

## AN AGENT-BASED APPROACH TO SIMULATIONS OF GLOBAL INFLUENCE WITH RANDOM EFFECT

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**ABSTRACT.** *Recently, agent-based simulation problems have been attracting much attention in not only information engineering but also economics and social science. We present a new method for analyzing social science by an agent-based simulation with random element which uses a stochastic system theory. We treat two types of agents, pioneers and followers, in a two-dimensional grid world. Agents decide the attitudes by local influences (effects of the neighbors) and global influences (effects of mass-media), and agents change their attitudes by two kinds of influences. So as to consider the obscure global influences, we propose a model of the global influence including a random element. Simulation studies show that the results of agent-based simulations are very sensitive to the global influence including the random effect.*

**Keywords:** Agent-based simulation, Categorization of agents, Global influence, Random effect

**1. Introduction.** Nowadays, agent-based simulations have been concentrating our attention as one of the interesting and important topics in various fields, especially economics and social science. Some research performs this simulation by various methods [1-3]. Agent-based simulation is the method for analyzing social phenomena in virtual spaces which researchers set up. Agents are given initial conditions and some performance rules. They are arranged in the virtual space, and then simulations are performed according to these rules in order to reproduce the social phenomena in virtual spaces.

In social science, many researchers have a great interest in diffusion processes of innovations. Rogers [4,5] has been extensively considered in such problems as innovation and communication. In his research, he proposes the adopter category in which he classified some segments.

Some researchers study and analysis innovation process by these adopter category and agent-based simulations. Murata et al. [6] research the effect of the initial arrangements of agents. Though they considered local influences (for example, the effect of neighborhood), but the effect of global influence (for example, effects from mass media) at diffusion process must be also considered. On the other hand, the author has dealt with some kinds of models describing stochastic partial differential equations [7,8].

Many researchers of agent-based simulations do not deal with the stochastic model but deal with deterministic models though some social models can not be described by deterministic models. In this paper, the variance of effects given agents is analyzed by