Studies on Transport Networks under Hazardous Conditions

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Guest Speakers

- **Michael G.H. Bell**, The University of Sydney
- **Serge Hoogendoorn**, Technical University of Delft
- **Hans van Lint**, Technical University of Delft
- **William Lam**, The Hong Kong Polytechnic University
- **Seungjae Lee**, The University of Seoul

invited by MLIT and JSPS

- **Mogens Fosgerau**, Technical University of Denmark
- **Zoi Christoforou**, Ecole Nationale des Pontes et Chaussees
- **Nicolas Coulombel**, Ecole Nationale des Pontes et Chaussees

invited by TSU, Tokyo Tech
Research Field of Traditional Traffic Engineering & Transport Planning

- Researchers have been working on fundamental studies to achieve efficient, safe and sustainable transport systems.

- Traffic engineering & transport planning have mainly targeted to solve recursive problems under ordinary conditions such as daily congestion, accident and environmental pollution.

- Un-ordinary and non-recursive conditions have not been studied sufficiently. This may be because that ‘scientific’ observation, modelling and validation were difficult.
Background of the Workshop

- Effects of traffic incident and natural disaster become more serious in modern information oriented society.

- Transport network management methods should be further developed that would mitigate the social damage in the hazardous conditions.

2011. Mar. 11, Tokyo  
2011. Sept. 04, Wakayama
Serious Traffic Accident Example

A tank lorry turned over and burned in fire at a junction in Tokyo Metropolitan Expressway (MEX).

MEX network was partly closed to traffic during August 03 and October 14, 2008.

The amount of economic loss was estimated 2 billion JPN for reconstruction, and 2.5 billion JPN for lost tolls.
Research Field:
Demand and Supply Conditions

- Normal Supply Conditions
- Disrupted Supply Conditions

- Traditional Study Field
  - Daily travel and Recursive problems (congestion, pollution, …)

- Recursive Demand
  - Unordinary Demand
    - Tourism
    - Event travel

- Unordinary Supply Conditions
  - New Field
  - Daily traffic incident

- Normal Demand
  - New Field
  - Daily traffic incident
Aims of the Workshop

• International workshop aims to exchange the knowledge and experience of the researchers and practitioners in the field of transport network studies under hazardous conditions.

• It is beneficial for academicians and practitioners to understand the variety of approaches toward traffic and transport problems under hazardous conditions.
Wide Variety of Topics

- Incident detection with detectors, image sensors and/or probe vehicles.
- Users’ behaviour under unexpected traffic conditions.
- Dynamic network traffic flow model when some links are closed to traffic.
- Traffic incident management and operation: information provision, inflow control and guidance.

![Diagram showing relationships between Theory, Policy, Technology, Natural Hazard, and Social Hazard]

- Theory
- Observation (Data Collection)
- Transport Systems
- Individual Behaviour
- Policy
- Technology
- Natural Hazard
- Social Hazard
Previous Workshops

1. Workshop on *Traffic Incident Management*. 04th March 2011, University of California, Berkley, USA.


Research Projects


Traffic Incident Management in Urban Expressways

Objectives

Traffic Prediction Model Development with Incident Detection & Simulation

Analysis and Modelling for User’s Behaviour and Information Needs

Contents

- Incident detection with traffic flow data
- Estimation of capacity reduction & time duration
- Traffic simulator for travel time prediction

- Probe Person survey with GPS mobile phone
- Analysis for behaviour & information needs
- Information provision with behavioural context

Development of Traffic Incident Management Methods

- Simulator improvement with user response
- Optimum design of information provision
Predictive Simulator and Information Provision

- Traffic simulator for predicting traffic conditions after incident.
- Supply conditions (bottleneck capacity reduction and its duration) are assumed to be estimated.
- Travellers’ route choice behaviour can be considered.
Studies on Traffic Flow and Accident Risk

• Estimating vehicle trajectories on a motorway by data fusion of probe and detector data (Masao Kuwahara)

• Traffic accident risk at designated expressway road networks (Toshio Yoshii)
Empirical Studies on Urban and Inter-urban Expressways

• Traffic prediction under accidents using dynamic traffic simulation on Tokyo Metropolitan Expressway (Ryota Horiguchi)

• Behavior changes of drivers in traffic jams due to traffic information provision based on portable traffic detectors (Tsuyoshi Matsushita)

• Improvement of travel time information under incident condition using prediction model based on current traffic condition (Dai Tamagawa)
Transport Network Reliability Evaluation Associated with Mobile Simulation

- Development of fundamental methodologies of behavioural modelling and reliability evaluation in a disrupted networks.
- Examination of those methodologies in an actual urban area.

2nd project by JSPS

Model Development

- Data Collection and Modelling of Travel Behaviour
- Network Flow Simulation
- Reliability and Risk Evaluation

Application

- Evacuation and refugee flow simulation in a disrupted network
Expected Research Outputs

• Improving Probe Person survey system for travel data collection in unexpected conditions.

• Development of evacuation and refugee flow simulation models with heterogeneous travellers in a disrupted network.

• Development of a network reliability evaluation model.
Evacuation and Refugee Simulation

- Modelling the cooperation network formation process for evacuation systems design in disaster areas with a focus on Japanese mega-disasters (Eiji Hato & Jun Urata)

- Evacuation dynamics and social interactions (Takamasa Iryo)

- Simulation analysis of commuters unable to get home and traffic congestion at large-scale disaster in Nagoya metropolitan area (Toshiyuki Yamamoto)
Methodologies on Data Collection, Network Modelling and Vulnerability Analysis

• Respondents' attitude on large-scale Probe Person survey using smartphone apps (Takuya Maruyama)

• Stochasticity of transportation networks: asymptotic distribution of travel times and maximum likelihood method (Sho-ichiro Nakayama)

• National land-use structure and disaster vulnerability (Daisuke Fukuda)
Great East Japan Earthquake (2011)

• Spatio-temporal analysis of gasoline shortage in Tohoku region after Great East Japan Earthquake (Takashi Akamatsu & Takeshi Nagae)

• The progress of Miyako recovery plan from tsunami disaster (Tetsuo Yai)
Guest Speakers

• **Michael G.H. Bell**, The University of Sydney
  Approaches to Modelling Degradable Networks

• **William Lam**, The Hong Kong Polytechnic University
  Temporal and Spatial Impacts of Rainfall Intensity on Traffic Accidents in Hong Kong

• **Serge Hoogendoorn**, Technical University of Delft
  Managing Pedestrian Crowds: for First Principles to Crowd Control Strategies

• **Hans van Lint**, Technical University of Delft
  A virtual travel laboratory: New methodological ways to unravel traffic and travel behaviour under extreme conditions
Guest Speakers

- **Seungjae Lee**, The University of Seoul
  Resilience Issues in Vulnerable Transport Networks

- **Mogens Fosgerau**, Technical University of Denmark
  Trip-timing decisions with traffic incidents

- **Zoi Christoforou**, Ecole Nationale des Pontes et Chaussees
  The impact of prevailing traffic conditions on incident characteristics
The workshop will be successful if it stimulates your research interests.