## **Accepted Manuscript**

Resolution of conflicts in cellular automaton evacuation model with the game-theory

Tian Huan-huan, Wei Yan-fang, Dong Li-yun, Xue Yu, Zheng Rong-sen



To appear in: *Physica A* 

Received date : 15 October 2017 Revised date : 15 April 2018



Please cite this article as:, Resolution of conflicts in cellular automaton evacuation model with the game-theory, *Physica A* (2018), https://doi.org/10.1016/j.physa.2018.08.140

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

## **Resolution of conflicts in cellular automaton evacuation model**

### with the game-theory

Tian Huan-huan<sup>1\*</sup>, Wei Yan-fang<sup>1,2</sup>, Dong Li-yun<sup>2</sup>, Xue Yu<sup>2,3</sup>, Zheng Rong-sen<sup>1</sup>

<sup>1</sup>Guangxi Colleges and Universities Key Laboratory of Complex System Optimization and Big Data Processing, Yulin Normal University, Yulin 537000, P. R. China

<sup>2</sup> Shanghai Institute of Applied Mathematics and Mechanics, Shanghai University, Shanghai 200072, P. R. China

<sup>3</sup>Institute of Physics Science and Engineering, Guangxi University, Nanning, 530004, P. R. China

#### Highlights

1. The cost in the game is related to the distance to the exit and the number of players.

2. The prisoner's dilemma games and the stage hunt games are played near and far from the exit.

3. The controllable parameter n is used to control the regions for two kinds of games.

#### Abstract

The floor flied cellular automata model coupled with game theory is used to simulate the evacuation from a room. In the improved model, the evacuees are divided into two kinds. One is patient and another is impatient. The patient evacuees try to avoid physical contacts, but the impatient evacuees vie for the empty target cell by paying the effort. During the evacuation, the payment of the impatient evacuee for the empty target cell is not always the same. In the improved model, the cost paid by the defectors is a function of the distance between the target cell and the exit and the number of evacuees playing the game. The controllable parameter n is introduced to describing the intensity of competition for the target cell by the defector. If n is small, the competition is fierce, otherwise, the competition is relatively mild. As the same time, the asymmetric rules of changing evacuees' strategies are introduced. There are two kinds of games in the room. One is the prisoner's dilemma game played near the exit, the other is the stage hunt game played far from the exit. The regions of two kinds of game depend on the controllable parameter n. For a big value of n, the region for the prisoner's dilemma game is small, but the region for the stage hunt game is large. The influences of the evacuation time are investigated in both of no changing and changing the strategy. The instantaneous and total fractions of the CD and DD games are analyzed in the both cases of no changing and changing the strategy. Meanwhile, the specific flow rates are compared with the others' experiments.

Keywords: Game theory, Evacuation, Cellular automata.

#### 1. Introduction

Up to now, many models have been developed to simulate pedestrian flow<sup>[1-25]</sup>, for example,

<sup>&</sup>lt;sup>\*</sup>Corresponding author.

E-mail address:tianhhylu@hotmail.com.

Download English Version:

# https://daneshyari.com/en/article/7375255

Download Persian Version:

https://daneshyari.com/article/7375255

Daneshyari.com