Journal of Visualization, Vol. 11, No. 2 (2008) 111

Portfolio Paper

Patterns of Crowd Behavior Using a Hidden Network Structure

Yamade, S.*[1] and Shirayama, S.*[2]

*1 School of Engineering, Department of Naval Achitechture and Ocean Engineering, University of Tokyo, 5-1-5, Kashiwanoha, Kashiwa-si, Chiba 277-8568, Japan.
E-mail: yamade@race.u-tokyo.ac.jp

*2 RACE, University of Tokyo, 5-1-5 Kashiwa-si, Chiba, 277-8568, Japan.

Received 12 November 2007 and Revised 15 November 2007

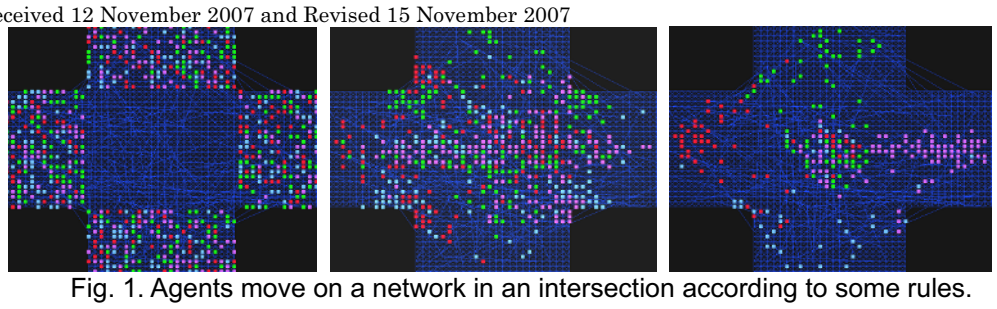

Fig. 1. Agents move on a network in an intersection according to some rules. Colored points show agents.

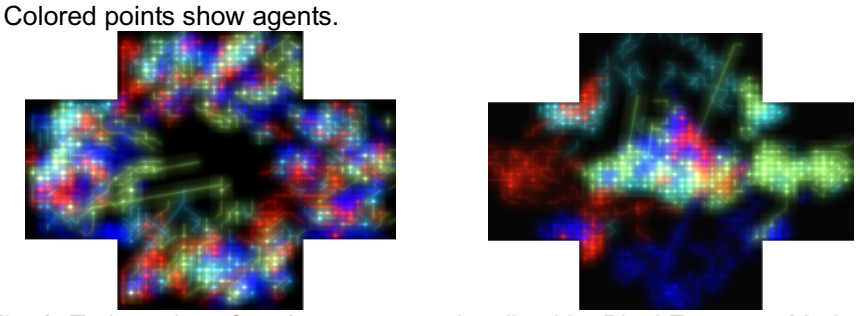

Fig. 2. Trajectories of each agents are visualized by Pixel Exposure Method with an exposure of 3 steps.

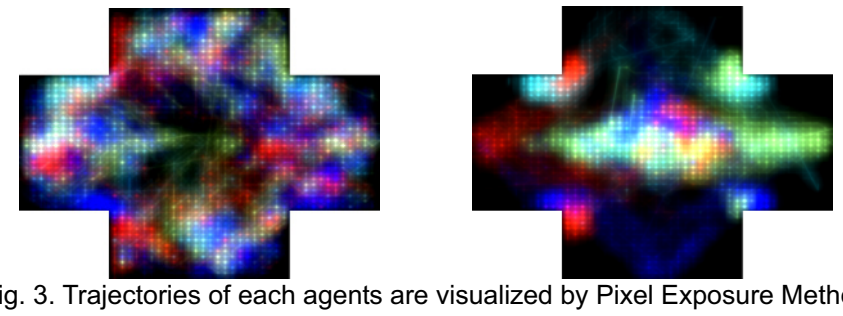

Fig. 3. Trajectories of each agents are visualized by Pixel Exposure Method with an exposure of 15 steps.

Various patterns emerge from crowd behaviors; march, vibration, straying, a swarm of mosquitoes, etc. It has been considered that such a pattern is caused by some interaction between individuals forming the crowd. Reproduction of the pattern has been explored in many previous works(1). Patterns represent a static and a dynamic state. Both have a certain kind of beauty like fluid art(2), (3), so that they are used for the particular motif of a picture or industrial design(4). We try to reproduce the patterns using a multi-agent simulation for crowd behavior in a space, where a network structure is assumed to exist behind the crowd. These figures show patterns emerge from the movement of agents in an intersection region, which consists of a network as shown in Fig. 1. After visualizing it using *Pixel Exposure Method*(5), a large scale structure appears (in Figs. 2 and 3).

References : (1) Helbing, D. et al., Nature, 407 (2000), 487-490. (2) Fujisawa, N. et al., J. of Visualization, 10-2 (2007), 163-170. (3) Burge, P., J. of Visualization, 10-2 (2007), 171-178. (4) Pan, Z. et al., Simulation and Gaming, 37 (2006), 423-437. (5) Shirayama, S. and Ohta, T., J. of Visualization, 1-4 (1999), 355-364.