A Cellular Automaton Simulation for Modeling Walking Speed of Mixed Pedestrian Flow at Crosswalks

張建彥,彭裕涵
Transportation Technology and Logistics Management
Management
axle@chu.edu.tw

Abstract

Pedestrian walking speed at crosswalks is an important parameter for the clearance time design of a pedestrian signal. Meanwhile, pedestrian walking speed is deeply affected by pedestrian characteristics and environmental characteristics. It is difficult to determine an appropriate parameter value of pedestrian walking speed under a combination of various pedestrian types and environments. The main purpose of this paper is to develop a cellular automaton simulation for modeling the behavior of mixed pedestrian flow at crosswalks and analyzing pedestrian walking speeds with different mixed pedestrian flows. In this paper, the statistics of uninterrupted inter-arrival time and walking speed at several crosswalks for child pedestrians, adult pedestrians and elderly pedestrians are firstly investigated. Then a goodness of fit analysis is used to determine the adequate inter-arrival time distributions and walking speed distributions for child pedestrians, adult pedestrians and elderly pedestrians. The walking behavior characteristics of pedestrians at crosswalks are also defined. Finally, a cellular automaton micro-simulation program is developed to analyze the uninterrupted walking speeds of various mixed pedestrian flows at crosswalks. After the simulation analysis, results show that pedestrian walking speed decreases with the increased elderly pedestrian ratio. The simulation program will be a helpful basis in the analysis of pedestrian flow characteristics and the design of pedestrian signal timing plan.

Keyword：Pedestrian, Walking speed, Mixed pedestrian flow, Cellular automaton, Simulation