

论文

基于LBM动态动画真实感绘制

黄瑞

(华北水利水电学院 信息工程学院,河南 郑州 450011)

摘要:

提出一种基于LBM的高效建模和绘制方法。通过潜水方程的LBM模型进行流体建模和表面高度场的计算,成功地模拟出水坝崩溃现象。简化了速度场方程组和添加浓度场方程组,结合两者对烟雾物理模型进行了改进,通过GPU加速技术实现了烟雾真实感的绘制。

关键词: Lattice Boltzmann 方法 浅水方程 自由表面 流体模拟

Dynamic Animation Realistic Rendering Based on Lattice Boltzmann Method

HUANG Rui

(College of Information Engineering, North China University of Water Resource and Electric Power, Zhengzhou 450011, China)

Abstract:

This paper presents a highly effective method of modeling and rendering based on LBM (Lattice Boltzmann method). Firstly, the LBM model based on shallow water equations is adopted to model the fluid volume and calculate the surface height field, and we simulate the Dam Break successfully. In addition, the Velocity field Equations are reduced and Denseness field Equations are added to improve the model of smoke, after which the GPU acceleration technology is adopted to achieve realistic rendering of smoke.

Keywords: Lattice Boltzmann method; shallow water equation; free surface; fluid simulation

收稿日期 修回日期 网络版发布日期

DOI:

基金项目:

通讯作者:

作者简介: 黄瑞(1987—),男,硕士研究生。研究方向:图形图像处理。E-mail: 411416182@qq.com

作者Email:

参考文献:

[1] 费少梅,彭艳莹,陆国栋,等.基于粒子的湍流燃烧火焰的可视化研究 [J]. 计算机辅助设计与图形学学报,2005,17(3): 461-466.

[2] KASS M, MILLER G. Rapid, stable fluid dynamics for computer graphics [J]. Computer Graphics, 1990, 24(4): 49-55.

[3] ZHOU J G. A lattice boltzmann model for the shallow water equations [J]. Computer Methods in Applied Mechanics and Engineering, 2002, 191(32): 3527-3539.

[4] LIU H F, ZHOU J G, BURROWS R. Multi-block lattice boltzmann simulation of subcritical flow in open channel junctions [J]. Computers & Fluids, 2009, 38(6): 1108-1117.

[5] WEI X M, LI W, MUELLER K. Simulating fire with texture splats [C]. Washington D C: Proceedings of the Conference Visualization, IEEE Computer Society Press, 2002: 227-234.

[6] WEI X M, LI W, MUELLER K. The lattice boltzmann method for simulating gaseous phenomenon [J]. IEEE Transactions on Visualization and Computer Graphics, 2004, 10(2): 164-176.

[7] ZHAO Y. Modeling natural phenomena with lattice boltzmann method [D]. New York: State University of New York, 2006.

[8] MEI R W, LUO L S, SHYY W. An accurate curved boundary treatment in the lattice boltzmann method [J]. Journal of Computational Physics, 1999, 155(2): 307-330.

[9] 朱红斌,刘学慧,柳有权,等.基于Lattice Boltzmann模型的液-液混合流模拟 [J]. 计算机学报,2006,9

扩展功能

本文信息

- ▶ Supporting info
- ▶ PDF (780KB)
- ▶ [HTML全文]
- ▶ 参考文献PDF
- ▶ 参考文献

服务与反馈

- ▶ 把本文推荐给朋友
- ▶ 加入我的书架
- ▶ 加入引用管理器
- ▶ 引用本文
- ▶ Email Alert
- ▶ 文章反馈
- ▶ 浏览反馈信息

本文关键词相关文章

- ▶ Lattice Boltzmann 方法
- ▶ 浅水方程
- ▶ 自由表面
- ▶ 流体模拟

本文作者相关文章

PubMed

(12):2071-2079.

[10] 肖诗云,王晓庆.洪水演进模型及冲击荷载数值分析 [J].工程力学,2010,27(9):35-40.

本刊中的类似文章

---

Copyright by 电子科技