Measurement, modelling, and management of urban transport systems with mobile data and distributed control

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Abstract

In this talk, we will be looking at measurement, modelling, and management of urban transport systems. These systems involve complex dynamics and interaction of a vast number of components including different operators, control devices, and users. An efficient and robust management of transport systems requires detailed real-time measurements, models for producing short-term predictions, and algorithms for deriving optimal control policies in real time. This talk will specially focus on the applications of measurements collected from mobile sensors and distributed control design. With its low cost and high penetration rate, mobile devices (e.g. GPS) are becoming an effective supplement or even substitute for the conventional fixed sensors for collecting real time transport data. The first part of the talk will be on modelling techniques with these mobile data through application of fusion algorithms. The models developed in our research can work with data collected in different space-time granularity, different accuracies, and from different kinds of sensors. On the management side, it is expected that the system performance could be optimised by coordinating all components under a centralised framework. Nevertheless, the complexity of the urban transport systems makes it difficult to be managed by a single central agent. The second part of
the talk will be about the development and application of distributed control algorithms in which local components can derive their own control actions based upon local measurements and estimates, as well as communications within their neighbourhood. It is found that a well-designed distributed system can allow the optimal control plans to be derived with significantly shorter time while without sacrificing much performance. The research work presented herein contributes to the state-of-the-art cooperative transport management with advanced data analytics and decision sciences.

About the Speaker

Andy Chow is a Lecturer (Assistant Professor) in the Department of Civil, Environmental, and Geomatic Engineering at University College London (UCL), UK. His research lies in developing tools for measuring, modelling, and managing urban transport systems. His doctoral dissertation on optimal control of dynamic transport networks completed at UCL received a Gordon Newell Memorial Dissertation Prize in 2008. In 2007-10, Andy worked as a postdoctoral researcher at University of California Berkeley in the United States where he participated in a number of Intelligent Transport Systems (ITS) projects funded by federal and state governments. Since joining UCL in 2010, Andy has been associated with the Centre for Transport Studies and UCL SpaceTime Lab. He has been participating and leading various research on transport performance analysis, space-time data mining, and optimal control funded by national and international research councils, government bodies, and industry.

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All are Welcome!