然而，在模拟高散射、高吸收特性的材料时，尤其是当吸收干扰散射过程时，与显式建模方法相比，弦长抽样法存在显著误差，且在模拟非马尔可夫随机介质时尤其容易产生偏差。为此，本文提出了一种半隐式弦长抽样法（SCLS），该方法通过记录中子及粒子的历史位置信息，并采用动态球来最大化计算精度，同时最小化计算开销。随后通过显式建模方法生成的粒子分布验证了该算法的准确性。结果表明，在模拟非马尔可夫弥散燃料时，与原始弦长抽样法相比，半隐式弦长抽样法能显著提升隐式建模的精度。



## 关键词

RMC，弦长抽样法，随机介质，弥散燃料



## Abstract

With the advent of stochastic geometry in nuclear reactors, implicit modeling processes play an increasingly important role in the precise simulation of particle transport in random media. Current implicit modeling methods in RMC utilize Chord Length Sampling (CLS). However, the CLS method experiences significant inaccuracies compared to explicit modeling methods when simulating materials of high scattering and absorbing properties, particularly where absorption interferes with scattering, and is especially prone to errors when simulating non-Markovian stochastic media. A Semi-Implicit CLS (SCLS) method is proposed where previous neutron and particle positions are recorded, while an inclusion sphere is used to maximise the accuracy of the method whilst minimizing the computational expense incurred. The accuracy of the algorithm was then verified against particle distributions generated via explicit modeling methods. The results show that SCLS can significantly improve the accuracy of implicit modeling when simulating non-Markovian dispersion fuel compared to the original CLS method.



## Keywords

RMC, Chord Length Sampling, Stochastic Media, Dispersion Fuel



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