

技术及应用

核设施退役虚拟仿真中烟尘输运过程建模及算法研究

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摘要 基于三维数值计算可实现核设施退役虚拟仿真中烟尘输运过程仿真, 而快速且稳定的数值求解方法是实现动态仿真过程的核心。研究中首先建立相应的数学模型, 然后采用半拉格朗日对方程进行求解。求解过程中首先对方程采用分裂法, 得到各分项方程, 然后利用半拉格朗日方法对瞬态项及对流项进行求解, 对于不可压缩压力方程采用了基于约束思想的投影算法。研究过程中对立方体空间进行了数值仿真, 仿真结果的显示采用OpenGL编程实现, 获得了三维流场分布及烟尘浓度分布。该方法能实现模型稳定、快速的求解。

关键词 [核设施退役](#) [虚拟仿真](#) [半拉格朗日方法](#)

分类号

Study on Computing Model and Algorithm for Simulation of Smoke-Dust in Nuclear Facilities Decommissioning Virtual Simulation

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Abstract Based on three-dimensional numerical calculation, the simulating transportation of smoke-dust was realized. Rapid and stable numerical solution is the key to achieve successful dynamic simulation. In the paper, the corresponding mathematical model was studied firstly, and then the semi-Lagrangian method was used to solve the equations. In the process of solving equations, a splitting-approach was adopted to achieve the component equations, and then the semi-Lagrangian method was used to solve both transient and convection terms. The projection algorithm constraint-based was adopted to solve the pressure equation for incompressible fluid. The study only realized the numerical simulation for a simple cube space. Simulation results are displayed by OpenGL programming in terms of three-dimensional flow field and the distribution of smoke-dust concentrations. The stable and fast solution can be achieved by using the method described herewith.

Key words [nuclear facilities](#) [decommissioning](#) [virtual simulation](#) [semi-Lagrangian method](#)

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