Guest editorial

Sustainably intelligent mobility (SIM)

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Guest Editorial: Sustainably Intelligent Mobility (SIM)

Private and public mobility needs to be both intelligent and sustainable, especially when confronted with not only the high efficiency required by continually increased travel demands but also many other issues including environmental and safety problems which must be properly addressing. Therefore, making full utilisations of, for instance, advanced in-vehicle information to enable evidence-based developments of transport systems, large-scale real statistical data of public transport operations, etc. is becoming increasingly essential. Though many researchers and practitioners have made continuous efforts, the wide adoption of sustainably intelligent travel modes by the public is still a challenging task due to various difficulties such as seamlessly incorporating intelligent electric vehicles into the existing transport systems, intelligently integrating the operations of different travel modes into unified coordinated transport systems, and data/information generation, collection and processing. These issues cover a broad interdisciplinary area of research and development towards the next generation of mobility solutions.

The idea of this special issue originated during the organization of the 10th International Conference on Green Intelligent Transportation System and Safety held in Beijing in June, 2020. Many valuable contributions were presented at the international conference. Finally nine articles are selected from the contributions of the conference participants and other sources after a strict review process based on their quality and fitness to the theme of this special issue, i.e. Sustainably Intelligent Mobility for the Integrated Transport System. The research topics in these nine selected articles focus mainly on driving behaviour analysis for traffic safety, traffic system monitoring and management, and public transport operation improvement.

Driving behaviour has always been one of the most important factors to traffic safety and needs to be intelligently regulated, in particular for the development of automated/autonomous vehicles in the future. First of all, as a psychological reaction to traffic environment, driving emotion greatly affects cognition, judgment and behaviour of drivers. Focusing on the identification of anxiety in which drivers are more likely to get distracted, Wang *et al*. propose an emotion recognition model for personalised driving warning system development that improves the intelligent human-machine interaction in vehicle to reduce traffic accidents. It is shown that their proposed model is able to recognise the calm and anxious emotions with an accuracy of 91.34% and 92.89%, respectively. Moreover, as investigated by Ma *et al*., personal attributes of different drivers have a significant effect on their lane-changing behaviours with a negative impact on both traffic safety and traffic efficiency if such behaviours are frequent, especially in a busy traffic flow. It is found that males aged between 31 and 40 years are likely to take frequent lane-changing actions, particularly when they have relatively low education levels and choleric personality type. In such cases, providing dynamic driving assistance and security warning in vehicle would help improve traffic safety. Furthermore, Jiang *et al*. have the impact of different cultural backgrounds on driving behaviour by comparing the car-following behaviours of Chinese and German drivers. Their study shows that the vehicle manufacturers will provide their products with different performances to different countries and regions in the future. In order to protect vulnerable road users such as pedestrians and cyclists, multiple object tracking that is able process traffic information in real time and also has a sense of traffic scenarios is indispensable for the development of autonomous vehicles in the future. Therefore, Gao *et al*. design a novel multiple object-tracking algorithm which integrates two attention modules with a novel detection refine strategy and achieves a very good performance in their tests.

Besides improving traffic safety from the perspective of driving behaviour analysis, systematically monitoring and managing the operations of vehicles are also crucial today. Large-scale trajectory data provides the possibility for transportation systems to evaluate drivers' behaviours in real time from a systematic management viewpoint, as proposed by Liao *et al*. in a study to utilise the data collected from August to September, 2018 in Jiangxi province of China. Also, the data obtained in the work of Ma *et al*. is also useful for the recognition and guidance of driving behaviour based on various attributes of different drivers. In addition to the driving behaviour management, the match between specific road infrastructure conditions and corresponding traffic management regulations is also the key to traffic safety. Hou *et al*. employ a large number of the aggregated sets of global positioning system data extracted from a vehicle monitoring platform to detect the speeds of large vehicle operations on freeways under different road conditions. It is found that the speeds of these vehicles are higher than the theoretically designed limits when the vehicles go downhill and, in contrast, significantly lower than the theoretical limits when they go uphill. Their study has some important practical implications to the design and evaluation of freeways to enhance operation safety of different types of vehicles.

Private mobility is developing fast with respect to both intelligence and sustainability, and it will become more human-oriented in safety, comfort and convenience. However, sustainably intelligent mobility in large scale can only be realised by public transport systems in the future. Mass rail transits have played and will continue to play a key role in safe, efficient and environment-friendly operations of any integrated transport system, especially for big cities. Accurately capturing the time and space distributional

characteristics of passenger travel demands and the effect of various decision factors is the premise of making wise decisions to provide satisfactory transport services. It is revealed in the research of Qian *et al*. that the travel cost and the passenger density are the most important for different people to have different metro utilisation time choice preferences in Nanjing of China. Meanwhile, as indicated by Zhang *et al*., mitigating the predicted delay errors of the train operations between neighbouring stops is also necessary to improve the mass rail transit service. Unlike mass rail transits which usually have uninfluenced corridors of the whole urban integrated transport system, operations on time are the most important issue for buses that interact with other vehicles among various traffic flows and need to be properly addressed. For this end, Li *et al*. develop a traffic signal optimisation model to reduce the total delay of traffic flow in consideration of the influence of curb-side bus stops.

We hope that these collected articles are able to provide a systematic vision of sustainably intelligent mobility in urban and regional transport fields. All the guest editors appreciate very much the IET Editorial Office for their reliable assistance during the process in organising and publishing this special issue. In addition, a special thank goes to Professor Wuhong Wang of Beijing Institute of Technology, China, for his continuous support during the entire track. Finally, please allow us to express our gratitude to all the dedicated reviewers who have contributed their time and effort to review these articles.

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