

13th COTA International Conference of Transportation Professionals (CICTP 2013)

Travel time estimation model for emergency vehicles under preemption control

Jiawen WANG, Meiping YUN, Wanjing MA, Xiaoguang YANG

Tongji University, 4800 Cao'an Road, Shanghai, 201804 P.R.China

Abstract

Travel time of emergency vehicle is an important parameter in emergency rescue. This paper established a travel time estimation model for emergency vehicles under preemption control conditions. Three levels of preemption control strategies, including path preemption, intersection preemption, and section preemption have been developed in the model. Section clearance time, which is the critical component of travel time, is formulated based on function of roads, traffic volume, number of lanes and mean travel speed of general traffic. In order to improve the accuracy of prediction of travel time and preemption control, real-time updated vehicle based location information is considered to estimate the travel time dynamically. A variety of simulations and Taicang Speedy Ambulance First-aid Emergency Rescue Operation Supporting (SAFER) System were established to test the model. Verification results indicate that the model can accurately estimate the travel time of emergency vehicles.

© 2013 The Authors. Published by Elsevier Ltd. Open access under [CC BY-NC-ND license](https://creativecommons.org/licenses/by-nc-nd/4.0/).
Selection and peer-review under responsibility of Chinese Overseas Transportation Association (COTA).

Keywords: Traffic engineering; Travel time estimation; Emergency vehicles.

1. Introduction

Travel time is an effective measure of roadway traffic conditions. It is imperative to both travelers and transportation agencies, especially in emergency conditions. Nowadays, there have been several projects and research efforts conducted globally to address preemption control of emergency vehicles. Cooperation by communication among vehicles and between vehicles and infrastructures is one of the methods today. In the province of emergency traffic management support, developed country such as USA (2012), Europe (2012) and Japan (2012) initialed earlier. Existing signal preemption methods are in general classified into several categories depending on the technologies used for detecting emergency vehicles, i.e., optical, infrared light, acoustic, special types of loop detection, and GPS-based systems (1999, 2000). To deal with these new emergency vehicle preemption control methods, it is quite necessary to establish corresponding emergency vehicle travel time estimation model.

This paper studies the problem of how to estimate travel time of emergency vehicle under preemption control condition. Nowadays, methods are developed to reduce travel time and delay of emergency vehicles, improve