European Transport \ Trasporti Europei n. 45 (2010): 50-63

Cellular automata cell structure for modeling heterogeneous traffic

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Abstract

Gap maintaining behavior significantly affects the traffic flow modeling under heterogeneous traffic conditions. The clearance between two adjacent moving vehicles varies depending on several traffic conditions. From the data collected on the gap maintaining behavior it has been observed that vehicles maintain different gaps when travelling under different traffic conditions and this is also influenced by lateral position of the vehicle. Mallikarjuna (2007) has found that this variable gap maintaining behavior can be explained using a macroscopic traffic characteristic called area occupancy. In this study, these relationships would be used in deciding the cell width which is the basic input for cellular automata (CA) based heterogeneous traffic flow models. It is proposed that the dominant vehicle in the traffic stream, its lateral position, and lateral gaps on either side are the governing factors in deciding the cell width. Cell width has been finalized based on this input and it is found to be varying when area occupancy is varying from 3 to 15%.

Keywords: Heterogeneous Traffic; Cellular Automata; Varying cell width; Area occupancy.

1. Introduction

Traffic flow models are crucial in implementing transportation planning and traffic management measures. Several types of traffic models such as models based on kinematic wave theory, Gas kinetic theory, and car following theory are available for this purpose. Wide ranging physical dimensions, weight, dynamic characteristics of vehicles makes it difficult to apply these models for heterogeneous traffic. A driver, traveling under these conditions, can utilize any space available on the road without any lane discipline. Many researchers have worked on it and developed some suitable solutions to model the heterogeneous traffic but their applicability is limited due to difficulties in data collection. When different types of vehicles share the same road space without any physical segregation, the extent of vehicular interactions varies

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