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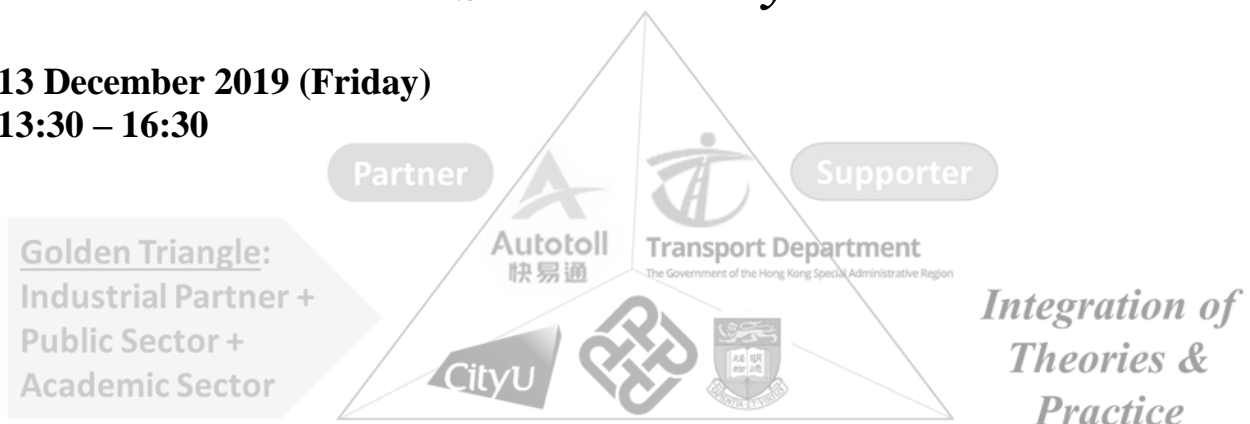**HKSTS**
香港交通研究學會
Hong Kong Society for Transportation Studies

International Workshop on
"Intelligent Transportation Systems (ITS) for Smart Mobility"

13 December 2019 (Friday)
13:30 – 16:30

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Integration of Theories & Practice

Dragon I & II, 2/F., The Kowloon Hotel
19-21 Nathan Road, Tsimshatsui, Kowloon
Hong Kong

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International Workshop on
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13 December 2019 (Friday), 13:30 – 16:30
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Contents

13 December 2019 (Friday), 13:30 – 16:30
The Kowloon Hotel, Tsimshatsui, Kowloon Hong Kong

Workshop Programme

Time	Event
13:15 – 13:30	**Registration**
13:30 – 13:45	**Opening Address** **Prof. William H.K. Lam, The Hong Kong Polytechnic University**
13:45 – 14:15	Smart Mobility in Hong Kong Ir Tony K.T. Yau, Transport Department of the Hong Kong SAR Government
14:15 – 14:45	Big-Data Driven Cyber-Physical Smart City Testbeds for Emerging Connected Mobility Technologies Prof. Kaan Ozbay, New York University, USA
14:45 – 15:00	**Coffee Break**
15:00 – 15:30	A Smart Mobility Showcase based on Digital Twin Modelling Prof. Seungjae Lee, University of Seoul, Korea
15:30 – 16:00	Smart Mobility and ITS Testbed Development in Taiwan Prof. Yu-Chiun Chiou, National Chiao Tung University, Taiwan
16:00 – 16:25	**Roundtable Discussion** (Chaired by Dr. Keechoo Choi, Metropolitan Transport Commission, Korea)
16:25 – 16:30	**Closing Remark**

International Workshop on
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13 December 2019 (Friday), 13:30 – 16:30
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Workshop Venue

13 December 2019 (Friday), 13:30 – 16:30
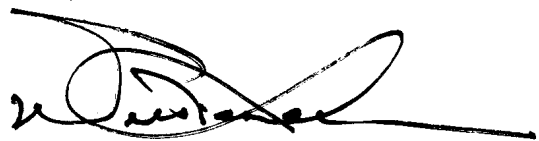The Kowloon Hotel, Tsimshatsui, Kowloon Hong Kong

Message from the Workshop Chairman

It is my great privilege to extend my warmest welcome to our distinguished speakers and delegates attending this Workshop today, particularly those from outside Hong Kong. I am very grateful to the colleagues from The Hong Kong Polytechnic University, The University of Hong Kong and the City University of Hong Kong, for putting together a comprehensive programme for this Pre-Conference Workshop jointly organized with the Hong Kong Society for Transportation Studies (HKSTS).

This workshop is motivated by a recent research project funded by the Research Impact Fund of the Hong Kong Research Grants Council in early 2019. The workshop aims to bring together the academic sectors and various stakeholders in the field so as to share their views on the development of intelligent transportation systems (ITS) for smart mobility. In this workshop, ITS testbeds in overseas are reviewed in connection with Hong Kong ITS Roadmap. Roundtable discussion for development of ITS testbed in Hong Kong is conducted with stakeholders in the industry for potential collaboration.

I would like to convey my sincere thanks to all the speakers, particularly to our keynote speaker, Ir Tony Yau, Assistant Commissioner for Transport/Technical Services of Transport Department, The Government of the Hong Kong SAR, together with renowned scholars from overseas for giving their presentations on the topics concerning ITS testbeds and smart mobility.

Finally, I wish all of you would find this workshop useful and rewarding. Look forward to your participation in this workshop. Thank you.

Ir Prof. William H.K. Lam
Chairman, Workshop Organizing Committee

International Workshop on
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13 December 2019 (Friday), 13:30 – 16:30
The Kowloon Hotel, Tsimshatsui, Kowloon Hong Kong

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Abstracts and Biographies of Speakers

Smart Mobility in Hong Kong

Ir Tony K.T. YAU

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The Transport Department (TD) of Hong Kong Special Administrative Region Government has published the Smart Mobility Roadmap for Hong Kong in July 2019, setting out a holistic and coherent strategy for implementing various smart mobility initiatives to meet the future transport needs. The Roadmap has integrated five key objectives of smart mobility into the "$\sum$ SIGMA" vision, viz., safe, informative, green, mobile and accessible.

To achieve the "$\sum$ SIGMA" vision, the Roadmap has broadly identified three inter-related dimensions essential to implementing a smart mobility strategy, namely "Smart Transport Infrastructure", "Data Sharing and Analytics" and "Applications and Services". Each dimension is underpinned by a number of actionable initiatives. With the committed efforts of embracing innovative and advanced technology, TD is working towards providing safer, greener and more efficient transport and traffic infrastructure, with an ultimate goal of achieving a livable and sustainable city of Hong Kong. In terms of traffic management, such will also lead to a paradigm shift of "from detecting to predicting" and "from responding to preventing". The speaker will introduce the overarching objective of the "$\sum$ SIGMA" vision as well as some of the forthcoming smart mobility initiatives.

Keywords: smart mobility, roadmap, livability.

Ir Tony Yau is a qualified civil engineer and joined the Government of the HKSAR in 1998. He has served in Highways Department and Transport Department participating in a wide range of engineering infrastructure and development projects (including Western Harbour Crossing, Deep Bay Link, Central Kowloon Route and Retrofitting Noise Barrier projects). He was the Chief Engineer of Road Safety and Standards Division from 2017-2019, and has taken up the post of the Assistant Commissioner for Transport/Technical Services since May 2019, overseeing the development and implementation of intelligent transport systems, smart mobility initiatives, traffic control system, road safety audit, traffic survey and surveillance project. Before joining the Government, he has also worked in Mass Transit Railway Corporation Ltd. and Ove Arup & Partners Hong Kong Ltd. Ir Yau holds a Bachelor degree in Civil Engineering from the University of Hong Kong.

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Big-Data Driven Cyber-Physical Smart City Testbeds for Emerging Connected Mobility Technologies

Kaan OZBAY

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In this talk, we will first introduce NYU's **C²SMART** (http://c2smart.engineering.nyu.edu) Center's on-going efforts for the creation of integrated cyber-physical testbeds of New York City transportation network to facilitate the development and deployment of emerging connected and autonomous mobility solutions. This effort centered around the idea of building a consortium of city and state agencies, Universities, and private companies is unique in the sense of creating a number of cyber-physical mobility testbeds that can pave the way to the development and deployment of new urban mobility solutions. We will briefly discuss our research which includes on-going partnership with NYCDOT lead "Connected Vehicle Pilot Test" project, development of a mega-scale data-driven agent based simulation of NY City transportation system, development of novel artificial intelligence and machine learning based predictive analytics and the development and deployment of mobile sensors for bicycle and pedestrian mobility and safety. As a collaboration example between University and private sector for using city as a test bed, we will present a novel approach that leveraged massive vehicle trajectory data acquired from DOT traffic cameras for proactive safety management.

We will also present a key innovation being implemented by C²SMART center namely, "Urban Mobility Data Observatory" (UMDO) which integrates massive real-world data sets on a spatio-temporal data structure of NYC. UMDO is cyber facility that continuously acquires, processes, analyzes, and visualizes big data generated by infrastructure sensors, mobile devices, social media, and other private company software and sensors among others with real-time connections to our cyber-physical testbeds.

We will conclude our presentation with a brief discussion of our future efforts for establishing long-term partnerships with city and state agencies, other Universities and private companies to accelerate the development of cyber-physical test beds and new generation of proactive safety and mobility analytics solutions for cities of changing sizes and complexities.

Keywords: Smart mobility, cyber-physical test bed smart cities, big transportation data, pro-active safety management, connected and autonomous vehicles, pedestrian and bicycle mobility and safety.

13 December 2019 (Friday), 13:30 – 16:30
The Kowloon Hotel, Tsimshatsui, Kowloon Hong Kong

Professor Ozbay joined Civil and Urban Engineering at NYU Tandon School of Engineering and Center for Urban Science and Progress (CUSP) as a tenured full Professor on August 2013. He is currently the Director of the C^2SMART Center funded by USDOT. Prior to that he was a tenured full Professor at Rutgers University, NJ. Dr. Ozbay is the recipient of the prestigious NSF CAREER award. He has co-authored 4 books and published approximately 400 refereed papers in scholarly journals and conference proceedings. Since 1994, Dr. Ozbay has been the Principal Investigator and Co-Principal Investigator of 100 projects funded at a level of more than $25,000,000 by various agencies.

13 December 2019 (Friday), 13:30 – 16:30
The Kowloon Hotel, Tsimshatsui, Kowloon Hong Kong

A Smart Mobility Showcase based on Digital Twin Modelling

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Smart city projects have been developed and deployed to enhance urban efficiency based on information and communication technologies. Several cities in South Korea have been chosen and developed as showcases or test beds of smart city projects funded by Korea Government. In Daegu and Siheung cities, smart mobility is a key theme to be developed as a showcase. Public and private partnership consortium has been formed to develop smart mobility solutions of the showcase. As a first showcase, smart parking systems have been developed to reduce parking searching times by driver, and increase its parking operation efficiency. We have developed a smart mobility platform to share its data and software. Various kinds of big data have been involved in this showcase by collecting and sharing its data in real time control. A digital twin model has been built to emulate real situations of parking lots by three dimensional modelling, and the digital twin platform enables to collect and store various data in real times such as entering and leaving cars from the parking lots. A digital thread technique has been developed to establish various component relationships which interact each other, and then evolve to various states of parking lots. These states are monitored and evaluated to keep the systems stable and optimum, which are visualized in the digital twin model. The objective of this presentation is therefore to introduce the showcase of smart mobility systems. In particular, the emphasis is how it is developed, coordinated and shared in order to develop and maintain smart mobility solutions, in which various data sources are obtained and required from various vendors such as telecommunication and software development companies.

Keywords: smart city showcase, digital twin, digital thread, smart parking systems.

Prof Seungjae LEE is a Professor of Transport Planning in the University of Seoul. He obtained his PhD in Department of Civil and Environmental Engineering, University College London in 1994, and worked as a Research Fellow in Department of Statistical Science, University College London, and then Korea Transport Institute before joining the University of Seoul. He has found and served International Journal of Transportation as an Editor-in-Chief, (ESCI). He has also served several editorial boards of SCI/SSCI journals such as Journal of Advanced Transportation, Transportmetrica, International Journal of Sustainable Transportation and Proceedings of Municipal Engineering, Institution of Civil Engineering.

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13 December 2019 (Friday), 13:30 – 16:30
The Kowloon Hotel, Tsimshatsui, Kowloon Hong Kong

Smart Mobility and ITS Testbed Development in Taiwan

Yu-Chiun CHIOU

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With advancement in auto-manufacture, heavy dependency on private vehicles makes "auto-mobility management" rather difficult and problematic. Numerous public transportation promoting strategies and investment are proved in vain. In recent years, due to the growing progression in ICT, ubiquity of smartphones, advancement in data analytics, smart mobility, especially, smart micromobility, such as Ubike, WeMo, Ucar, become rapidly prevailing in many cities in Taiwan.

Towards smart city and smart mobility, goals for 2020-2024 ITS development in Taiwan are (1) Towards high-quality traffic data platform for data analytics and applications. Vehicles and travelers are connected by using various IoT technologies, such as EVP (e-Tag vehicle probe), GVP (GPS-based vehicle probe), cellular-based vehicle probe (CVP), and novel vehicle detectors (video image recognition, smart street lights, beacon…). Traffic and travel data are collected and provided based on open data principle, for example, the platform of Public Transport Data Exchange (PTX). (2) Towards intelligent and innovative applications in mobility management. Many ITS projects are put into field trials, including Mobility-as-a-Service (MaaS), autonomous vehicles (AV), unmanned flying vehicles (UFV). (3) Towards smart sea and air ports. Novel data exchange (electronic data interchange, EDI) and vehicles tracking technologies are used to ensure the efficiency, safety and security of port operations. (4) Towards smart rail transportation systems. Railway systems are the major transportation investment in Taiwan. Many MRT or light rail projects are under assessment and review. Information and communication technologies and data analytics will be applied in these systems, including train monitoring and control, preventive maintenance of rail assets, booking and ticketing, etc, so as to enhance their safe, efficient and service quality.

Unlike traditional transportation infrastructure projects with a focus on civil engineering construction, the ITS projects emphasize data collection, analyses and applications, providing lots rooms for research and development. The potential research topics and collaborations are addressed.

Keywords: Smart Mobility, Micromobility, IoT technologies, Mobility-as-a-Service (MaaS).

International Workshop on
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13 December 2019 (Friday), 13:30 – 16:30
The Kowloon Hotel, Tsimshatsui, Kowloon Hong Kong

Prof. Yu-Chiun Chiou is currently a Professor of Transportation and Logistics Management, Associate Dean of College of Management, and Chair of Transportation Research Center at the National Chiao Tung University. He serves the members of many committees, e.g., Periodical Inspection of MRT Systems (Taipei, Taoyuan, Kaohsiung), Transportation Fare Review, Fare Review and Service Quality Assessment of Civil Aviation, Urban Planning (Taipei and I-Lan), City Bus Review (New Taipei, Taoyuan and Taichung), Road Safety Advisory (New Taipei), etc. His research interests cover public transportation policy, travel behaviors, traffic flow/control and he is the author of over 200 journal and conference papers together with over 50 consultancy reports.

Biography of Moderator

Dr. Keechoo Choi is Chair of Metropolitan Transport Commission of Korean Government. For 3 years since March 2019, he is leaving university and professor of transportation engineering at Ajou University, Korea. He also served director for the National Engineering Research Center [ERC] of Sustainable Urban Transportation. He is ex-president of Korean Society of Transportation [KST] 2017-2019 and ex-chairman of the Korean PIARC (World Road Association). His specialties include travel demand forecasting, travel time estimation for ITS and C-ITS, sustainable transportation with environmental concerns, and public transportation. His recent research area also covers autonomous and connected vehicle implementation with infrastructure augmentation. He is the founding editor and current Editor-in-Chief of International Journal of Sustainable Transportation (SSCI in Transportation), editorial board member of Journal of Intelligent Transportation Systems, both by Taylor and Francis, also a board member of Transportmetrica B: Transport Dynamics. He eagerly attends TRB, PIARC, WCTR, and ITS WC.