

World Conference on Transport Research - WCTR 2016 Shanghai. 10-15 July 2016

## Dissipating traffic congestion of emergency events through information guidance on mobile terminals

Kun Bo <sup>a, b</sup>, Jing Teng <sup>a, \*</sup>, Xianglong Liu <sup>c</sup>, Haode Liu <sup>c</sup>, Hanjin Shi <sup>a</sup>

<sup>a</sup> Key Laboratory of Road and Traffic Engineering of the Ministry of Education, Tongji University, 4800 Cao'an Highway, Shanghai 201804, China

<sup>b</sup> Shanghai Maritime University, No.2600 Pudong avenue, Shanghai 200135, China

<sup>c</sup> China Academy of Transportation Sciences, No.240 Huixinli, Beijing, 100029, China

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### ▪ Abstract

This paper presents emergency events in the urban road traffic system caused by bus delays buses and consequent congestion problems. It intends to dissipate the traffic congestion of passenger transport network. For the purpose of keeping the order of transit passengers and improving efficiency of transit service, it is important that transit passengers obtain the travel information when transit service is interrupted or delayed. There is also a need for the public transportation authority (PTA) to know how to use travel information to guide the passenger flow assignment and coordinate transport dissipation. This project builds emergency traffic congestion scenarios and adopt the Stated Preference questionnaire to acquire passenger's travel demand information and distinguish sensitivity of demand factors. Then, it researches on the mechanism of sending group short messages (SMS) including partitioned methods, published time, contents and frequency to bus passengers using mobile terminals. This paper also presents published regulation of group short message sending on mobile terminals in emergency traffic events to PTA.

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Peer-review under responsibility of WORLD CONFERENCE ON TRANSPORT RESEARCH SOCIETY.

*Keywords:* Emergency events; Traffic congestion; Information guidance; Mobile terminals

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### 1. Introduction

\* Corresponding author. Tel: +86-21 69583695 ; fax: +86-21 69583695.

E-mail address: [vipbo@126.com](mailto:vipbo@126.com)

With the rapid growth of car ownership in recent decades, traffic congestion often occurs in the urban region. The bus service, as a common public transport method, is most easily affected by traffic congestion. The performance of the urban road traffic system is mainly determined by the efficiency of the passenger travel. It may be measured in three basic aspects including congestion, mobility, and accessibility. Congestion is relatively easy to evaluate, as roads filled with cars, trucks, and buses, while sidewalks filled with pedestrians.

Congestion and excess of vehicles are related at particular time, which is caused by slower speed of motor vehicles than normal speed. The report of FHWA shows that congestion is the result of seven root causes, such as physical bottlenecks, traffic incidents, work zones, weather, traffic control devices, special events and fluctuations in normal traffic (Traffic Congestion and Reliability, 2005). Emergency events include traffic incidents and severe weather. With the increasing of road traffic congestion, the operation of the bus will be getting more difficult and inefficient.

For that matter, it affects individual passenger's time allocation, meanwhile additional travel time is added. So, it is important that the bus companies publish real-time delayed information and traffic accident information.

Once the congestion happens, passengers usually spend extra time on waiting and the congestion will spread to a large range in a short period. As a result, the slowdown gets worse and it takes more time to dissipate vehicles and passengers, especially in metropolitan area. For that matter, it affects single passenger's time allocation, meanwhile additional travel time is added. So, it is important that the bus company publish real-time bus delayed information and traffic accident information.

In the era of Internet and big data, passengers need to get the guidance information in the process of travel mode choice, especially in case of emergency events. The guidance information provides real-time data of traffic congestion, such as locations and conditions of jams, alternative routes and so on. The PTA develops electronic bus stop, public transportation APP and transportation radio to publish information which has made great achievement for alleviating congestion. For example, as of 2014, more than 800 bus stops have been set up two-dimensional code identification in Shanghai, 602 bus stops have been installed electronic bus stops which can broadcast arrival information. Transportation guidance information becomes more important along with the rapid development of Advanced Public Transportation Systems. A lot of passengers have scanned the two-dimensional code to join the public transport information service on We Chat. If there are no SMS, the only way for passengers to acquire the real-time traffic information is the electronic bus stops.

## **2. Literature review**

Emergency traffic events present unpredictable characteristic. When transit supply capacity breaks suddenly, it is important for passengers to be informed in time of Transit trip decision-making process including availability, comfort and convenience. Transit availability consists of spatial availability, temporal availability, information availability and capacity availability. Transit comfort and convenience consist of passenger loading, reliability, travel time, safety and security, cost, appearance and comfort, and customer relations (TCRP165,2014).

Several authors research passenger route choice. Hickman et al. (1995) presented the transit users route choice model which accommodates network travel time is both stochastic and time-dependent. Liu et al. (2010) reviewed the main studies on transit users' route choice in the context of transit assignment. These studies are categorized into three groups: static transit assignment, within-day dynamic transit assignment, and emerging approaches. The first group includes shortest-path heuristics in all-or-nothing assignment, random utility maximization route-choice models in stochastic assignment, and user equilibrium based assignment. The second group covers within-day dynamics in transit users' route choice, transit network formulations, and dynamic transit assignment. The third group introduces the emerging studies on behavioral complexities, day-to-day dynamics, and real-time dynamics in transit users' route choice. Zhang et al. (2011) studied on a bi-level programming model. The upper level problem is to minimize the total travel cost in the view of traffic management agencies, and the lower level problem is to present travelers' dynamic route choice behavior under temporary vehicle movement bans using the simulation of cell transmission model, then a genetic algorithm is employed to solve the proposed bi-level programming model. Computational results show that the temporary vehicle movement bans measure is able to alleviate the traffic network incident-based congestion effectively and improve system performance of the traffic network.

Real-time public transit information is an individual-specific travel demand management tool which is used to

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