CS498-SOCIAL VISUALIZATION

READING 10 – CELLULAR AUTOMATA AND LATTICE GASES

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This paper addresses a very interesting question and that’s if there is an intermediary space between a continuum space and a discrete space? Is it possible to come up with an environment wherein there will be no need to discretize continuum problems to develop a complete numerical algorithm and solve it? In order to come up with an answer for this question, paper addresses the subject of lattice gases, or in another words, cellular automata (CA).

In order to solve any problem by simulation of cellular automata, Navier-Stokes equations in fluid dynamics need to be solved something that I personally have experienced for several years. This type of methodology allows fluid to be considered as a parcel of fluid and in turn allows a cartoonish version of the underlying microscopic dynamics to be considered and visualized. For this purpose, collision of the elements needs to be considered. This paper explains a series of rules that apply to lattices though in fact details of the fluid dynamics and its interactions is indeed complex.

Simulation of the cellular automata required a specific load and power of computation. In general special-purpose Computation Aided Machines can equalize or go above performance of large supercomputers for computer aided problems. The most important issue associated with cellular automata is the ability of a universal computation. This type of computation allows 3D graphics to be performed through first-principles description. A major possibility as the paper refers is the possibility of substituting ray-tracking calculations with lattice photons propagations model. All these provide an enormous opportunity for visualization of different continuum spaces.

Another very interesting issue regarding lattice gases is that it does not imply that things need to be bounded by information content of space. This notion arises in quantum field theories, however cellular automata (CA) begins with discrete theories and therefore will not face this issue and allows to be more satisfactory compared to differential equations.