细胞自动机及其在实时云模拟中的应用

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摘要： ：针对云形状不规则、变化莫测等特点，探讨了一种实时云模拟算法.在模拟空间随机地产生云的离散分布，通过一组布尔规则描述云的动态变化，采用 Sigmoid 函数生成云的连续密度分布.提出改进的多重前向散射光照模型计算云的颜色和光照强度，采用 GPU 光线投射算法进行渲染.与纹理贴图、粒子系统和分形几何方法生成的云进行对比分析，表明该方法的实时性较好、真实感较强。
关键词： 细胞自动机；实时云；Sigmoid 函数；多重散射；光线投射

Cellular Automaton and its Application in the Simulation of Real-time Cloud

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Abstract： Aiming at the irregular shape and unpredictable characteristics of clouds, a real-time cloud simulation algorithm is discussed. The discrete distribution of clouds is randomly generated, and their dynamics is described by a group of Boolean rules. The continuous density distribution is computed through the Sigmoid function. We propose an improved multiple forward scattering illumination model to compute the color and intensity of clouds, and render it using ray casting algorithm on the GPU. The experimental results show that the algorithm is better in real-time and more realistic, comparing to texture mapping, particle system and fractal geometry methods.
Key words： cellular automaton；real-time cloud；Sigmoid function；multiple scattering；ray casting

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