

**“Technical Research and Development for Road Policy Quality Improvement”
Study Summary**

No.	Title	Principal Researcher
No.29 - 5	Development of Traffic Accident Risk Management	Ehime Univ. Prof. Toshio Yoshii
<p>In order to enhance traffic safety through the implementation of effective soft measures, this research aims to develop a traffic management method that utilizes information on the likelihood of traffic accident occurrence (hereinafter referred to as "traffic accident risk"). This research and development involve the development of methods for evaluating and calculating traffic accident risk; the quantitative evaluation of the effects of traffic accident risk management including the provision of traffic accident risk information; and understanding the cognitive bias towards traffic accident risk as well as the development of communication methods for mitigating such bias.</p>		
<p>1. Backgrounds and Objects Engineers involved in road traffic have a commonsense understanding on the fact that traffic accidents are more likely to occur during traffic congestion or in rainfall, as well as the fact that access-controlled expressways are much safer than signalized arterial roads. On the other hand, there is a certain percentage of road users who have the misperception that expressways are more dangerous than arterial roads. There is a high possibility that they confuse safety with security; they prefer to drive arterial roads where safety is low and thus is “dangerous”, but they can drive with a sense of security because the speed is low. This study is achieving the improved safety in road traffic by understanding such cognitive bias with respect to safety, i.e., the traffic accident risk, and by establishing an effective communication method for encouraging the use of safer roads. In addition, if the traffic accident risk is quantitatively evaluated, road safety can also be achieved through the implementation of traffic control/traffic management, in which the control goal is to maintain traffic conditions with low traffic accident risk. Therefore, the purpose of this study is to propose traffic management methods that utilize traffic accident risk. The study also establishes a method to quantitatively evaluate the effect of safety improvement by the implementation of traffic management methods, with which the effectiveness of such management method is demonstrated.</p> <p>2. Activities in Research Period This study conducted the following activities.</p> <ol style="list-style-type: none"> 1) Development of a calculation method for traffic accident risk evaluation 2) Development of a traffic accident risk simulation model that simulates network traffic flow under the information provision of traffic accident risk 3) Field experiment of traffic accident risk information provision 4) Analysis of the route choice behavior of drivers acquiring traffic accident risk information 5) Evaluation of the accident reduction effect of traffic accident risk information provision 6) Understanding the cognitive bias towards traffic accident risk 7) Study of traffic accident risk communication methods to mitigate the cognitive bias. <p>3. Study Results</p> <ol style="list-style-type: none"> 1) Traffic accident risk evaluation method was developed using a Poisson regression model for expressways and major arterials, and multiple regression model for residential roads. 2) A traffic accident risk simulation was developed (Fig. 1), and the simulation was utilized to analyze the effects of providing traffic accident risk information. The results indicated that the traffic accident risk information has the potential to reduce accidents by up to a 		

dozen percent.

- 3) A field experiment was conducted to provide traffic accident risk information on the VMS (Fig. 2). The questionnaire survey revealed that road users who saw the accident risk information understood the content and had a high awareness for safe driving.
- 4) A car navigation application was developed to provide route guidance considering the traffic accident risk (Fig.3), and a field experiment was conducted with test users. It was shown that traffic costs could be reduced by a few percent if the drivers receiving the navigation follow the recommended routes.
- 5) A questionnaire survey revealed that about 30% of road users had a false perception towards traffic accident risk. In addition, an experiment on traffic accident risk communication showed that the residents could be more likely to accept the implementation of specific traffic safety measures such as one-way traffic control and entry bans, if the information on traffic conditions and accident risk was provided.



Fig.1 Simulated traffic flow in traffic accident risk simulation



Fig.2 Traffic accident risk information on the VMS (Niigata BP)



Fig.3 Route guidance considering traffic accident risk

4. Papers for Presentation

Takahiro TSUBOTA, Toshio YOSHII, Jian XING :

PREDICTION OF TRAFFIC ACCIDENT LIKELIHOOD

ON INTERCITY EXPRESSWAY BY CONVOLUTIONAL NEURAL NETWORK, Intelligence, Informatics and Infrastructure, Volume 1 Issue 1, pp. 11-17, 2020.

5. Study Development and Future Issues

- Further development of an evaluation method of traffic accident risks with high accuracy, particularly for residential roads, as well as the incorporation of AI technologies.
- Development of traffic control methods to maintain traffic flow conditions with low risk of traffic accidents, such as route guidance or information provision that enables the shift from the use of roads with higher accident risk to the ones with lower risk, as well as the control measures such as metering and speed regulation.
- Identification of effective information contents and provision methods by taking into account the individual characteristics of road users.

6. Contribution to Road Policy Quality Improvement

- The provision of online accident risk information in the traffic control system of the Hanshin Expressway started in April 2021.
- This system is expected to be put to practical use by detecting situations where the risk of traffic accidents is increasing through a combination of fixed-point observation data and mobile observation data, and providing the same accident risk information online.

7. References, Websites, etc.

Research on Traffic Accident Risk Management

URL=<http://www.cee.ehime-u.ac.jp/~keikaku/jste/outcome1.html>