Traffic Management and Pavement Engineering in Asia

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Traffic management aims to achieve efficient, safe and environmentally sustainable transport systems by optimally utilizing transport supply side conditions. Traffic management covers a wide variety of traffic and transport measures such as traffic control and regulation, pricing and fare adjustment and travel information provision. Travel demand management is employed to adjust excess travel demand in time and space dimensions, and could be categorized as one of the instruments of traffic management. Transport facility management such as pavement repair planning can also work as a tool for traffic management. In addition to the development new transport devices and the construction of transport facilities, it becomes more important to study about traffic management methods and applications under limited resource and environment in Asian countries.

This issue of Asian Transport Studies focuses on Traffic Management and Pavement Engineering in Asia. It covers a variety of management problems in road traffic; bus frequency optimization in mixed-traffic, health issue of walking and cycling, road traffic data mining, dynamic traffic assignment for optimal signal setting, analysis and design of signalized intersections, travel time reliability estimation, behaviour of joint plain concrete pavement, and rubberized porous asphalt pavement.

Kov et al. proposed an optimum network design model. The model is capable of determining the optimal bus frequency under variable demand and explicitly considered interaction between different types of vehicles in urban mixed traffic. A multi-modal user equilibrium traffic assignment model was formulated in which the link cost function was modified to reflect the effect of road congestion on in-vehicle travel time associated with each mode. An optimal frequency design model was then formulated and solved by Hooke-Jeeves algorithm. Although the numerical calculation was limited to a small scale network, the computational result proved that the proposed model is applicable to the real bus network design in mixed traffic.

Hwang and Hwang treated a health issue in transport. By using the samples of students and their parents in Taiwan, they presented the promotion policy possible of improving the willingness of walking or cycling to school. A System Dynamics simulation model was developed to evaluate the feasibility of reducing BMI (Body Mass Index) through walking/cycling to school. The model is capable of calculating the calories consumed, accumulated, and the effect of walking/cycling on BMI. They found that the weight control program can be effectively replaced by walking to school, and that walking or cycling to school can be effectively promoted by roadside tree planting, and adding pathways and bicycle lanes.

Arimura et al. presented a statistical analysis technique for a large scale congestion data of road traffic. They identified mid- and long-term characteristics of congestion trends in
A clustering technique (K-means method) was applied to classifying time-series data collected at sensor-installed points. Temporal and spatial characteristics of congestion patterns were extracted from a large amount of traffic sensors installed at approximately 2,200 locations in the network. They have found five regular congestion patterns at certain locations and hours. The proposed method is useful to select effective measures of traffic management and the identification of targets for countermeasures.

Chen and Hu focused on the interaction between signal setting and dynamic traffic assignment (DTA) for efficient traffic control. The problem is formulated as a bi-level optimization framework. The upper level determines signal setting parameters, including cycle length, green splits, and offsets. The lower level problem involves the application of the time-dependent user equilibrium in a traffic network. The signal setting is adjusted using the Webster formula and Adaptive Signal Control. Dynamic traffic flow patterns were solved through a simulation-based DTA model. They presented numerical examples derived from the Kaohsiung City network to illustrate the effectiveness of the proposed framework.

Tang et al. studied the characteristics of right-turn traffic, such as right-turner’s behaviour as well as clearing distance and speed under various phases at signalized intersections in Japan. They examined lost time estimation method under the permissive-and-protected right-turn (PPRT) and protected-only right-turn (PORT) phasing plans. Based on the findings that the current method is very likely to overestimate lost time, they proposed two modifications to the current method for the PORT and PPRT phasing plans. Further, it was found that the current method may generate unnecessarily long all-red times for right-turn traffic requires investigation to reduce lost time as well as cycle length.

Ishizaka and Fukuda investigated the effective data collection system using probe vehicles for estimating travel time reliability indexes. They developed a new methodology to determine the required number probe vehicles and their optimal regional allocation in order to minimize the cost of data collection from probe vehicles while maintaining an acceptable level of reliability. A probe vehicle system could be used as a traffic information collection system, and would be particularly appropriate for collection from a wide area. The number of probe vehicles estimated by the new methodology is less than those required by conventional methodology, and led to the quicker development of traffic information collection systems based on probe car data.

Kim et al. monitored early age behaviour in the construction of jointed concrete pavement. They investigated how the early age temperature trend in the concrete pavement affected the random crack initiation and the behaviour of saw-cut joints using the test road. They measured the ambient air temperature and temperatures in the concrete pavement and analysed the random crack initiation in concrete slabs and early behaviours in the joints. The results indicated that the first random crack was initiated at one of the slabs placed in the early morning, and the joints that were saw-cut in the morning cracked more rapidly than those saw-cut in the afternoon.

Katman et al. presented the results of the application of the Cantabro Abrasion Loss Test on rubberized porous asphalt. They prepared specimens according to different percentages of binder content, rubber content and mixing process. Air cured and water soaked samples were used to simulate ravelling and stripping, respectively. They found that the incorporation of a low amount of rubber exhibited better abrasion resistance in the wet mixing process. Meanwhile, it was found that resistance to abrasion increases as the rubber content was increased on samples prepared by dry mixing process. This showed that dry process samples were more effective compared to wet mix in reducing abrasion loss for both conditions of the samples.