MECHATRONICS BOOK SERIES SYSTEM DESIGN AND SIGNAL PROCESSING

VOLUME 1

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CONTENTS

CHAPTER 27

GIS-based Vehicle Traffic Simulation

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1. Introduction

One serious problem in many big cities is the traffic congestion. For instance, in the year 2000 a distance of 14.6 km between *Kalideres* in the western part of Jakarta and the district of *Jalan Gajah Mada* in the central part of Jakarta should be passed through in 51.7 minutes [1]. According to the ever increasing amount of newly registered vehicles in Jakarta, the time interval needed to across some districts tends to be longer. During the peak hour traffics in Jakarta city can only move forward at 12 km/h. Strong rainfalls would immediately make the whole city stuck. This conditions cause high operational costs and non-negligible loss in time. The social cost paid for this traffic congestion is estimated to be more than USD 1.83 billion per year. Traffic congestions in the surrounding cities of Jakarta, like *Depok* and *Bogor*, were reported to cost IDR 1.7 billion per day [2]. Besides, traffic congestion has severely deteriorated the air quality in Jakarta city.

The main reason for traffic congestion is the condition in which the road capacity and the arrival rate of vehicles do not stay in balance. Well planned traffic rules can be used to control the traffic flow so that the overload conditions can be avoided. In this sense, a traffic simulator can be used to assist in the planning of satisfying traffic rules.

It is shown that a simple model of queuing system can be used to simulate many traffic conditions [3,4]. A model used in this traffic simulator is shown in Fig. 27.1. In addition to that, it would be very useful when we can generate a realistic traffic model comply with the real existing traffic situations. Using this model several simple analyses of traffic situations could be performed [4,5].

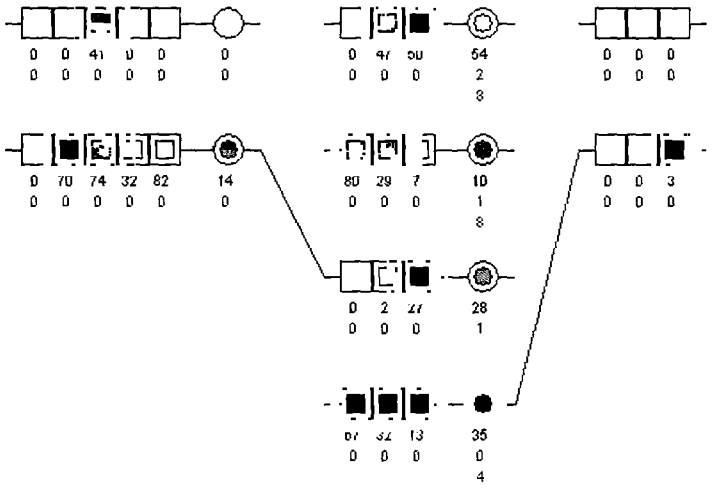

Figure. 27.1.: A graphical user interface of simple queuing system for vehicle traffic simulation.

Previous results of the traffic simulation at the Jakarta's highways and toll gates have shown that the total number of the operating toll gates and the service time at that gate have significantly influenced the traffic flow [4]. When the number of currently operated toll gates does not stay in