Welcome to AHB45 Committee on Traffic Flow Theory and Characteristics

January 24, 2012

Self-Introductions

Please don’t forget to sign in!

Congratulations To….

Review and Approve Minutes

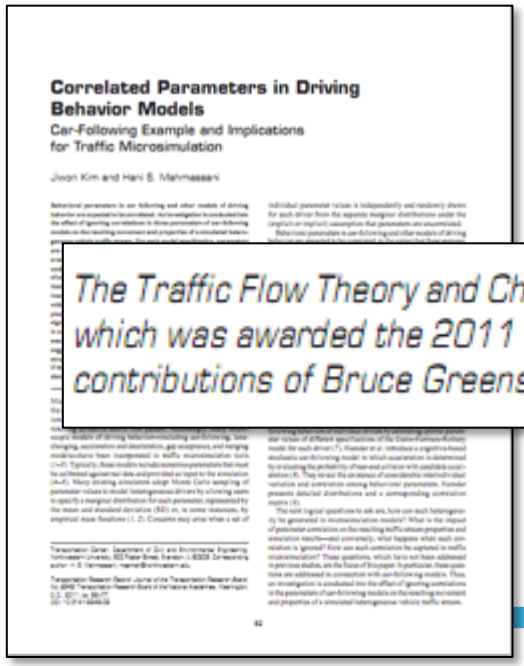
- January 2011
- July 2011
- Special thanks to Marguerite Zarrillo and Meead Saberi!

Membership Update

- Total membership: 25 + 5 International + 4 Young + 1 Emeritus = 35
- Strong international (37%)
- Improve gender/racial diversity (~43%)
- Urgent need to improve organizational diversity (11% non-academic, no state DOT or MPO)
- Mohammed Hadi has been appointed our Committee Research Coordinator—thanks Mohammed!
- Steve Mattingly is Communications Coordinator

Greenshields Prize

- **Greenshields Prize Citation for 2011**
- TRB Paper No. 11-4034/TRR No. 2249, pp. 62-77
- Correlated Parameters in Driving Behavior Models: Car-Following Example and Implications For Traffic Microsimulation
- By Ji-Won Kim and Hani S. Mahmassani
- Congratulations on receiving the inaugural Greenshields Prize!


Correlated Parameters in Driving Behavior Models
Car-Following Example and Implications for Traffic Microsimulation
Jiwon Kim and Hani S. Mahmassani

The Traffic Flow Theory and Characteristics Committee peer-reviewed this paper, which was awarded the 2011 Greenshields Prize by the committee, honoring the contributions of Bruce Greenshields to the field of traffic flow theory.

Chair Report

- *TRB 2012 Transportation: Putting Innovation and People to Work*
- Need to update paper reviewer pool (~440 members)
- State DOT and MPO involvement
- Young Members Council (YMC): Mr. Pingbo Tang (Western Michigan University) and Mr. Nikola Ivanov (University of Maryland) are representing the Operations and Preservation Group

Chair Report

New Circular Published!

TRB Report

- 4300 papers received (>3900 last year)
- 4,372 presentations, 550 sessions and 100 workshops
- 60% of papers in poster sessions (58% last year)
- 17,000 reviews (3–5 per paper)
- 60 sessions and workshops address Transportation: Putting Innovation and People to Work
- More poster sessions, shortened to 1 hour 45 minutes
- Committee Research Coordinators added (thanks to Mohammed Hadi!)
- Can ask for up to 5 additional committee members, and can have Vice Chair

TRB Report

- Daily e-Newsletter, QR codes
- Annual Meeting Online includes compendium for download
- New attendees – 1/3 of attendees are "freshmen" (first time ever or first time in at least five years)
- Investigating DC Convention Center feasibility
- New committee web pages being prepared on TRB website (Steve Mattingly to support?)
- Funding Sources for Transportation Research: http://www.trb.org/ResearchFunding/ResearchFunding.aspx
- New Research Program and Project Management website: http://www.transportationresearch.gov/rppm/default.aspx
- Call for TR News topics

TRB Report

Paper Submissions	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total Number			2862	3070	2847	3384	3694	3875	4300
Total Presented			1688 (59%)	1849 (60%)	1759 (62%)	1882 (56%)	2190 (59%)	2322 (60%)	
Papers - Lectern			888 (53%)	935 (51%)	867 (49%)	900 (48%)	921 (43%)	912 (39%)	
Papers - Poster			728 (43%)	752 (41%)	861 (49%)	952 (51%)	1232 (56%)	1352 (58%)	
Papers - Meeting			21 (1%)	34 (2%)	31 (2%)	28 (2%)	20 (1%)	44 (1.9%)	
Other Papers			2 (0.1%)	5 (0.2%)	0	2 (0.1%)	17 (0.8%)	14 (0.6%)	
Invited Presentations							1750	2050	
Total Speakers							3100	3300	
Total Agencies/Orgs							1700	?	
Sessions, Workshops, and Meetings									
Lectern Sessions	498	470	469	455	452	461	382	418	
Poster Sessions	46	65	88	134	112	132	134	145	
Workshops	62	62	73	79	86	89	99	110	100
Committee Meetings				425	442	424	444	503	
Other Meetings							500+	500+	
Total Meetings							>1500	>1500	

TRB Critical Issues

- CONGESTION: increasingly congested facilities across all modes;
- ENERGY, ENVIRONMENT, AND CLIMATE CHANGE: extraordinary challenges;
- INFRASTRUCTURE: enormous, aging capital stock to maintain;
- FINANCE: inadequate revenues;
- EQUITY: burdens on the disadvantaged;
- EMERGENCY PREPAREDNESS, RESPONSE, AND MITIGATION: vulnerability to natural disasters and terrorist strikes;
- SAFETY: insufficient improvement;
- INSTITUTIONS: 20th century institutions mismatched to 21st century missions; and
- HUMAN AND INTELLECTUAL CAPITAL: inadequate investment in innovation

TRR Update

- ISI Impact Factor = 0.482 for 2010
- TRR ranks 17 out of 26 Transportation Science and Technology journals
- See other measures
- 950 articles published in 2010 (next two journals 446 and 128)
- High half lives
- TRR publication board conducting survey of TRR stakeholders, results to be discussed this week.
- Future searches through TRB website will allow to search by committee\
- We are posting list of our committee TRR published papers

YEAR	TRR IMPACT FACTOR
2010	.482
2009	.298
2008	.259
2007	.206
2006*	---
2005	.145
2004	.072
2003	.093

*No impact factor was computed for 2006

MEASURE	TRR RANK IN 2010
Citation Impact Factor	17th
Total Cites	1st
# of Articles	1st
Cited Half-Life	4th
Eigen factor Score*	2nd

USDOT/FHWA Report

1. Traffic Analysis Toolbox Series
2. HCM Chapter on Active Transportation and Demand Management (ATDM)
3. Update of Traffic Analysis Tools Workshop Material
4. Workshop on Foundations of Dynamic Traffic Assignment (DTA)
5. Traffic Analysis Pooled Fund Study 1: “Traffic Analysis Tools Consistency: Recommended Practice”
6. Traffic Analysis Pooled Fund Study 2: “Guidance on the Level of Effort Required to Conduct Traffic Analysis”
7. Travel and Emissions Impacts of Highway Operations Strategies
8. Guidebook on Utilization of Dynamic Traffic Assignment (DTA) Modeling
9. Modeling and Forecasting of Toll Revenues
10. Effective Integration of Analysis Modeling and Simulation Tools
11. Analysis of Network and Non-network impact upon Driver Behavior to improve analysis, modeling, and simulation techniques and accuracy
12. Integrated Corridor Management
13. Active Transportation and Demand Management

TRB 2012 Annual Meeting
FHWA Report

Report subjects:

1. Traffic Analysis Toolbox Series
2. HCM Chapter on Active Transportation and Demand Management (ATDM)
3. Update of Traffic Analysis Tools Workshop Material
4. Workshop on Foundations of Dynamic Traffic Assignment (DTA)
5. Traffic Analysis Pooled Fund Study 1: "Traffic Analysis Tools Consistency: Recommended Practice"
6. Traffic Analysis Pooled Fund Study 2: "Guidance on the Level of Effort Required to Conduct Traffic Analysis"
7. Travel and Emissions Impacts of Highway Operations Strategies
8. Creation of Guidebook on Utilization of Dynamic Traffic Assignment (DTA) Modeling
9. Modeling and Forecasting of Toll Revenues
10. Effective Integration of Analysis Modeling and Simulation Tools
11. Analysis of Network and Non-network impact upon Driver Behavior to improve analysis, modeling, and simulation techniques and accuracy
12. Integrated Corridor Management
13. Active Transportation and Demand Management

Traffic Analysis Toolbox Series - The Traffic Analysis Toolbox is a collection of traffic analysis guidance documents that have been developed to present a high-level overview of the different types of traffic analysis tools.

- Volume I: Traffic Analysis Tools Primer
- Volume II: Decision Support Methodology for Selecting Traffic Analysis Tools
- Volume III: Guidelines for Applying Traffic Microsimulation Modeling Software
- Volumes IV: Guidelines for Applying CORSIM Microsimulation
- Volume V: Traffic Analysis Tools Case Studies: Benefits and Best Practices
- Volume VI: Definition, Interpretation, and Calculation of Traffic Analysis Tools Measures of Effectiveness
- Volume VII: Predicting Performance with Traffic Analysis Tools
- Volume VIII: Workzone Modeling and Simulation – A Guide for Decision-Makers
- Volume IX: Workzone Modeling and Simulation – A Guide for Analysts
- Volume X: Localized Bottleneck Congestion Analysis Focusing on What Analysis Tools Are Available, Necessary and Productive for Localized Congestion Remediation
- Volume XI: Weather and Traffic Analysis, Modeling and Simulation

All eleven volumes of the Traffic Analysis Toolbox may be viewed and downloaded at http://www.ops.fhwa.dot.gov/trafficanalysistools/toolbox.htm .

HCM Chapter on Active Transportation and Demand Management (ATDM) - Chapter 35 of HCM2010 is intended to provide recommended methodologies and measures of effectiveness for evaluating the impacts of Active Transportation and Demand Management (ATDM) strategies on highway and street system demand, capacity, and performance. However, at this point in time available information on the performance of ATDM strategies has not matured sufficiently to enable the development and presentation of specific recommended analysis methodologies. Consequently, this first generation of Chapter 35 limits itself to the description of ATDM strategies, a discussion of the mechanisms by which they affect demand, capacity, and performance, and general guidance on possible evaluation methods for ATDM techniques.

FHWA's Office of Operations is sponsoring a research project to develop the methods to evaluate the ATDM strategies that will be incorporated into the HCM. Application of the methodologies will assist in answering the following types of questions:

1. How much can I improve facility performance by implementing more aggressive ATDM strategies?
2. How much additional vehicle and person throughput can I achieve for a given facility through the application of aggressive ATDM strategies?
3. Which combination of ATDM strategies and at what levels produce a target quality of performance for a facility?

Update of Traffic Analysis Tools Workshop Material - FHWA has completed the Updated Workshop material of Traffic Analysis Tools and it is now an NHI Course.

Workshop on Foundations of Dynamic Traffic Assignment (DTA) - a FHWA sponsored workshop providing participants with a solid grounding in the fundamentals of conducting traffic analyses using DTA techniques, knowledge on the appropriate use of DTA, and an understanding of both strengths and weaknesses inherent in DTA analyses.

The workshop has a one-day format featuring lecture and interactive pen-and-paper class exercise elements. Hands-on computer exercises are NOT an element of the workshop. The workshop is intended to provide participants with the background to make informed decisions regarding the value and challenges of DTA analyses using a broad range of simulation tools. The target audience for the workshop is transportation and community planners within MPOs and local, county and state organizations, transportation engineers, traffic analysts and consultants.

Traffic Analysis Pooled Fund Study 1: "Traffic Analysis Tools Consistency: Recommended Practice" - A Final Report is complete. The Guidance offers:

- Advice on setting up consistent study assumptions and parameters and select measures of effectiveness (MOEs) that are as directly comparable as possible.
- Advice on how to prepare each type of analysis in a manner that allows the MOEs of different tools to compliment one another, while avoiding confusing or contradictory results.

- An approach to the development of a study scope in a manner which anticipates the analysis requirements throughout the life cycle of a study (from planning, through design and construction, and into operations). Consideration and guidance should be given on the benefits and limitations of conducting larger geographic studies as compared to multiple small scale studies, reflecting the work and requirements of multiple projects to realize consistency in the assumptions, impact assessments of one or multiple alternatives, and the use of one or multiple tools and/or tool types.

Traffic Analysis Pooled Fund Study 2: "Guidance on the Level of Effort Required to Conduct Traffic Analysis" - This study will develop guidance/templates for State and local agencies, and consultants by demonstrating, through case studies and/or examples, the proper application of traffic modeling and simulation process, from cradle to grave; from system monitoring and problem identification through demand forecasting, into design and operational analysis and into deployment and Operations and Management resulting from the transportation decision. A boilerplate/template SOW will be developed so that State and local agencies can use in their RFPs to reflect the required level of effort and resources needed to effectively and efficiently carry out the work. A Draft Final Report is complete.

Travel and Emissions Impacts of Highway Operations Strategies - This research effort will address the short- and long-term impact of highway operations on travel and emissions. Strategies of particular interest include signal timing, ramp metering, traffic incident management, congestion pricing, active traffic and demand management strategies such as speed harmonization, queue warning, etc. The travel behavior component of this work will examine key factors affecting travelers' responses to these treatments.

Key research questions include:

- The extent to which highway operations strategies affect throughput, travel delay and travel time reliability
- the extent to which these improved travel conditions result in induced demand - defined as the additional travel across a system over both the short- and long-term (up to 40 years following deployment)
- the system-level traffic flow and emissions impacts of these projects, including the production of both criteria pollutants and greenhouse gases over a 40-year time horizon.

Creation of Guidebook on Utilization of Dynamic Traffic Assignment (DTA) Modeling - The FHWA Office of Operations is developing a Guidebook document to aid Metropolitan Planning Organizations (MPOs) and State Departments of Transportation (SDOTs) to inform them of the potential benefits and applications that are possible from utilization of DTA modeling tools. This Guidebook document will provide recommended process for using DTA tools in transportation analyses. In addition, it will provide examples of "success implementations" from transportation organizations. These guidelines will provide transportation practitioners with guidance (i.e. "how to")

on the appropriate application of DTA tools for decision making process. The process will walk the practitioner through the process from "soup to nuts" in how to develop and implement DTA for regional planning, project planning, and other transportation operation projects.

Modeling and Forecasting of Toll Revenues - A significant gap in this area concerns the modeling and forecasting of toll revenues. Specifically, there is a need for intermediate-level revenue analyses for toll projects between the "back of the envelope" calculations done in early planning stages and the more comprehensive investment-grade traffic and revenue studies that are required prior to obtaining financing. This project will develop intermediate analyses tool and procedure that would aid project sponsors in deciding which types of tolling options would warrant deeper consideration.

Effective Integration of Analysis Modeling and Simulation Tools - This project will define a model integration concept of operations and requirements that will enable harmonious information exchange, and data transferability among models of various domains and scale. These new methods and tools will be validated through a proof of concept and prototype(s) demonstration

Analysis of Network and Non-network impact upon Driver Behavior to improve analysis, modeling, and simulation techniques and accuracy - A significant gap exists between current capability of existing traffic analysis tools and the ability of these tools to simulate and analyze complicated behavior of drivers. This research study will narrow such gap and advance our understanding of driver behavior to continue improving operations and safety of our nation's transportation systems.

Integrated Corridor Management – Multi-year and multi-modal initiative, jointly managed by a program team from RITA, FTA, and FHWA with a phased approach to program delivery. Two demonstration sites, San Diego, CA and Dallas, TX, will go live early 2013. A comprehensive evaluation and traveler behavior survey area already started. In addition to the core research effort, the ICM program includes a continuous knowledge and technology transfer effort.

- Demonstration hypotheses: *ICM Will..*
    - Improve Situational Awareness
    - Enhance Response and Control
    - Better Inform Travelers
    - Improve Corridor Performance
    - Hold other priorities harmless
        - i.e., ICM will have a positive or no effect on congestion, air quality, etc
- Evaluation –
    - Pre-deployment and post deployment data collection
        - 12 months pre, 12 months post after 6 month shakedown

        - Evaluation framework complete October 2011
        - Dallas Test Plans complete
        - San Diego Test Plans under review
    - Test plans
        - Institutional and Organizational Issues
        - Corridor Performance
        - Benefit/Cost Analysis
        - Technical Capacity
        - Air Quality
        - Traveler Response
        - Decision Support Systems
- Guidance and Technology Transfer
    - ICM Analysis, Modeling, and Simulation State 2 Summary Reports and Executive Summary
        - Draft Final complete. Expect publication February 2012
    - ICM Analysis, Modeling and Simulation Guide
        - Stakeholder review, September 2011
        - Draft Final complete. Expect publication February 2012
    - ICM Implementation Guide
        - Stakeholder review, October 2011
        - Expect publication Spring 2012
    - ICM Informational Briefs
        - Four briefs describing relationship between ICM and other areas of transportation operations
        - Topics: 1. ICM and Traffic Incident Management, 2. ICM and Active Management; topics for briefs 3 and 4 will be identified after initial tech transfer workshops
    - Technology Transfer early adopter workshops
        - See handout
        - 5 technical assistance workshops in 2012

Active Transportation and Demand Management - What is ATDM? The collective approach for dynamically managing travel and traffic demand and available capacity of transportation facilities, based on prevailing traffic conditions, using one or a combination of operational strategies that are tailored to real-time and predicted conditions in an integrated fashion.

- *Or more simply ATDM is dynamic management of traffic and demand.*

- **Guidance**
    - Guidance, FHWA Division Administrators and Specialists: FHWA Division Offices will play a critical role in reviewing, influencing, and approving ATDM program and project concepts, especially those involving non-traditional design and operations practices.
    - Guidance for practitioners:
        - Active Traffic Management Guide

        - Active Parking Guide
        - Freeway Management and Operations Handbook
        - Also working to include ATDM elements into other guidance, e.g. Planning for Operations, Designing for Operation, Benefit/Cost, etc.
        - System Engineering guidance
- **Research**
    - Analysis needs
        - Methodologies for the Highway Capacity Manual
        - Needs and requirements for modeling and simulation
        - Benefit-Cost analysis: Operations Benefit Cost Analysis; MUL Pool Fund Study , Cost Benefit methodology for Managed lanes
    - Capability Maturity Model
    - Safety
        - Shoulder lane safety analysis
        - Lane control safety analysis
        - ATM Traffic Control Device human factors
    - Technology
        - Decision Support Systems
        - Data needs
        - Connected Vehicle initiative
        - Variable Speed Limit/Automated Speed Enforcement field operational test
            - ConOps FY12. Expect to solicit FOT in FY13
- **Technology Transfer**
    - Peer-to-Peer Support: HOP has funding for FY 12 and FY13 for peer-to-peer support.
    - ATDM workshops (see handout) -
        - Six workshops in the US from April through October 2012.
    - Parking workshops

Subcommittees

1.	Joint Subcommittee on Traffic Simulation Models	List
2.	Research Problem Statements	Hadi
3.	Paper Review and Sessions	Bertini
4.	Greenshields Prize	Gartner
5.	Mid-Year Meeting	Hadi
6.	Committee Website	Bertini
7.	Strategic Planning	Bertini
8.	Committee Communications	Mattingly
9.	Classic Papers	Ahn/Laval/Geroliminis
10.	Historic Papers	Xuan
11.	Special Report on Traffic Flow Theory	Mahmassani
12.	NEW Teaching TFT	van Lint

SimSub

SimSub Website:
http://sites.google.com/site/trbcommitteeahb45/
To join, send email to:
TRBCommitteeAHB45@gmail.com
Within few days you will get an invitation to join "Friends of SimSub" which is a Google group through which we post announcements and distribute emails about SimSub activities.

Sunday Simulation Workshop: ”Use of Simulation to Assess Safety Performance"

TFT Committee Research and Back to Basic Initiative

Washington D.C., January 2012

TRB Back to the Basics Initiative

- Major initiative of the TRB with 100 committee participating
- TRB is allocating a lot of resources
- Provide ongoing guidance and training through a community of Committee Research Coordinators (CRCs).
- Enhance the RNS Database and other tools to help committees achieve the above vision.
- Each committee has research coordinator(s)
- CRCs are the coordinator of research
  - However, it is expected that they will be helped by volunteers

Objectives

- Develop and maintain an up-to-date set of peer-reviewed research needs statements.
- Assure that committee approved statements are included in the TRB RNS database
- Coordinate with other committees
- Maximize the probability of statement is funded
- Make those who manage and conduct research aware of committee's RNSs.

Current and Past Efforts

- NGSIM workshops identified research needs with focus on microscopic simulation algorithms
- SimSub Survey (about 50 participants) identified and priorezed 43 research issues in 2006.
- Traffic flow theory survey in 2008
- Currently RNS has 8 statements uploaded in 2008
- RNS may have others related to TFT

Current Needs

- Need to have a robust portfolio of needs statements
- Need to write statements according to TRB requirements and maintain current with review of on-going research. Take the statements out if the research is done.
  - The committee has to approve each statement in the database
  - Using an enhanced version of the TRB Research Needs Statements (RNS) Database
- Assuring that research organizations are aware of the identified research needs
- Monitoring status of research of interest.

Potential Immediate Actions

- Workshop at the mid-year meeting
- Review existing RNS databases for other committees
- Collaborate with other committees
- Start writing research statement for potential funding.

Paper Review & Sessions

Thanks to subcommittee members authors and reviewers!

AHB45 Committee on Traffic Flow Theory and Characteristics Paper Review History

Annual Meeting	**2012**	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001
Papers Received	**177**	119	101	92	82	88	70	69	80	40	42	25
Percent increase	+49%	+18%	+10%	+12%	-7%	+26%	+1%	-14%	+100%	-5%	+68%	
Presentation only	32	22	13		7	9	7	3				
Publication only	5	1	4		2	2	5	2			3	
Present and publish	140	96	84		73	77	58	64				
Submitted for Presentation	172	118	97	87	81	86	70	67	75	40	39	
Lectern Sessions	5	4	4	4	4	4	4	4	4	4	4	
Lectern Papers	25	20	20	20	20	20	20	20	20	19	19	
Poster Sessions	4	2	2	2	2	2	2	2	2	0	0	
Poster Papers	67	60	40	39	33	39	32	25	30	0	0	
Subtotal	92	80	60	59	53	59	52	45	52	19	19	
Percent Accepted	53%	67%	62%	68%	65%	69%	74%	67%	69%	48%	49%	
Rejected	80	38	37	28	28	27	18	22	23	21	20	
Submitted for Publication	145	97	88	78	76	79	63	66	71	40		
Accepted	0	2	0		1				4			
Revise and re-review	44	35	0	14	19	16	15		20	15		
To be determined	0	0	31	29	18	29	21		16			
Subtotal	44	37	31	43	38	45	36	42	40	15		
Publication Slots	~36	~30	~25	27	23	22	24	26	26	~12		
Acceptance Rate	25%	31%	28%	29%	28%	25%	34%	38%	33%	30%		
Rejected	109	49	57	51	53	57	39	40	45	28		
Reviews												
Assigned	712	568	441	394	332			269	356	200		
Assigned/paper	4.0	4.8	4.4	4.3	4.0			3.9	4.5	5		
Received	597	481	394	360	315			248	317	120		
Received/paper	3.4	4.0	3.9	3.9	3.8			3.6	4.0	3		
Response rate	84%	85%	89%	90%	95%			92%	89%			
TFT Reviewer Pool	440	310+	282									
Number of Reviews	1-32		1–34									
Average	5.3		6.2									
Total Reviews	2330		1500									
Friends Email List	411	404	343									
Annual Meeting Attendance		?	79	?	65	58	72	57	80+	80+	50+	?
Midyear Meeting Attendance		25	65	-	39	-	-	-	-	-	-	-
SimSub Attendance		61										
Sunday Workshop Attendance												

Paper Review & Sessions

Traffic Flow Theory & Characteristics Committee Events - TRB 2012

Type	No.	Sponsor	Title	Location	Time
M		AHB45	Traffic Flow Theory and Characteristics Committee	Marriott	Jan 24 2012 1:30PM- 5:30PM
M		AHB45	Traffic Simulation Models Joint Subcommittee of AHB45, AHB40, AHB25, AHB20, ADB30, AHB55, ADC20	Marriott	Jan 23 2012 7:30PM- 9:30PM
W	105	AHB50	Doctoral Student Research in Transportation Operations and Traffic Control	Marriott	Jan 22 2012 9:00AM- 12:00PM
W	149	ADB30	Doctoral Student Research in Transportation Modeling	Hilton	Jan 22 2012 1:00PM- 5:00PM
W	161	AHB45	Use of Simulation to Assess Safety Performance	Marriott	Jan 22 2012 1:30PM- 4:30PM
P	403	AHB45	Research in Traffic Flow Theory and Characteristics, Part 1 (Part 2, Session 433; Part 3, Session 434; Part 4, Sessio	Marriott	Jan 23 2012 4:15PM- 6:00PM
P	433	AHB45	Research in Traffic Flow Theory and Characteristics, Part 2 (Part 1, Session 403; Part 3, Session 434; Part 4, Sessio	Marriott	Jan 23 2012 7:30PM- 9:30PM
P	434	AHB45	Research in Traffic Flow Theory and Characteristics, Part 3 (Part 1, Session 403; Part 2, Session 433; Part 4, Sessio	Marriott	Jan 23 2012 7:30PM- 9:30PM
P	493	AHB45	Research in Traffic Flow Theory and Characteristics, Part 4 (Part 1, Session 403; Part 2, Session 433; Part 4, Sessio	Marriott	Jan 24 2012 8:30AM- 10:15AM
S	645	AHB45	Advances in Macroscopic Modeling	Marriott	Jan 24 2012 7:30PM- 9:30PM
S	684	AHB45	Traffic Flow Theory Network Applications	Marriott	Jan 25 2012 8:00AM- 9:45AM
S	718	AHB45	Car Following and Driver Behavior	Marriott	Jan 25 2012 10:15AM- 12:00PM
S	800	AHB45	Modeling Pedestrians and Motorized Traffic	Marriott	Jan 26 2012 8:00AM- 9:45AM
S	807	AHB45	Traffic Oscillations and Simulation	Marriott	Jan 26 2012 10:15AM- 12:00PM

Paper Review & Sessions

- 2012 Joint Call for Papers with Pedestrian Committee
- Received 16 papers
- Note slight flaw in TRB system, we do not know for sure that all 16 were directly related to the call
- Created one new joint podium session (5 papers)
- Several other papers in joint poster session

Greenshields Prize

- Papers/presentations being reviewed this week
- Announcement at mid-year meeting

Mid-Year Meetings

- 2007 ISTTT London (in pub)
- 2008 Greenshields Symposium, Woods Hole
- 2009 ISTTT Hong Kong (lunch table)
- 2010 Does Traffic Data Support Traffic Models? Annecy, France
- 2011 ISTTT Berkeley (one hour w/SimSub)
- 2012 Joint Summer Meeting with HCQS Committee, June 19-22, Fort Lauderdale, Florida
- 2013 ISTTT, July 17-19, Noordwijk, the Netherlands
- 2014 TBD (commemorate committee 50th anniversary?)
- 2015 ISTTT Kobe
- 2016 TBD (ideas?)

Joint Meeting of the Transportation Research Board HCQS(AHB40) and TFT(AHB45) Committees

June 19-22, 2012
Fort Lauderdale, FL

Organizing Committee

- Dr. Mohammed Hadi, Florida International University
- Dr. Robert Bertini, Portland State University
- Dr. Darcy Bullock, Purdue University
- Dr. Lily Elefteriadou, University of Florida
- Dr. Nikolas Geroliminis, L'Ecole Polytechnique Federale de Lausanne (EPFL), Switzerland
- Dr. Samer Hamdar, George Washington University
- Mr. William Sampson, University of Florida
- Dr. Bastian Schroeder, North Carolina State University
- Mr. Robert Sheehan, Federal Highway Administration

Technical Program

- Tuesday (6/19) 8:30-12:00 Predictive traffic flow methodologies for ATDM Workshop
- Tuesday (6/19) 1:00 PM-5:00 PM: TFT and SimSub meetings and Workshop on Research Needs. HCQS workshops (two concurrent).
- Wednesday (6/20) 8:00 AM-5:00 PM Joint TFT/HCQS workshop discussion, Plenary sessions (two) and technical presentations - (Most likely two concurrent sessions)
- Thursday 8:00 AM - 5:00 PM- HCQS subcommittee meetings
- Friday 8:00 AM- 12:00 PM full HCQS committee meeting

Other Activities

- Dinner and River Cruise http://www.youtube.com/watch?v=3JxaRPUa8n8
- Other activities and reception ??
- Lunch meeting of HCQS with ITE Gold Coast Chapter and the local chapter of WTS

Call for Extended Abstracts

- Call for extended abstract issued
- Web site for submittal set by TRB http://precis2.preciscentral.com/Public/UserLogin.aspx?P=D805325BAA88D2EA1FB38829735EDDB5&Reload=True&ID=4FDE8BDCA0F495A3
- Few selected papers will be published in a special section of the ASCE Journal of Transportation Engineering
  - Full paper will be requested and reviewed after the meeting
- Deadline extended until February 15, 2012

Abstract Submission and Review

- Submittal Categories
  - **Empirical modeling to support Capacity Analysis**
  - **Alternative Tools (Simulation)**
  - **Active Management/ITS Modeling**
  - **Performance Measurements**
  - **Others**
- TRB needs from us
  - **Date review start: 2/16**
  - **Date review end: 3/16**
  - **List of reviewers**
-

Location and Hotel

- Fort Lauderdale Beach Hilton Resort
- Across the road from Fort Lauderdale Beach, one of the most attractive beaches in Florida
- Restaurants and activities nearby
- Few minutes from Las Olas Boulevard and Downtown Fort Lauderdale
- 30 minutes from Palm Beach and 30 minutes from Miami downtown. About one hour from the Everglades National Park.

Hotel

Website

- News Items and RSS Feed http://www.tft.pdx.edu/news.php
- Anyone can contribute items
- Revised 2001 Monograph: 32 sold, 322+ downloaded
- Greenshields Symposium 2008 *TR Circular* Published!
- New Greenshields Prize page
- New listing of 497 papers contributed by committee

Strategic Planning

- Thanks to Marguerite Zarrillo and Avi Unnikrishnan
- Submitted draft Triennial Strategic Plan and awaiting comments
- Highlights
  - Primary Activities
  - Committee Membership and Management
  - SimSub
  - Traffic Flow Characteristics
  - Research Problem Statements
  - Communications and Outreach
- Think "products"
- Engage non-traditional partners/participants who can't travel

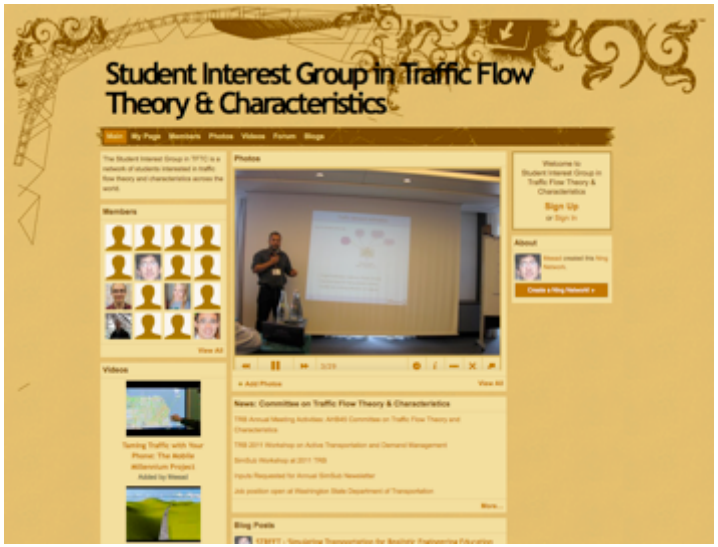
TSP Review Comments

- Specific to our committee:
  - Post Annual Meeting webinars are excellent
  - Lacks organizational diversity—discuss steps to improve
  - Focus more on actions to be taken
- General Operations Section comments:
  - Very positive trends (level of activity, interaction with other committees, use of social media, midyear meetings, alternative meeting formats, international engagement, development of handbooks)
  - Need to update/expand research problem statements
  - Consider impact of new technology or outside activity on mission
  - Consider Best Young Member Paper Award
- "Keep up the good work!"

Committee Communications

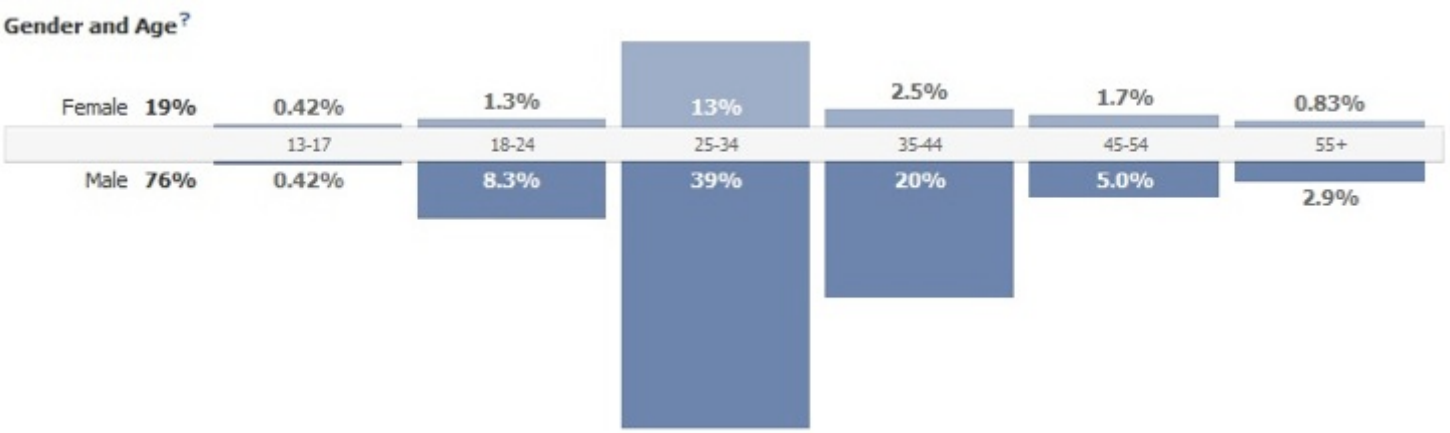
- TFT Facebook Page: 242 “Likes”
- Student Interest Group: 38 members

  http://tftcsig.ning.com/



Facebook Update

- Total number of persons who have liked the page so far: 242 (from more than 20 countries)
- Female: 19%/Male: 76%
- Most of the fans are in the range of 25-34 years old! The top 5 countries where people have liked us from are the U.S., Greece, Netherlands, India, and United Kingdom. The page has been viewed 50 times per day on average. Every content of the page (a posted item) reaches about 150 persons on average.



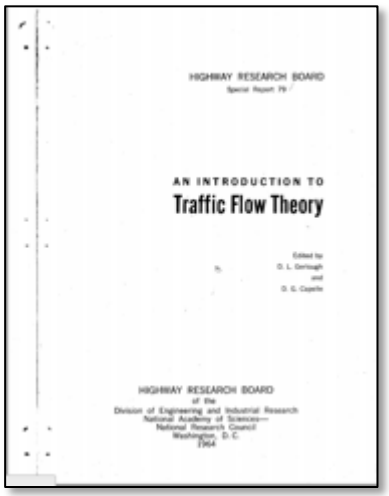
Classic Papers

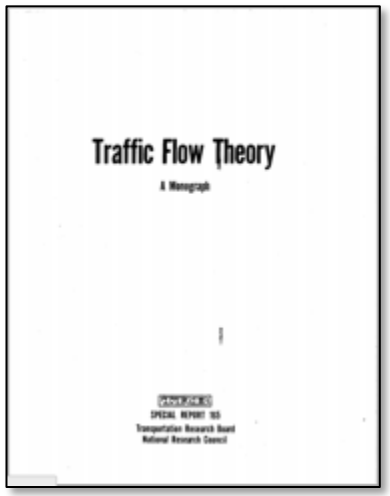
- Update from Nikolas Geroliminis, Sue Ahn and Jorge Laval

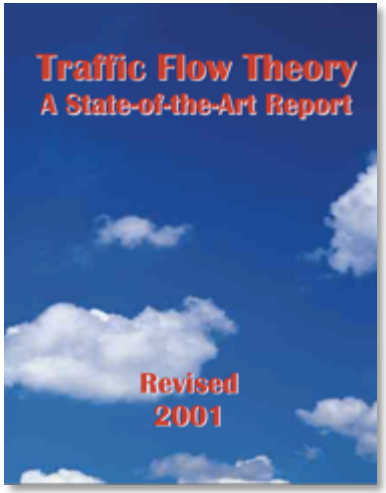
TFT Historic Papers

- Thanks to Ethan Xuan, U.C. Berkeley!
- 497 papers and 57 issues of HRR/TRR since 1963 (Aha! 50 years in 2013!)
- Some topics now covered by newer committees
- Predecessor committees:
  - Committee on Traffic Flow Theory (1963-1970)
  - Committee on Characteristics of Traffic Flow (1965-1970)
  - Committee on Speed Characteristics (1963-1965)
- Lists available via website on Google Docs
- Need volunteers to verify none were missed
- Obtain comments – which papers have influenced research and practice? Which papers are highly cited? Other ideas, e.g. literature review or annotated bibliography?
- Another outcome – in future TRB will include committee as a searchable parameter in TRID

Special Report on TFT



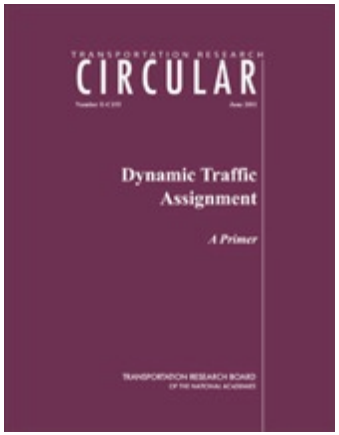




1964 1975 2001

Special Report on TFT

Network Committee Primer on DTA 2011



Teaching Traffic Flow Theory

- New Subcommittee led by Hans van Lint
- Launched web-based survey
  - 88 completed responses
  - 61 bachelor/undergraduate courses (mean 25% of course covers TFTC material)
  - 52 graduate/masters/doctoral courses (mean 65% of course covers TFTC material)
  - 15 experience with K-12 outreach
  - 30 experience with general public/decision makers
  - 59 respondents interested in results/willing to be contacted

AHB45
Committee on Traffic Flow Theory & Characteristics
Transportation Research Board
National Academy of Sciences

The **P**romotion & **E**ducation of the **TFT** domain to students, road authorities, politicians and the broad **P**ublic using fun and cool methods **Sub**committee

THE TFT PEP-SUB

(OTHER ACRONYMS WELCOME!)

Panel discussion to kick of the TFT -PEPSub

Panel:

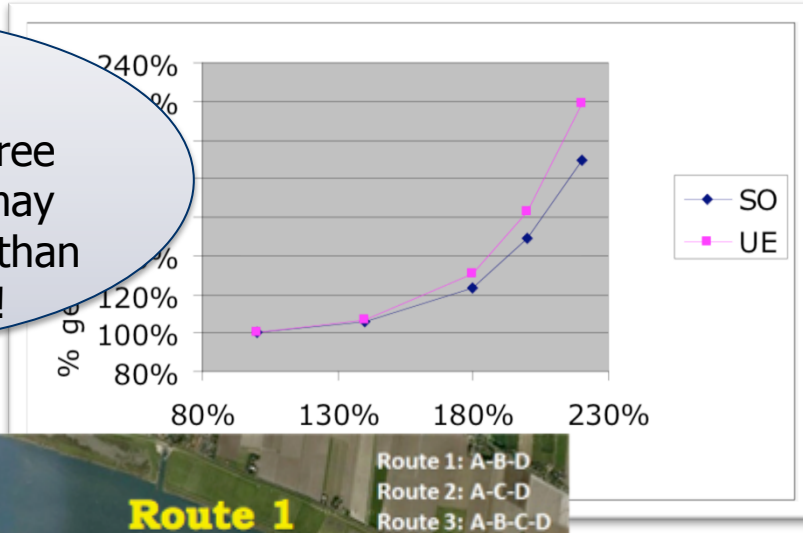
- Hans van Lint (TUD) – *DIY experiments to teach traffic control*
- Hani Mahmassani (NWU) – *Convincing policy makers*
- Christine Buisson (IFFSTAR) – *Teaching TFT methods*
- Eddie Wilson (USouthampton) – *Play, learn, appreciate!*

Planning

1. 5 minute pitch each
2. Discussion across the table. Example discussion points:
   a. Systematically sharing (methods, ideas, slides, material) in TFT community?
   b. Workshop / conference (session) on this subject?

The walking experiment why ramp metering (and perimetercontrol in general) is a good idea

A route choice experiment why free individual choices may lead to worse traffic than "guided" choices!

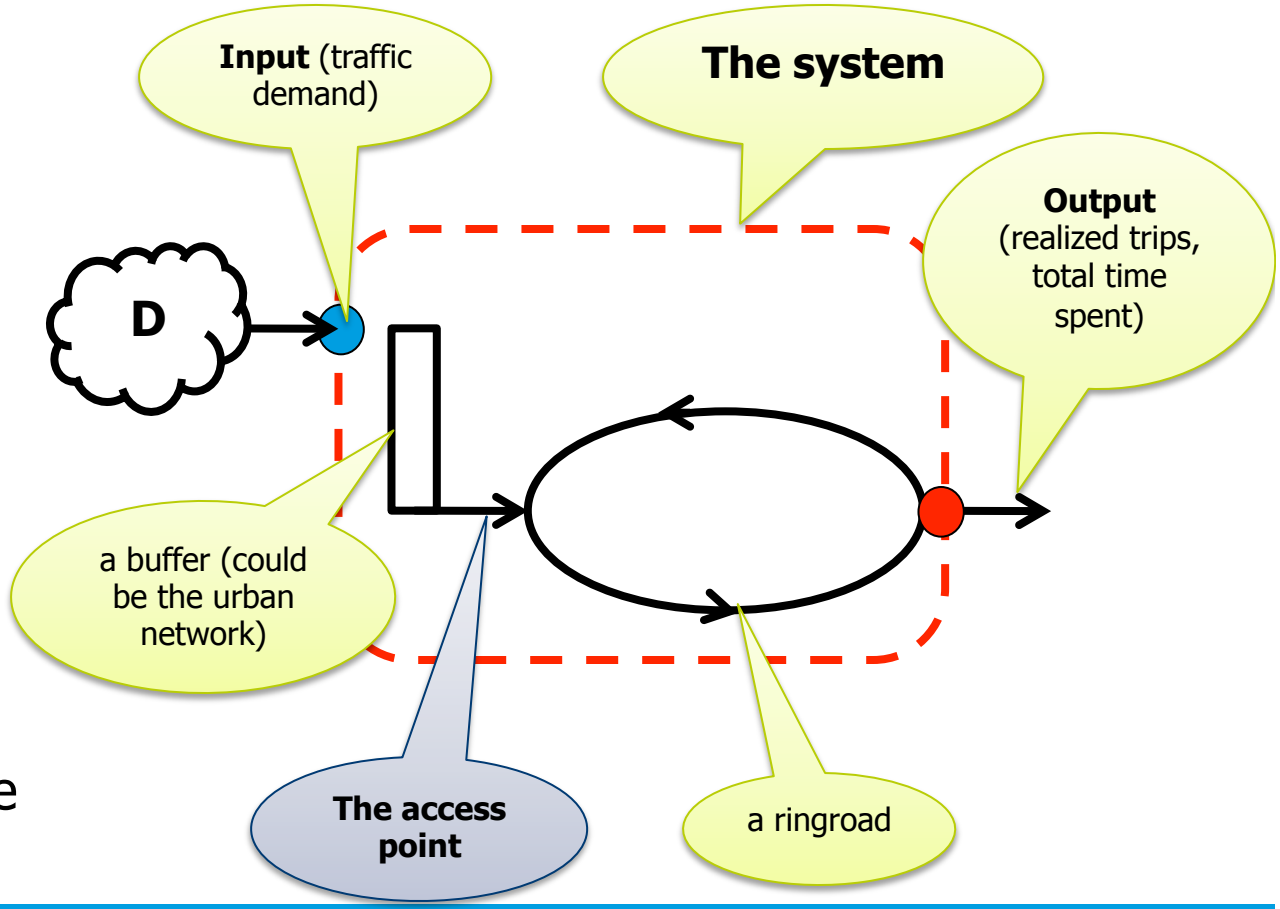


Rice through a funnel experiment demo's the capacity drop, but also the faster is slower evacuation effect!

The Walking Experiment

A closed reservoir system (only way out is through)

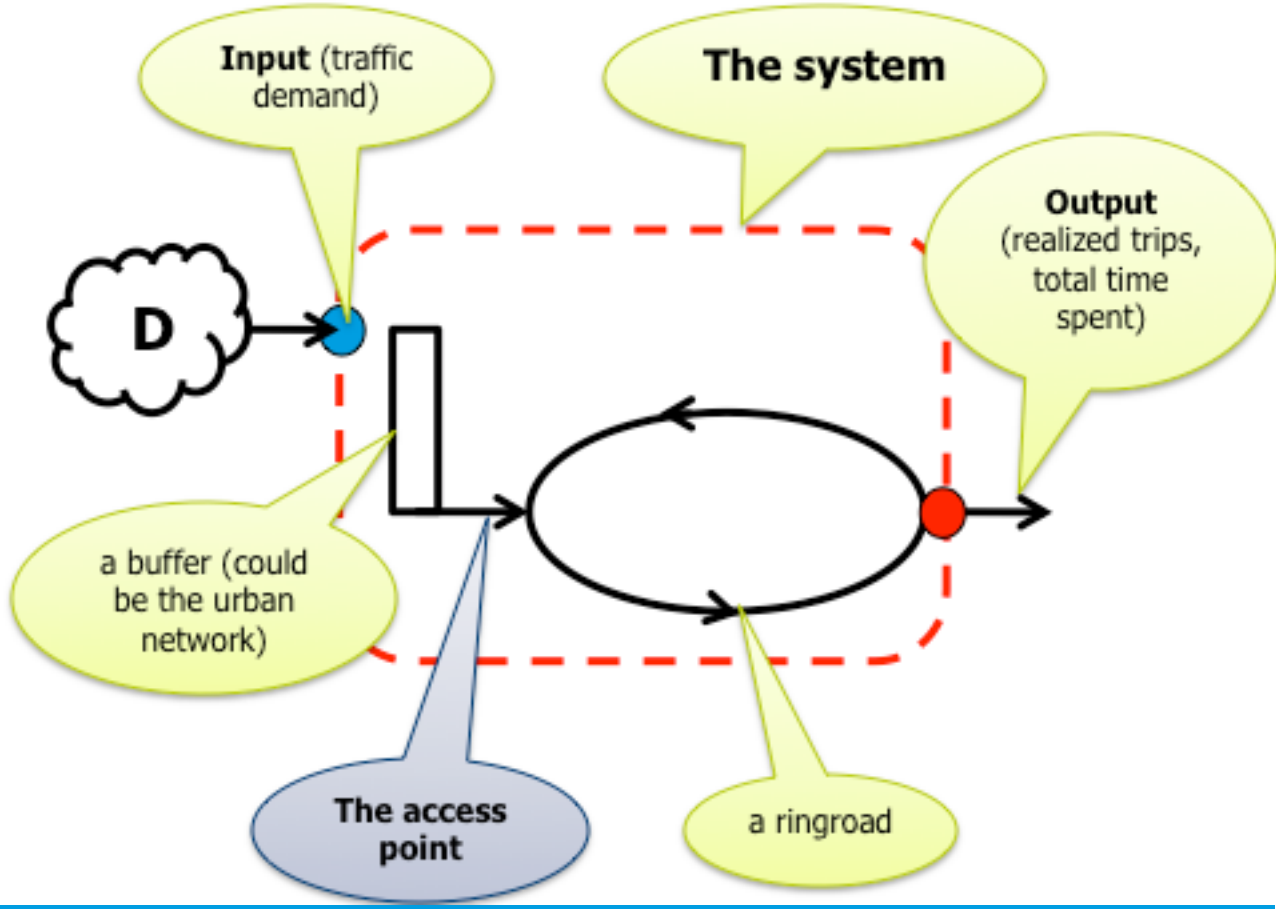
- Assume that a fixed total demand **D** (#travelers/hour) *wants* to travel through this network.
- **the only way out is through the ring road …**
- Every person has a simple task: walk *X* rounds and than leave

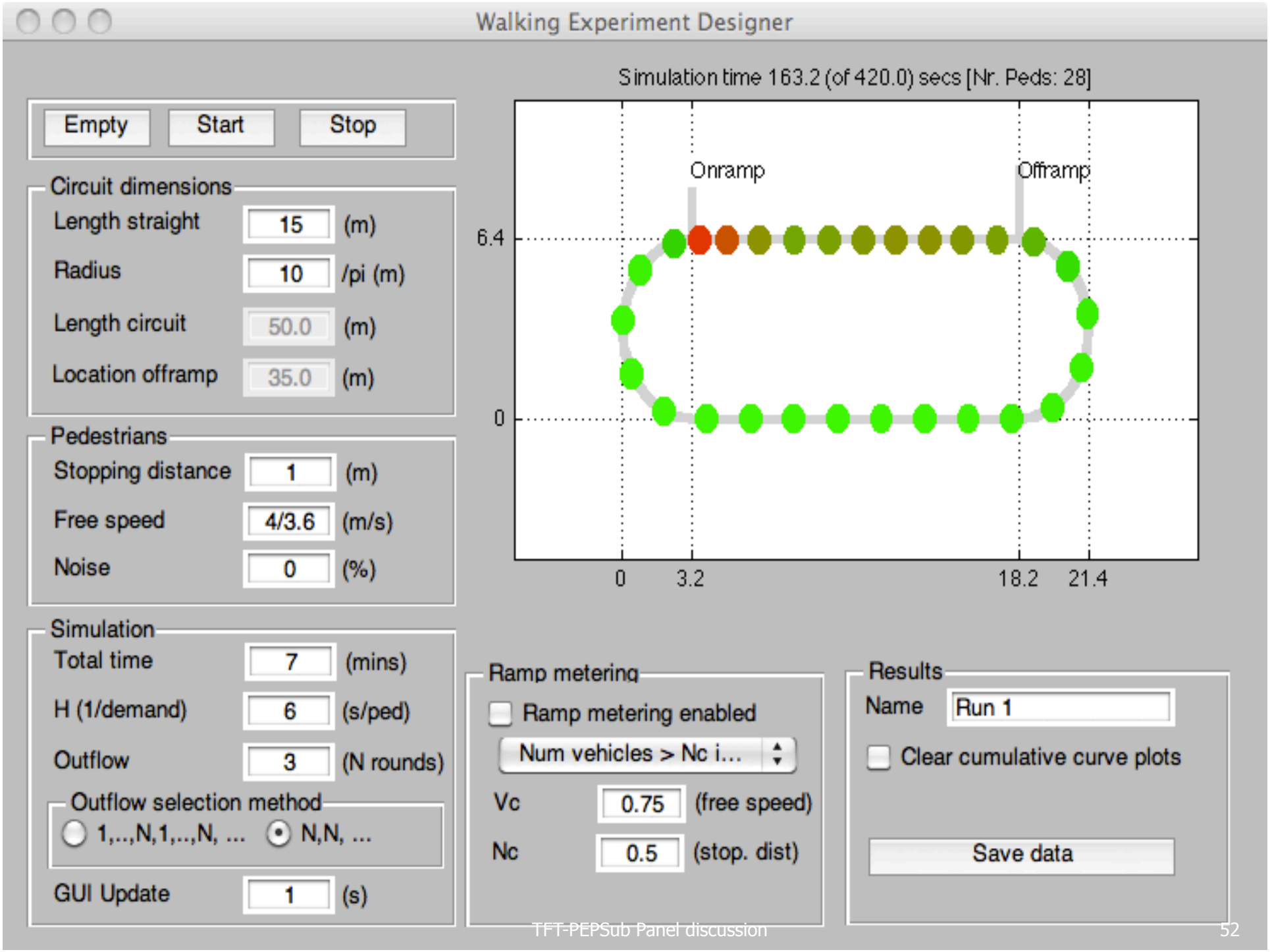


The Walking Experiment

A closed reservoir system (only way out is through)

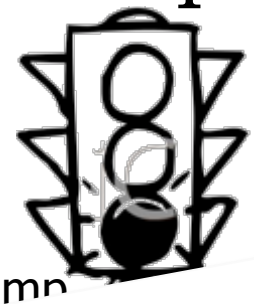
- Experiment A
  - do nothing and let nature take its course
- Experiment B
  - use exactly the same demand as in experiment A, but now control the access point




Walking Experiment Designer
Simulation time 163.2 (of 420.0) secs [Nr. Peds: 28]
Empty
Start
Stop
Onramp
Offramp
6.4
0
0
3.2
18.2
21.4
Circuit dimensions
Length straight
15
(m)
Radius
10
/pi (m)
Length circuit
50.0
(m)
Location offramp
35.0
(m)
Pedestrians
Stopping distance
1
(m)
Free speed
4/3.6
(m/s)
Noise
0
(%)
Simulation
Total time
7
(mins)
H (1/demand)
6
(s/ped)
Outflow
3
(N rounds)
Outflow selection method
1,..,N,1,..,N, ...
N,N, ...
GUI Update
1
(s)
Ramp metering
Ramp metering enabled
Num vehicles > Nc i...
Vc
0.75
(free speed)
Nc
0.5
(stop. dist)
Results
Name
Run 1
Clear cumulative curve plots
Save data

Experiment A: let nature take its course …

Experiment B: ramp metering



onramp

Gain after just seven minutes =
1 ½ hour of collective travel time

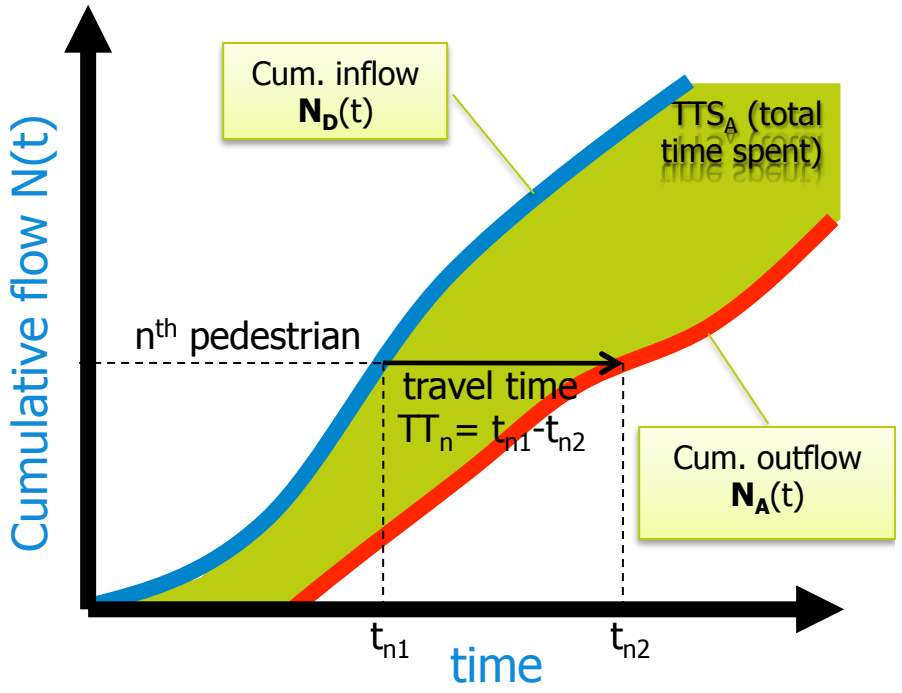
Now that is what you call a return of investment!

Explanation of the results

This is how we compare the two situations

- Consider the cumulative inflow $\mathbf{N_D}(t)$ and the cumulative outflow $\mathbf{N_A}(t)$
- The horizontal distance between the curves equals the travel time
- The surface between $\mathbf{N_D}(t)$ and $\mathbf{N_A}(t)$ = the sum of all these travel times, the *total time spent* ($\mathbf{TTS_A}$)

The smaller TTS the better!

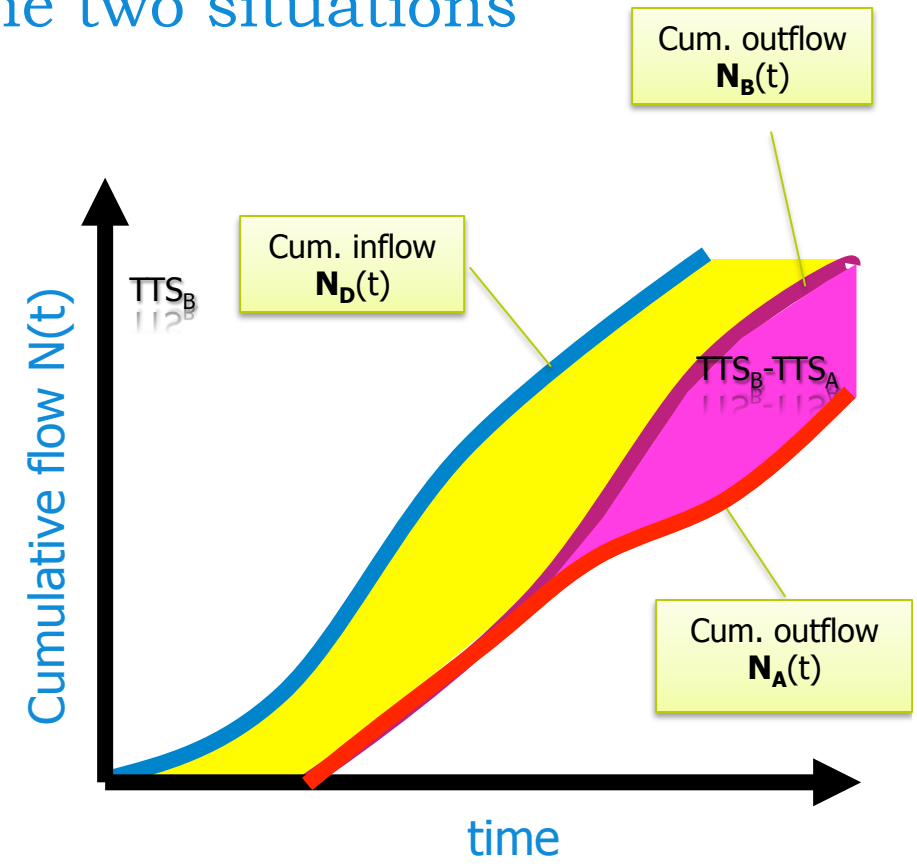


Explanation of the results

This is how we compare the two situations

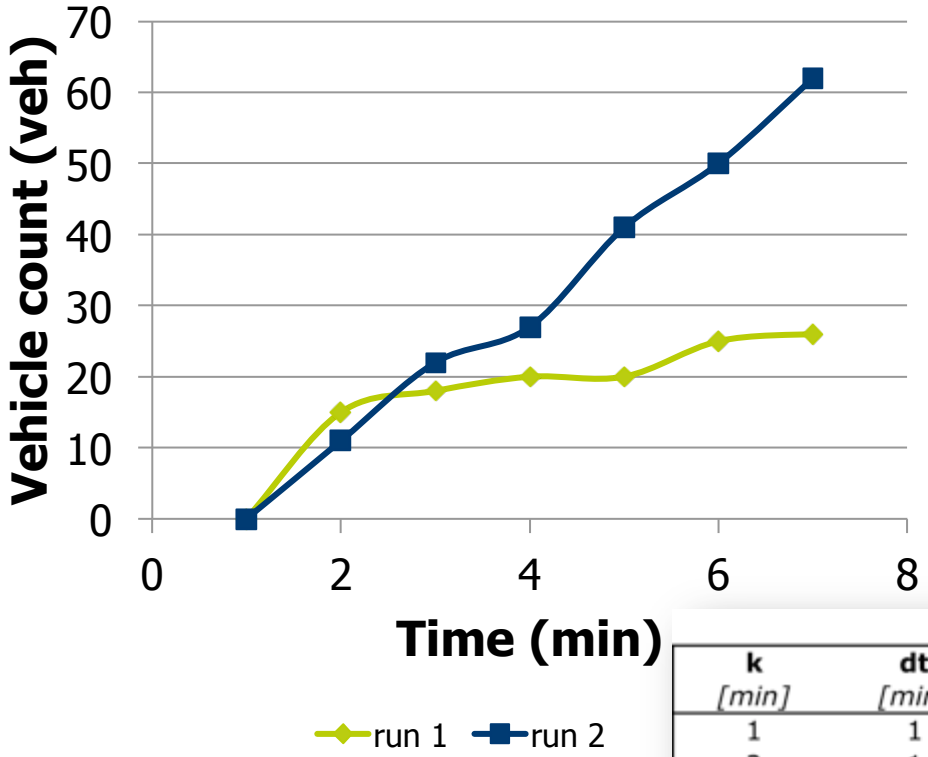
- In experiment B we had exactly the same cumulative demand $\mathbf{N_D}(t)$ but a different cumulative outflow $\mathbf{N_B}(t)$. Again the surface between these depict total time spent ($\mathbf{TTS_B}$)

- If we plot also $\mathbf{N_A}(t)$ in the same graph, the surface between $\mathbf{N_B}(t)$ and $\mathbf{N_A}(t)$ obviously equals the difference in total time spent, that is:
  Performance = $\mathbf{TTS_B}$ - $\mathbf{TTS_A}$



Explanation of the r

Cumulative outflow curve



TTS_B-TTS_A =

89

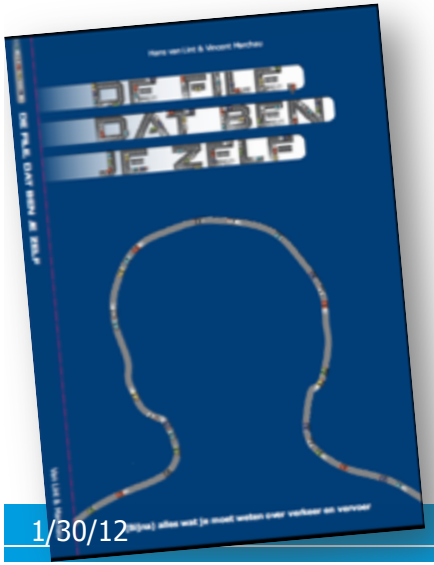
Person minutes
(1½ person hours)

Which is equal to
(depending on the
average value of
one person hour)
a bottle of (pretty
good) whine

				CUM. OUT		
k [min]	dt [min]	qout [aantal]		NA(t) [aantal]	NB(t) [aantal]	TTA-TTB [min]
1	1	0	0	0	0	0
2	1	15	11	15	11	4
3	1	3	11	18	22	-4
4	1	2	5	20	27	-7
5	1	0	14	20	41	-21
6	1	5	9	25	50	-25
7	1	1	12	26	62	-36
		26	**62**	**124**	**213**	**-89**

You even make it to Belgian national TV (live)!

Many thanks to Chris Tampere!

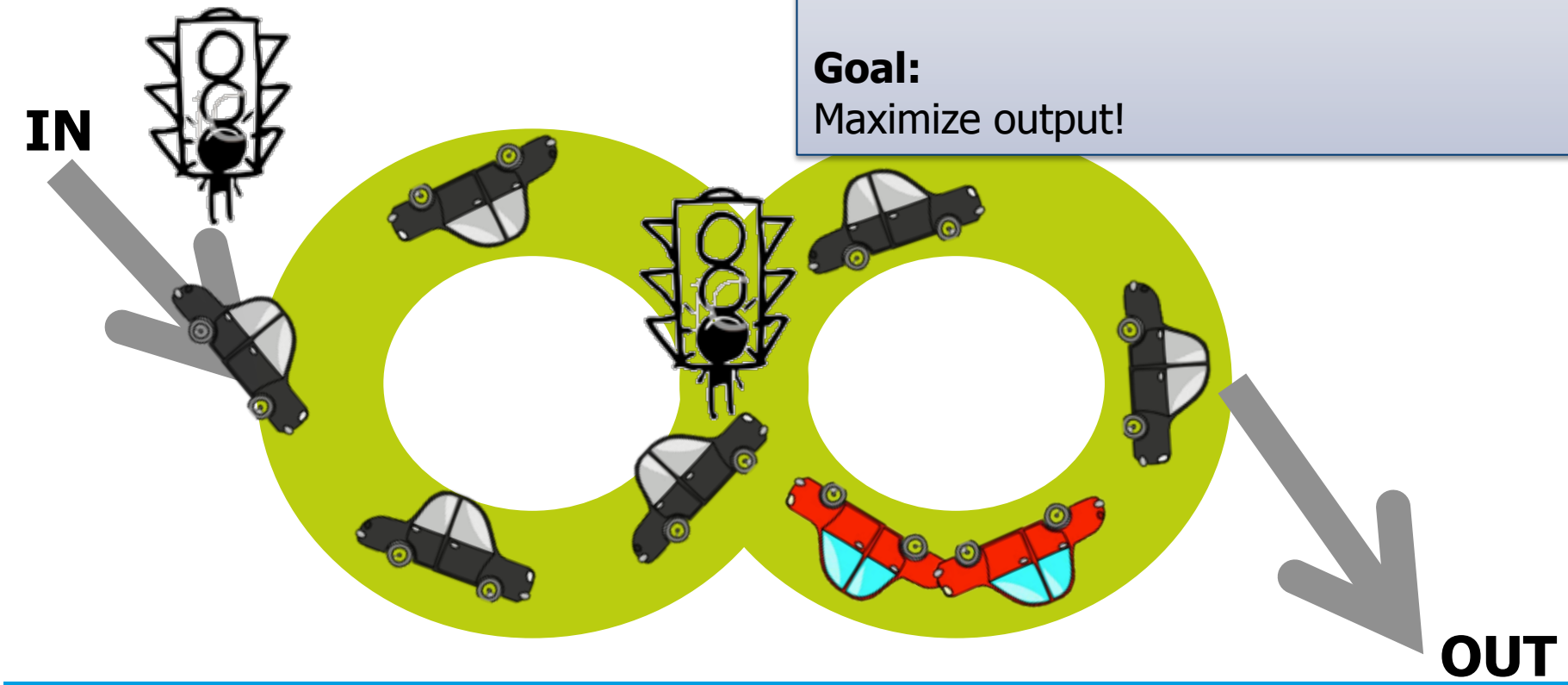


More advanced experiments

Can we also demonstrate that **coordination** is a GREAT IDEA ???

Possible scenarios:
Fixed traffic control
Fixed traffic control + ramp metering
Adaptive traffic control + ramp metering

Goal:
Maximize output!



21st Century Traffic Control: the Invisible Referee Public Exhibition, July 2011

http://invisible-referee.soton.ac.uk/

R. Eddie Wilson

Transportation Research Group
University of Southampton

January 24, 2012

TRG at the Royal Society Summer Science Exhibition

- Our exhibit: *21st Century Traffic Control: the Invisible Referee*

  Much of the UK road network is monitored by space-age Control Offices. These are the invisible 'referees' that aim to smooth traffic flow, for example, by varying the timings of traffic lights. Our research is in Mathematical models that are used to predict how traffic jams build up - and how we should program Control Office computers to keep the traffic flowing freely. At our exhibit you will explore the world of such Intelligent Transport Systems. You will 'take the controls' in interactive computer games and discover if you can smooth the traffic better than us!

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- Three simple messages:
  - Traffic jams are a bad thing. (They cost money and carbon).
  - There is such a thing as traffic control.
  - Maths and computing help you do it better.

The three activities:

Scalextric

Our track has one big difference - it's got traffic lights! Race our cars while you learn how "inductance loop" technology is used to detect vehicles and control the traffic lights.

Junction Control

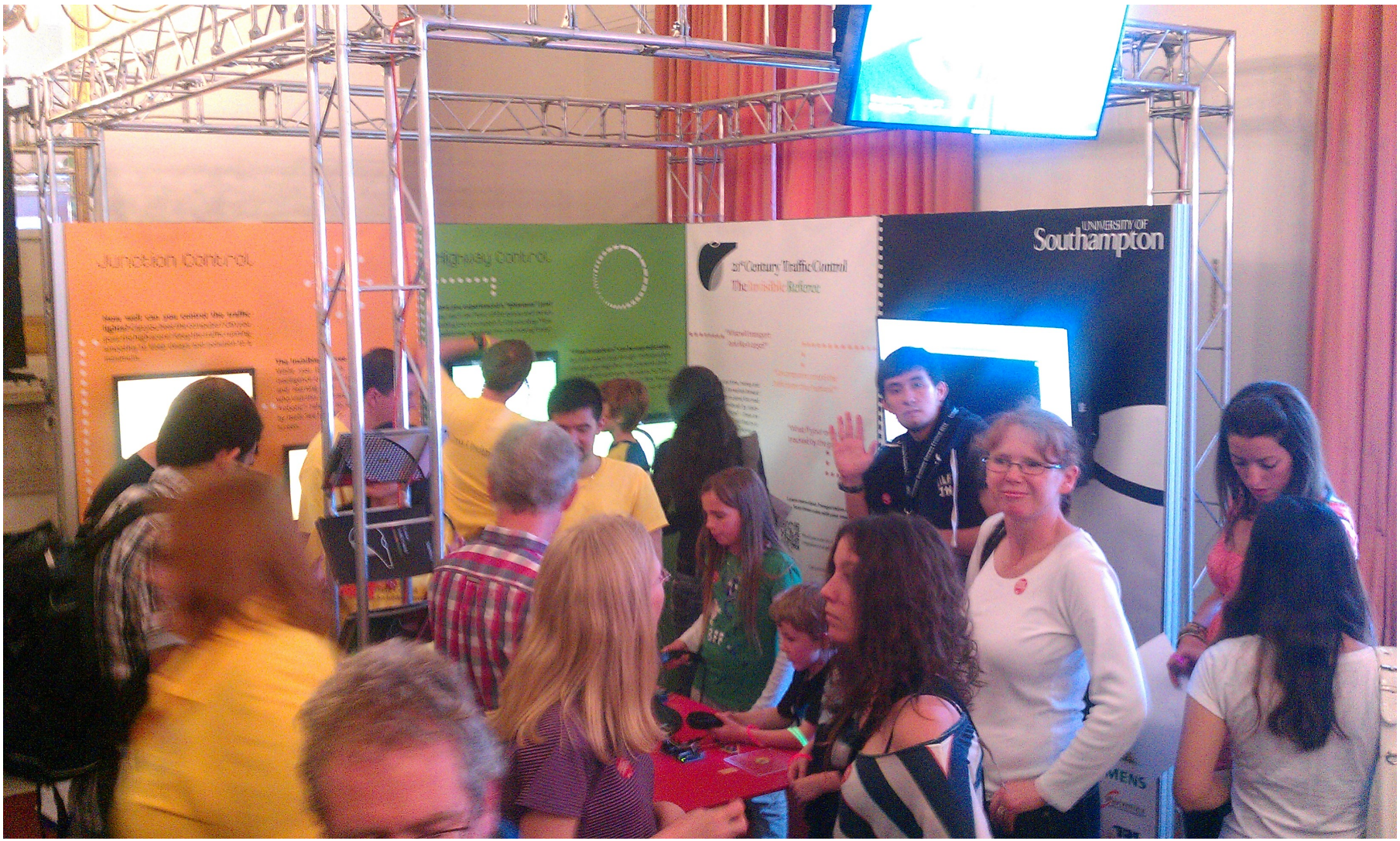
How well can you control the traffic lights? Can you beat the computer? Can you post the high score? Keep the traffic running smoothly to keep delays and pollution to a minimum.

Highway Control

Have you experienced a "phantom" jam? You reach the front of the queue and there's nothing there to explain it. Can you stop "flow breakdown" and keep the cars moving freely?

Our exhibit . . .

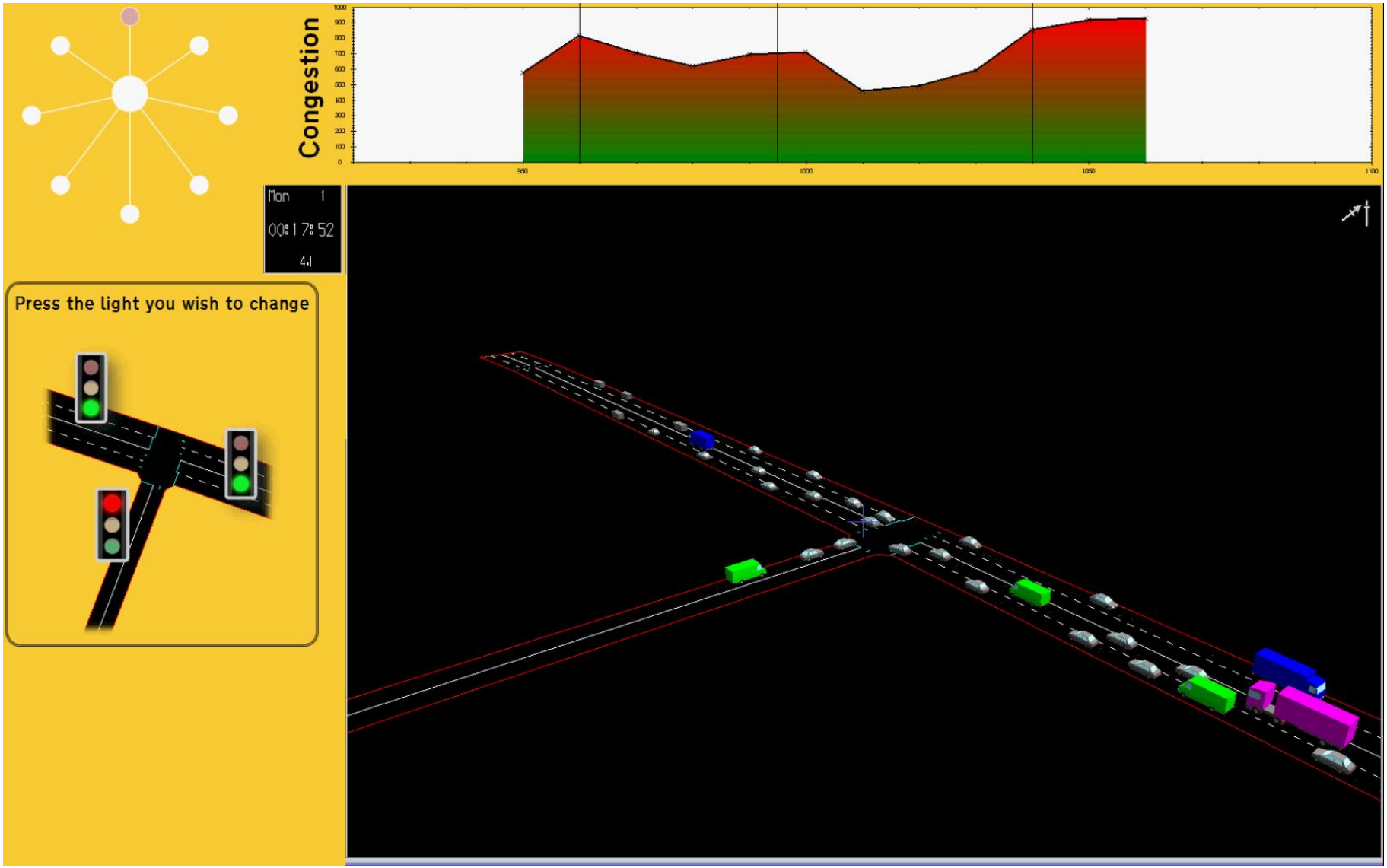
Big crowds . . .


Junction Control
Highway Control
UNIVERSITY OF
Southampton

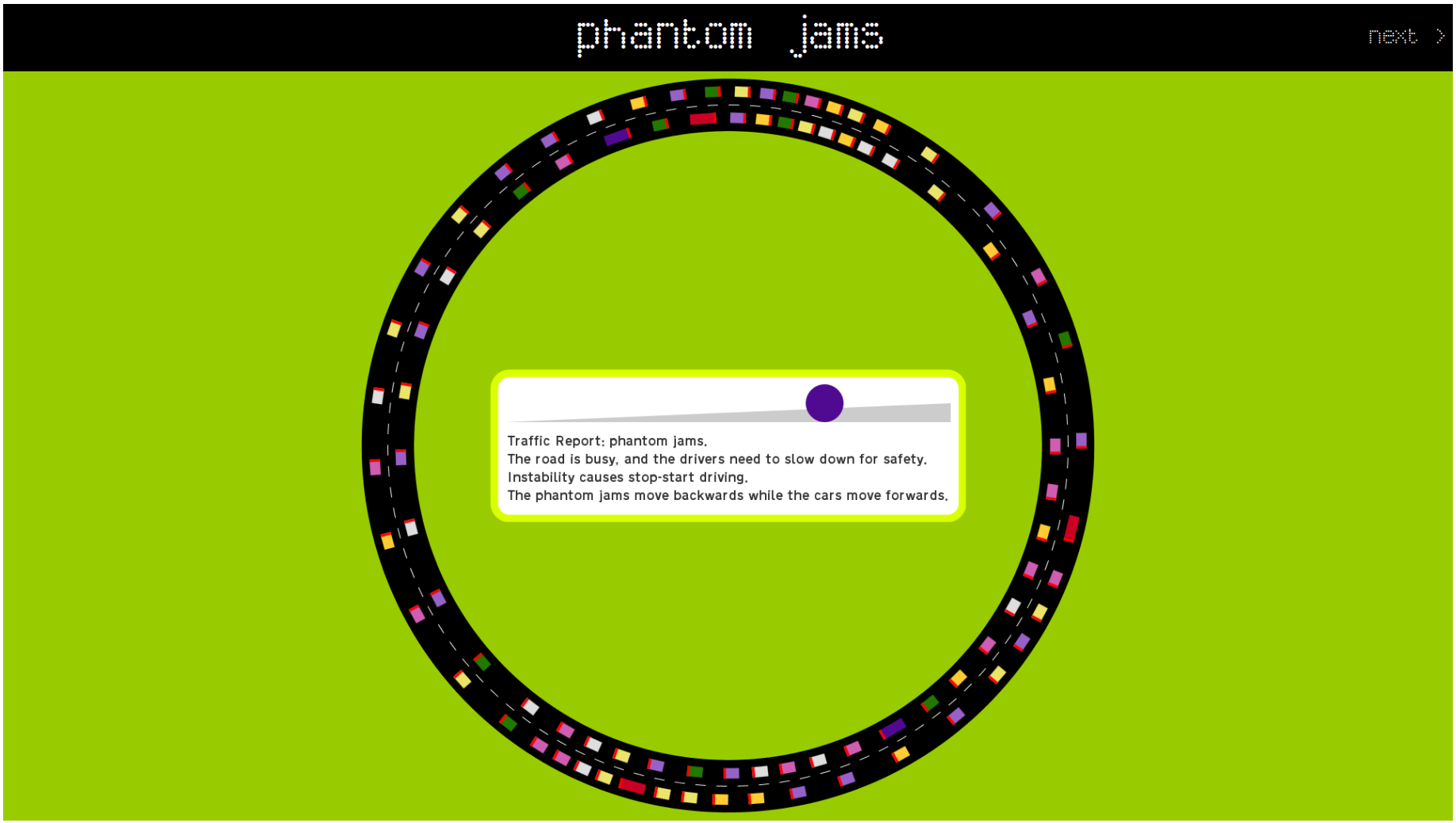
A little bit of lobbying . . .

Small kids having fun on the Scalextric

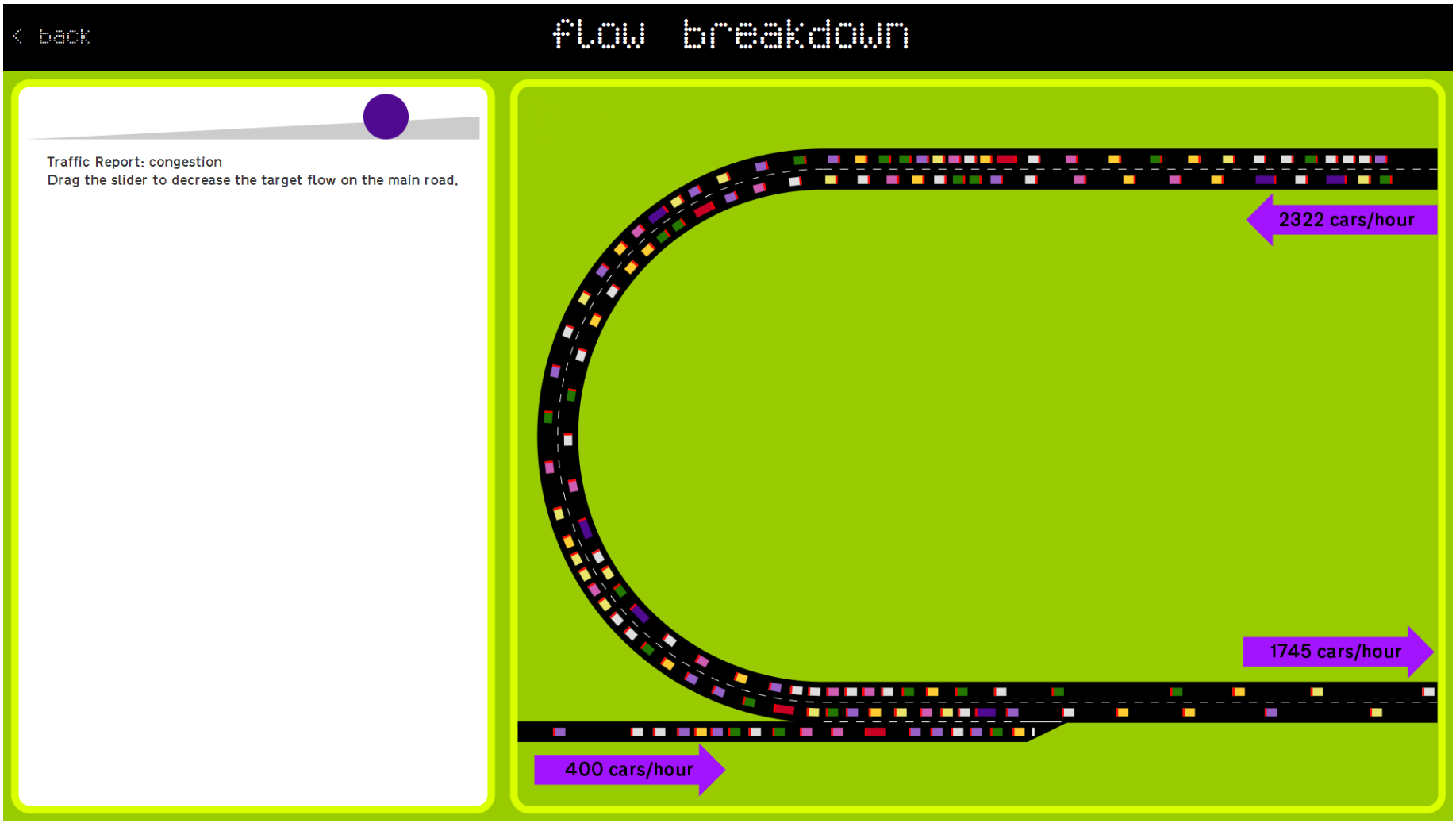
Traffic control game



Highway traffic game (I)



Highway traffic game (II)



How to teach? Especially traffic flow theory? A personal point of view

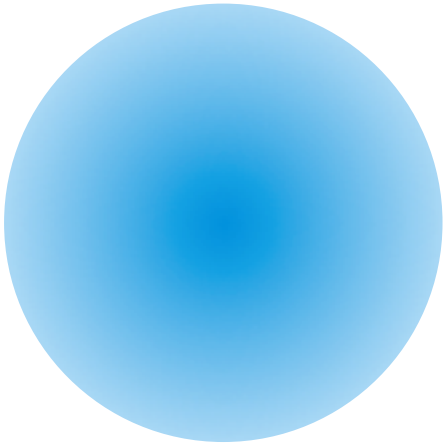
January 2012, TRB, Traffic Flow and Characteristics Committee

Christine Buisson

What is the situation? (1/2)

Students
(specially in France)
think that:

- Any question has an answer
- The answer is unique and rationally arguable
- The teacher (or at least someone else) knows the answer.



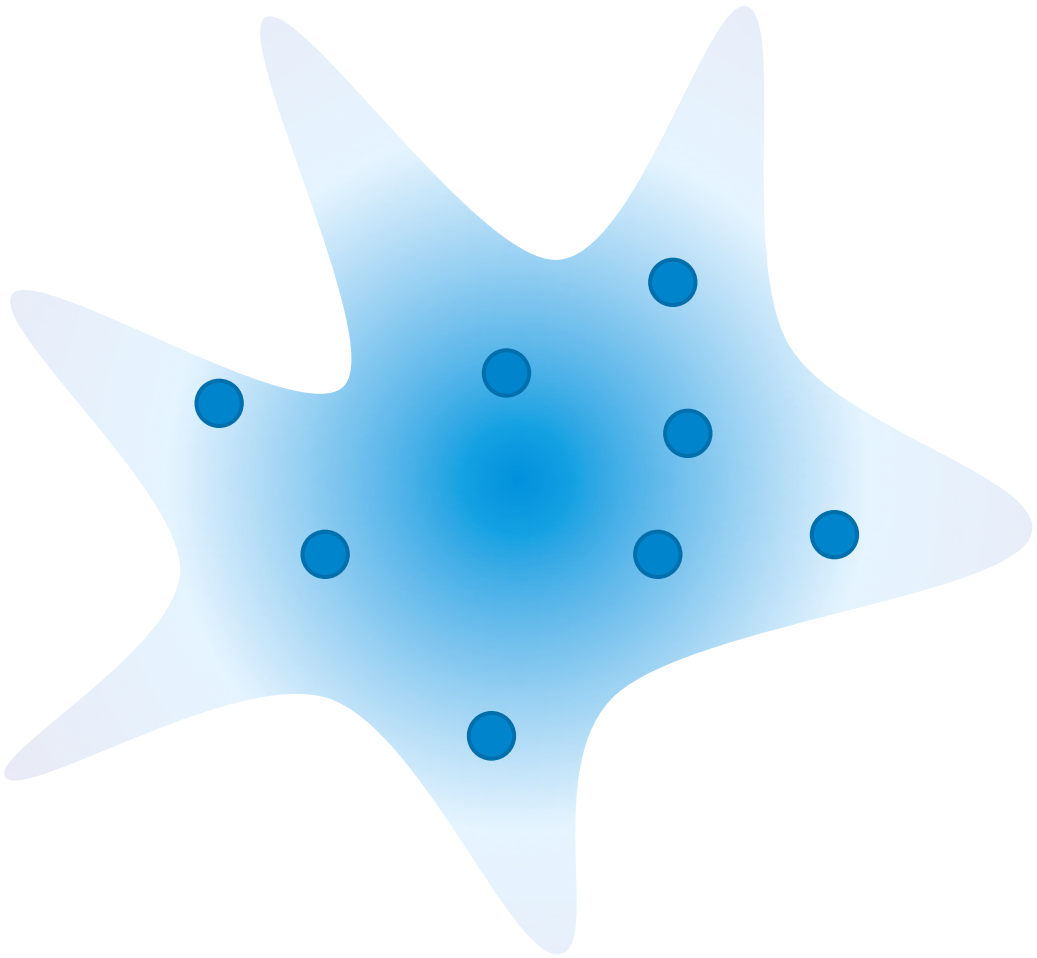
What is the situation? (2/2)

Usually in real professional life,

- The question is not corresponding exactly to the problem,

  it is necessary to reformulate it,
- The answer is not unique, or may not exist,
- The choice of the answer is subjectively made,
- The arguments for the choice are not all quantified.
- If you give a rapid answer to a unclear question, the solution may create catastrophes.

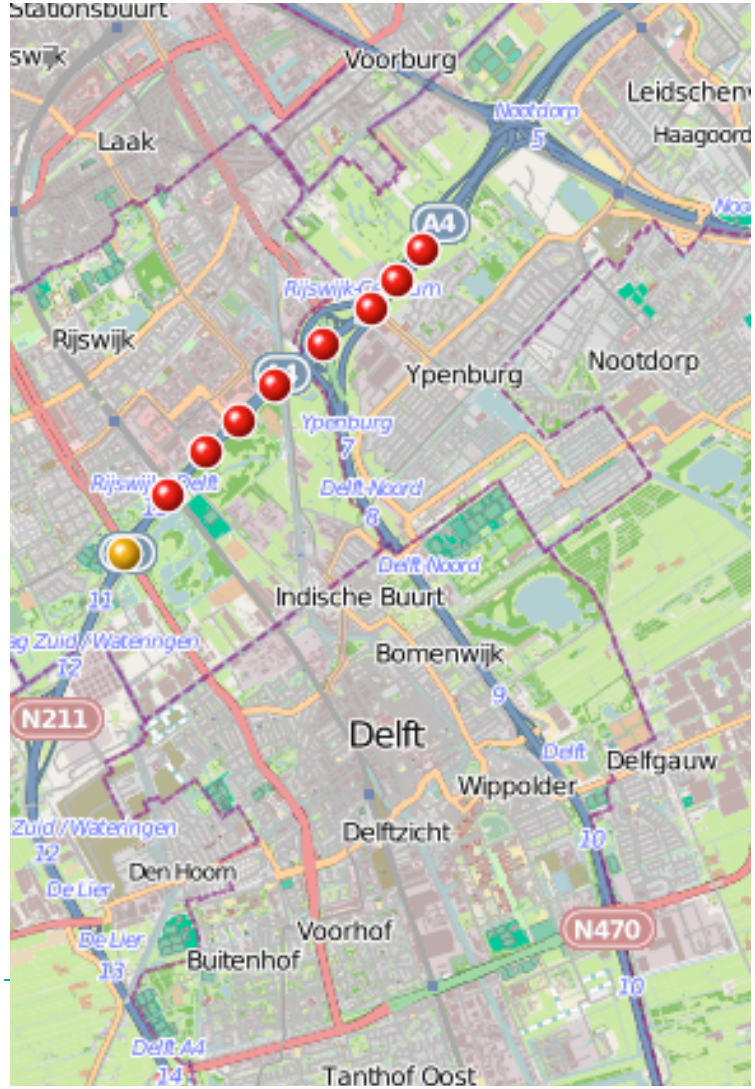
Problems are usually not well defined



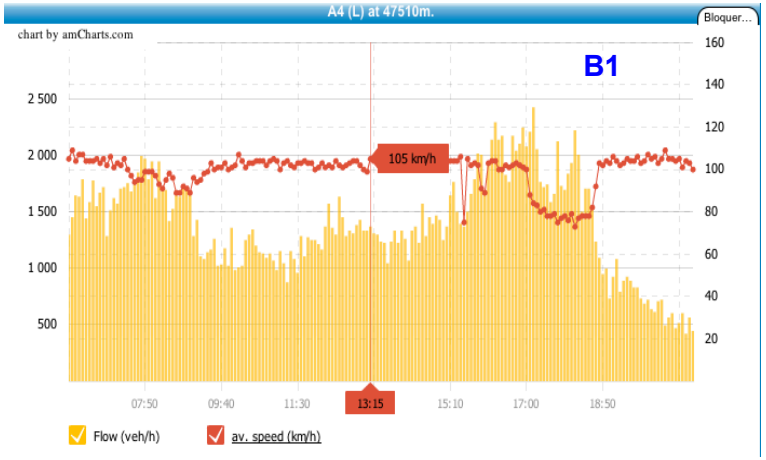
- But there is inside some real parts of knowledge:
  - Q/K/V
  - Fundamental diagram
  - Congestion propagation
  - Cumulative vehicle curves
  - LWR model
  - Use of simulation
  - …
- And its our responsibility to allow our students to use them as a starting tool box

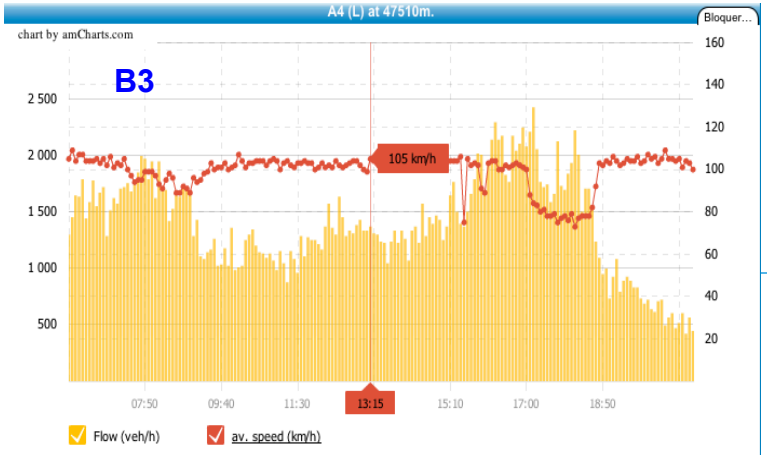
An example of teaching a knowledge (thanks to Céline Parzani)

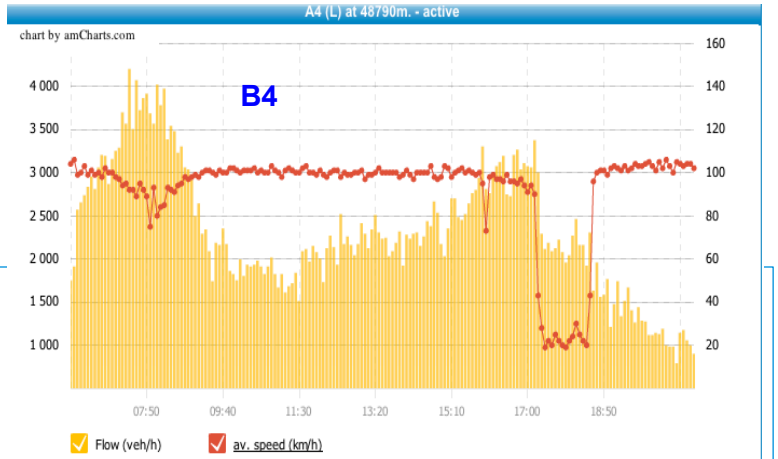
- An exercise for undergraduate students about
  - the congestion propagation and
  - the use of loop detectors data
- Use of regiolab data (offered by TU Delft – thank you)
  - Loop data from A4 NL
  - December 19 2011 6:00-21:00

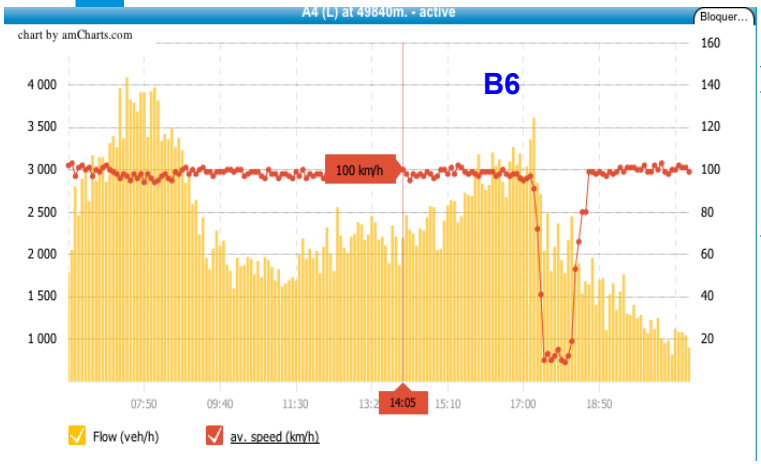


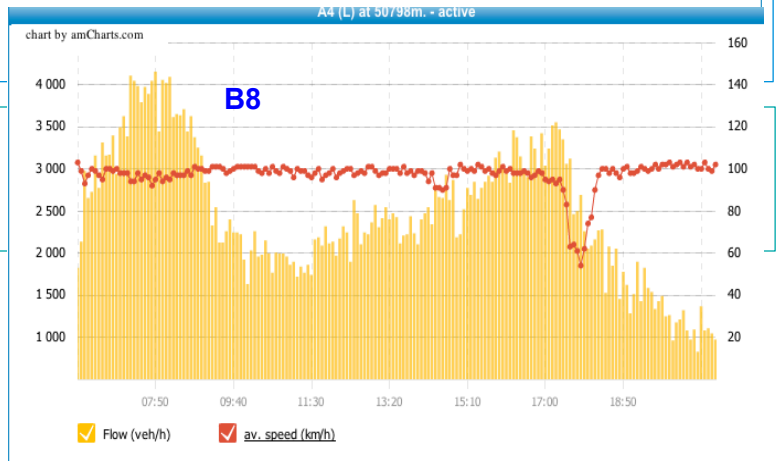

B1
B3
B4
B6
B8
Rijswijk
A4


A4 (L) at 47510m.
chart by amCharts.com
B1
105 km/h
Flow (veh/h)
av. speed (km/h)


A4 (L) at 47510m.
chart by amCharts.com
B3
105 km/h
Flow (veh/h)
av. speed (km/h)


A4 (L) at 48790m. - active
chart by amCharts.com
B4
Flow (veh/h)
av. speed (km/h)


A4 (L) at 49840m. - active
chart by amCharts.com
B6
100 km/h
Flow (veh/h)
av. speed (km/h)


A4 (L) at 50798m. - active
chart by amCharts.com
B8
Flow (veh/h)
av. speed (km/h)

Two main messages and two questions

- We have to teach
  - the complexity
  - some precise knowledge
- We may share exercises and syllabus
  for the basic knowledge
  because we all have this in common

- Where to post the sharable teaching resources?
- How to organize this and who will?

The 91st TRB AHB 45 Committee Meeting

TRAFFIC FLOW WEBINARS

Jorge A. Laval

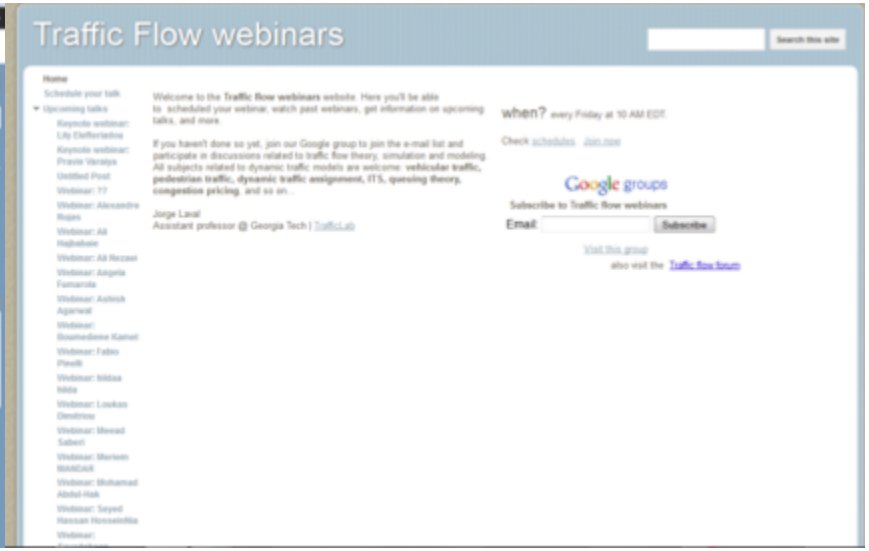
Danjue Chen

Introduction

- Established in May 2010 by Dr. Jorge A. Laval.
- To share latest research & practice.
- 307 members from over 20 countries.
- A traffic flow webinar group

  http://groups.google.com/group/traffic-flow-webinars?hl=en
- Traffic flow webinar website

  http://www.webinars.jltraffic.com/

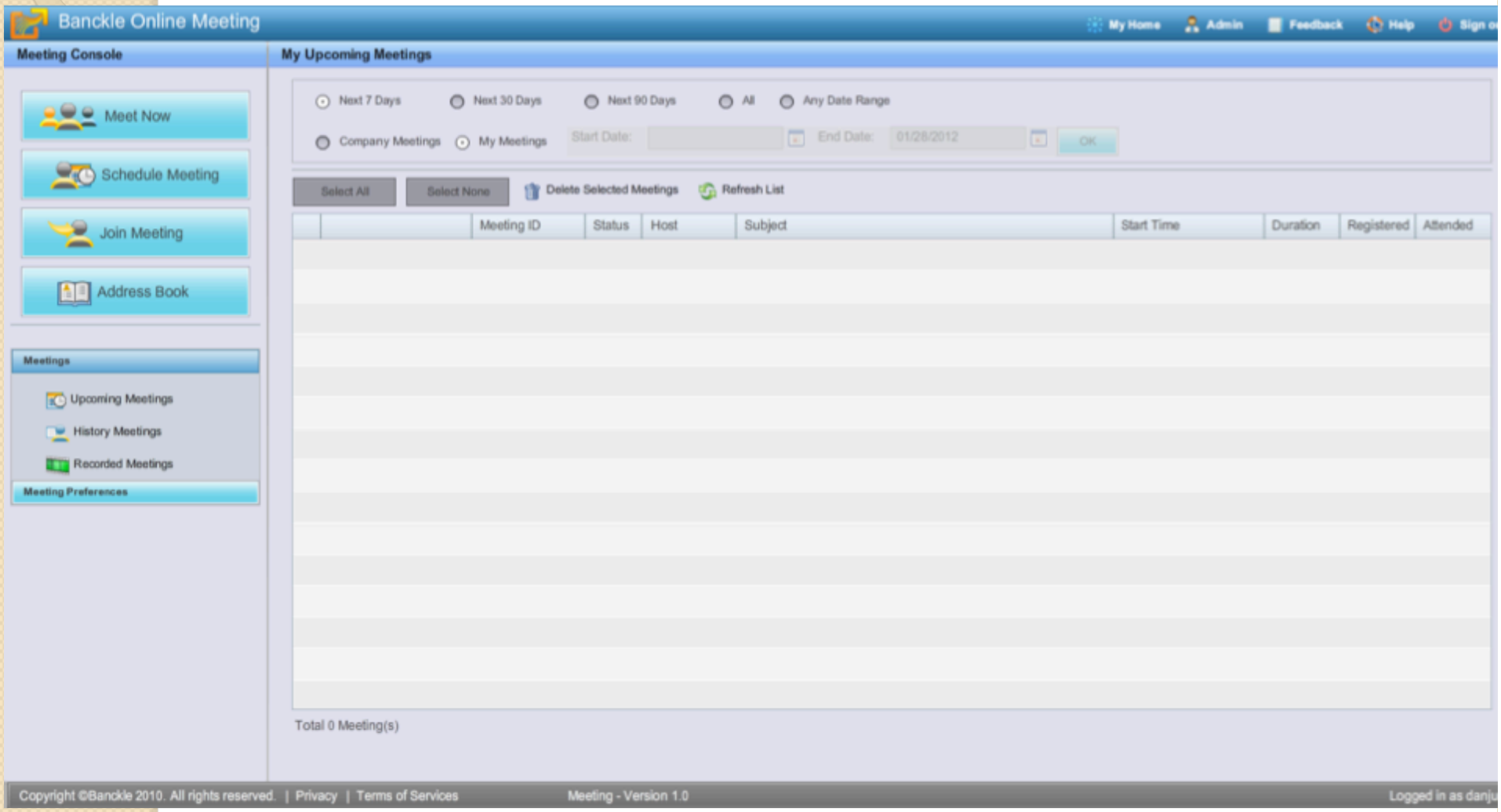


Introduction

- When?
  - 11am (ET) every Friday.
- Who will present?
  - scholars, students, consultants, etc.
- Audience?
  - scholars, students, consultants, engineers, government officer(?), etc.
- Where?
  - http://banckle.com/

How it works?

http://banckle.com/



How it works?

Audience:

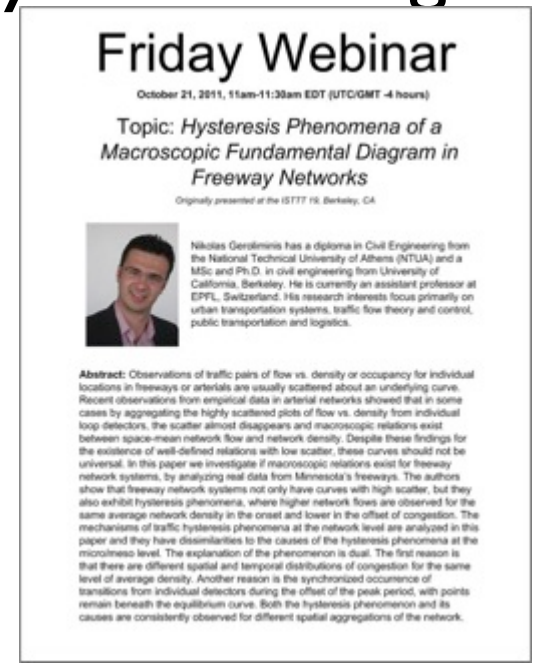
- Subscribe to the webinar group.
- Join the webinar through webinar link.
- Interact with the presenter. Have fun!

Presenter:

- Schedule a webinar.
- Prepare materials (slides or pdf file).
- Join the webinar.
- Present, interact with audience.

Activities

- Regular invited webinars
- TRB AHB 45 webinars
- 19^{sth} ISTTT webinars
- Traffic flow mid-year meeting live webinars



Friday Webinar

October 21, 2011, 11am-11:30am EDT (UTC/GMT -4 hours)

Topic: *Hysteresis Phenomena of a Macroscopic Fundamental Diagram in Freeway Networks*

Originally presented at the ISTTT 19, Berkeley, CA

Nikolas Geroliminis has a diploma in Civil Engineering from the National Technical University of Athens (NTUA) and a MSc and Ph.D. in civil engineering from University of California, Berkeley. He is currently an assistant professor at EPFL, Switzerland. His research interests focus primarily on urban transportation systems, traffic flow theory and control, public transportation and logistics.

Abstract: Observations of traffic pairs of flow vs. density or occupancy for individual locations in freeways or arterials are usually scattered about an underlying curve. Recent observations from empirical data in arterial networks showed that in some cases by aggregating the highly scattered plots of flow vs. density from individual loop detectors, the scatter almost disappears and macroscopic relations exist between space-mean network flow and network density. Despite these findings for the existence of well-defined relations with low scatter, these curves should not be universal. In this paper we investigate if macroscopic relations exist for freeway network systems, by analyzing real data from Minnesota's freeways. The authors show that freeway network systems not only have curves with high scatter, but they also exhibit hysteresis phenomena, where higher network flows are observed for the same average network density in the onset and lower in the offset of congestion. The mechanisms of traffic hysteresis phenomena at the network level are analyzed in this paper and they have dissimilarities to the causes of the hysteresis phenomena at the microlmeso level. The explanation of the phenomenon is dual. The first reason is that there are different spatial and temporal distributions of congestion for the same level of average density. Another reason is the synchronized occurrence of transitions from individual detectors during the offset of the peak period, with points remain beneath the equilibrium curve. Both the hysteresis phenomenon and its causes are consistently observed for different spatial aggregations of the network.

Activities

Have completed over30 webinars!

To be improved

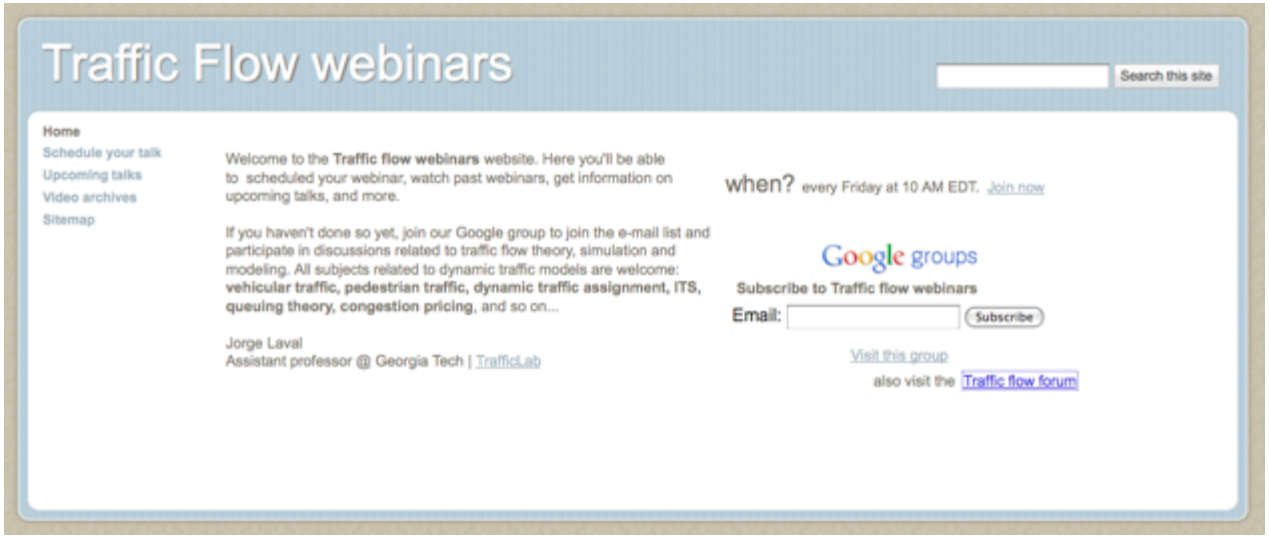
- Time: AM? PM? Friday?
- Access
  - webinar subscription
  - Facebook
  - Twitter?
- Feedback
- Interaction
- More diverse topics? Mixed traffic?

Plan in 2012

- 19th ISTTT
- Mid-year meeting (live webinar?)
- TRB AHB 45
- Special series?

Advice ?

Webinars



GA Tech Traffic Flow Webinars

www.webinars.jltraffic.com/

25 Archives

http://www.webinars.jltraffic.com/video-archives

Liaison With Other Committees

International Liaison

- NEARCTIS — W. Daamen
- MULTITUDE — V. Punzo
- MOCoPo Website — C. Buisson

Last year's results and further contributions

TRB 2012, Washington

Winnie Daamen, Christine Buisson

Last year's results

Summer school at TU Delft 2-4 May 2011

- Traffic modeling for traffic management and cooperative systems
- organized together with Multitude
- 44 participants from fifteen institutes in nine different countries

Mobility exchanges

Contribution to ITS workshop on 'Training in ITS' (08/06/2011)

Workshop for knowledge exchange in Lyon (09/06/2011)

Harmonised research agenda for cooperative ICT in transport (31/12/2011)

- Specification of future Research Themes (RT)

Distribution of survey to identify contribution of NEARCTIS for partners and associate partners

Outlook for 2012

Specification and evaluation approaches for possible case studies (30/04/2012)

Specification of existing or synthetic Application Sites (AS)

Possible scenarios of NEARCTIS perpetuation (30/06/2012)

Analysis of the realizations Nearctis has to conduct in the future

Round table in London 29 March to prioritise the research agenda

Prioritisation of the research agenda

Workshop directly after ITS World in Vienna

Special call for papers TRB2013 (ITS & TFT)

Summer school in Ispra, Italy 6-8 June

Organised together with Multitude

Plan for perpetuation of NEARCTIS

Research agenda

D14 Research Themes

1 Increased use of mobile communication

1.1 Data capture

1.2 Improved traveller information

2 Increased data availability

2.1 Data quality

2.2 Data collection and fusion

2.3 Data processing

3 Modelling

3.1 Real time estimation of traffic conditions

3.2 Improving estimation of travel time and other performance measures

3.3 Dynamic traffic assignment

4 Communication between autonomous systems

4.1 Cooperative strategies

5 Understanding interactions at various levels

5.1 Intelligent vehicles

5.2 Multi-scale traffic control

5.3 Understanding feedback loops

6 Traffic management

6.1 Incident detection

6.2 Pedestrians in multi-modal environment

6.3 Active traffic management

6.4 Urban traffic control

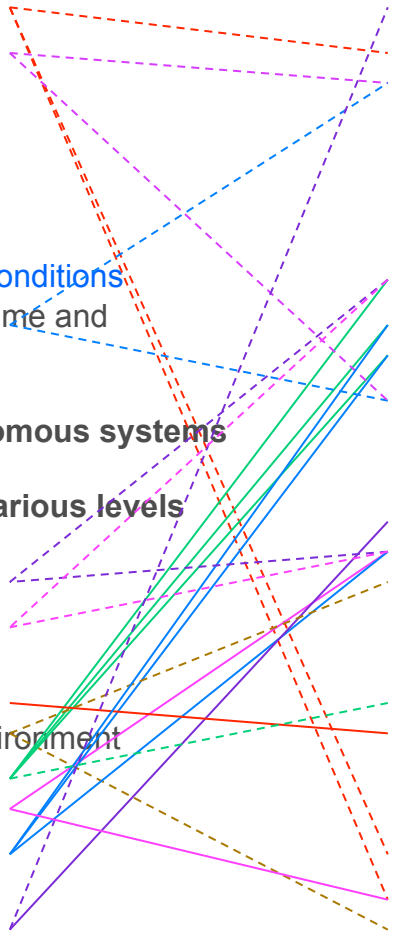
6.5 Adaptive optimisation

6.6 Safety on rural roads

6.7 Differential road pricing

7 Support for policy developers and decision makers

7.1 ???



D15 Application Sites

Task 2.1: Global services, led by TUD

1. A case study on shadow toll systems and road pricing
2. A case study on fleet management and telematics
3. A case study on door-to-door travel support
4 A case study on individual cooperative systems
5. A case study on coordination on network level

Task 2.2 Large Highway Corridors, led by TUC

1. Coordinated ramp metering (TUC/IFSTTAR/EPFL)
2. Mainstream traffic flow control (TUC)
3. Variable speed limits (TU Delft)
4. Route guidance and driver information systems (DLR)

Task 2.3: Dense urban networks, led by ICL

1. Differential road user charging in dense urban networks (ICL)
2. Advanced urban signal control for saturated networks (TUC)
3. Some more case studies

Task 2.4: Local main road networks, led by IFSTTAR

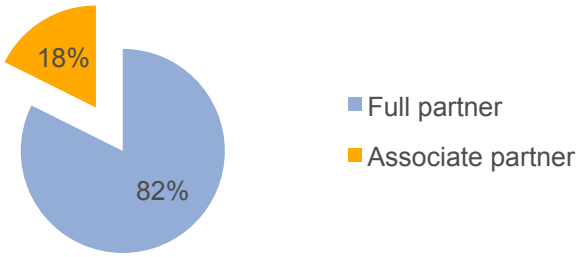
1. Dynamic use of the hard shoulder on the A4-A86 (IFSTTAR)
2. C2X-based sign control adaptation for dynamic incident rerouting (DLR/EPFL)

Task 2.5: Shared multi-modal/multi-user networks, led by UoS

1. AVL based bus priority at traffic signals in London (UoS)
2. Integrated bus priority measures (UoS)
3. Advanced road crossing facilities for pedestrians (UoS)

Questionnaire to define the future actions plan

Questionnaire: 34 answers



What do you think as the main contributions of NEARCTIS until now?

PhD Program	63%
Mobility program	64%
Access to sharable resources	55%
Summer school	72%
Setting a common research agenda	66%
Promoting your research agenda towards the institutions (especially European ones)	52%

COST Action TU0903
Methods and tools for supporting the Use, caLibration and validaTIon of Traffic simUlations moDEls

MULTITUDE
www.multitude-project.eu

Motivation

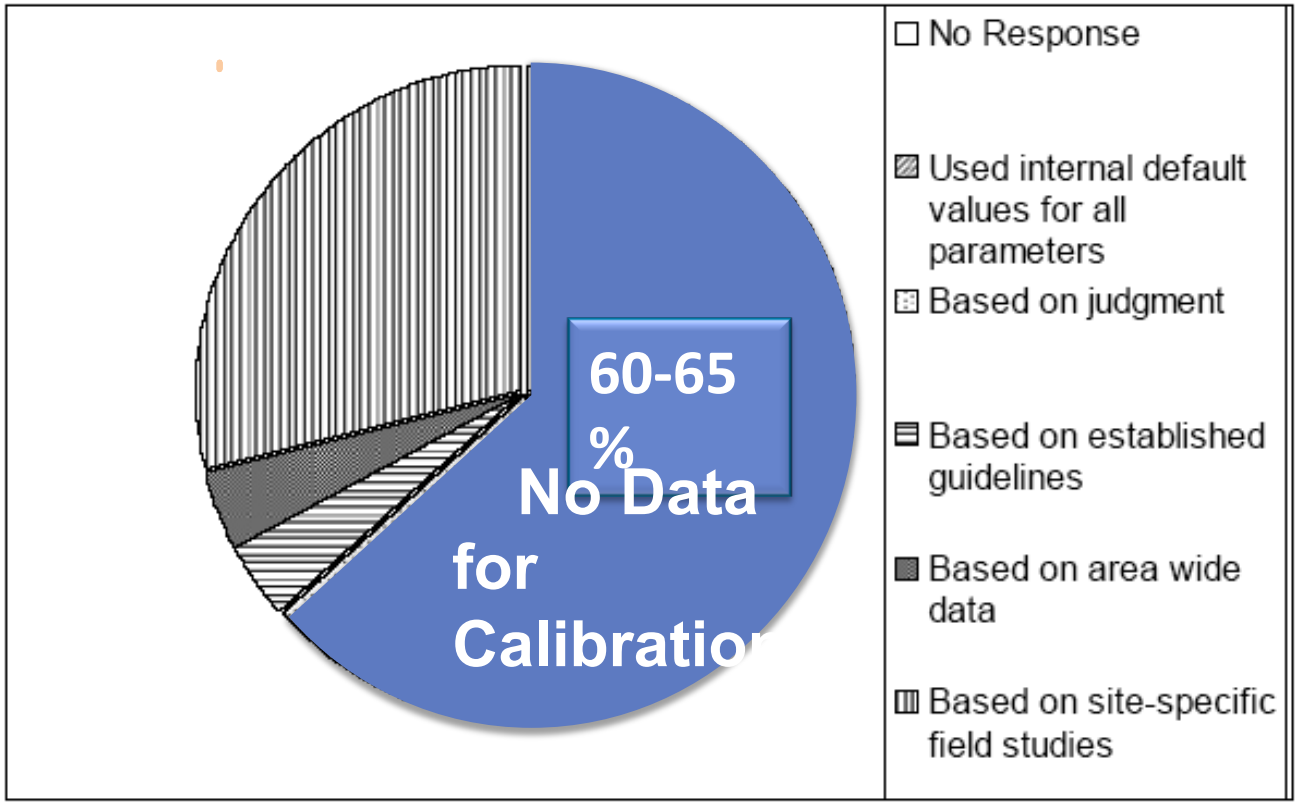
- Traffic simulation now widespread
- How much can/should we trust our results and conclusions ?
  - **the same simulation study carried out by different people can give different results**
- Trustworthiness of the results, depends on the ability of users
- Correct use is a difficult task even for experts

State of the Art

"If you have used micro simulation tools, what calibration and/or validation procedures did you apply?"

"Guidance for the Use of Alternative Traffic Analysis Tools in Highway Capacity Analyses"

National Cooperative Highway Research Program (NCHRP 3-85), TRB, 2007.



What is starting to happen...

8 » OPINION

COMMENT

Manchester Evening News

M56 misery could have been avoided

READERS who were driven to distraction by so-called improvements on the M56 through Cheshire can today deliver a resounding chorus of "I told you so" to the Highways Agency.

The Government department responsible for maintaining and planning motorways has finally admitted a serious error in reducing the Manchester-bound carriageway from three lanes to two in order to increase traffic flow.

Not only did the unnecessary work lead to increased traffic delays while the cones were in place, but traffic flow was far worse after the work had been completed. Worse still, the ill-conceived and badly executed exercise has seen bureaucrats squander £5.3m of public money.

And all at a time when clogged roads and spiralling fuel costs have already caused enough misery for motorists.

We now understand that this wasteful disaster resulted from a computerised traffic modelling program which failed to take into account the random way in which road users would react to the changes on the carriageway.

Indeed, part of the problem stemmed from the fact that some drivers were leaving it late to negotiate before [illegible] which was overlooked by the computer. Human intervention could have saved the frayed tempers of countless drivers, as well as a lot of cash.

This was a case where the computer said "yes" when the answer should have been "no".

We now trust that the Highways Agency will be more willing to perform a U-turn should our readers again voice concerns about an unsuitable road scheme.

"We now understand that this wasteful disaster resulted from a computerised traffic modelling program which failed to take into account the random way in which road users would react to the changes on the carriageway."

6 » NEWS

After £1.5m is spent on M56, it will take £3.8m to put it right . .

■ Lane 'improvements' made things worse

■ We got it wrong, admit highway chiefs

DEAN KIRBY

HIGHWAYS bosses have admitted that a £1.5m scheme to improve traffic flow on the M56 actually made things worse.

And now they are having to spend more than double that amount – £3.8m – on putting things right.

They admitted that a computer program 'got it wrong' and had 'failed to account for human behaviour'.

Motorists put up with chaos and roadworks which cut the Manchester-bound carriageway to two lanes at Junction 7 at Bowdon, near Altrincham, last year . . . and now face another 22 weeks of cones as the junction is altered again.

The Highways Agency is spending the extra £3.8m to reinstate the third lane after their traffic modelling program 'got it wrong'.

Drivers had told the M.E.N. the 'improvements' were causing daily queues stretching back towards the motorway's junction with the M6.

Now the Highways Agency says it is revising the junction's layout to 'ease congestion'. It said in a statement: "The junction was altered last September with the aim of improving the flow of traffic.

"But while the scheme has helped vehicles merge more freely from the A556, there have been increased delays on the main carriageway.

"To combat this problem the Highways Agency is now planning to reinstate three lanes on the main carriageway and adapt the hard shoulder to provide a long auxiliary lane for traffic joining the motorway from the A560."

The slip road leading on to the M56 at Junction 7 used to merge from two lanes into one as it reached the Manchester-bound carriageway.

22 more weeks of roadworks

Work to construct an extra filter lane for motorway access was done last year but traffic on the motorway was reduced to two lanes and drivers were soon fed up after the scheme was completed in September.

Geoff Robbins, from Winsford, said: "The changes to the junction layout are causing chaos for commuters.

"The enormous increase in congestion is adding more than 30 minutes to a journey that used to take an hour."

Alwyn Burrage, from Chester, a regular commuter to Manchester, said: "I've generally had a trouble-free journey of about an hour each way. But since the changes, it has become a nightmare.

"Traffic was fine until this disaster of a decision. It's morning mayhem and accidents will almost certainly happen."

Work to modify the junction will start on August 26 for about 22 weeks.

Most of the work will be done at night to avoid further disruption.

Neil Symmons, from the Highways Agency, said: "We have monitored and evaluated the scheme and listened to drivers, which is why we are embarking on this new work.

"We understand the frustration of motorists using this route over the last few months and we appreciate not only their feedback, but also their patience during the preparation of the new scheme."

He added: "Although it's not possible to eradicate delays entirely, the changes we intend to make should improve the situation significantly."

Signs will be put up advising motorists of closures, diversions and other restrictions. More information will be available at www.highways.gov.uk

» Comment – Page 8

The Parable of the Blind Leading the Blind
BRUEGEL, Pieter the Elder,

Museo Nazionale di Capodimonte, Napoli

The Purpose of the COST Action

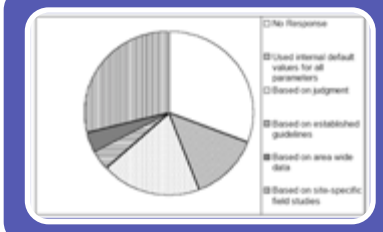
- Focus Research issues, bring together existing strands of work & activities
- 'The sum is greater than the parts'
- 2-3 Working Meetings per year + Annual meeting
  - 2011: Naples, **Stockholm**, Ispra.
  - 2012: London, **Riga** +...
- Training school (early stage researchers and practitioners) with NEARCTIS:
  - Spring 2011, Delft,
  - Summer 2012 @ JRC + 2013?

1. Review of traffic simulation practice and research

Hoogendoorn, Daamen & Buisson

TU Delft
Technische Universiteit Delft

ENTPE



Task 1.1. Survey of the usage of traffic simulation tools - **FINISHED**

Task 1.2. Review of traffic data collection and estimation techniques – **FINAL STAGES**

Task 1.3. Review of methodologies for traffic model estimation, calibration and validation – **FINAL STAGES**

1.1 State of the Art + Survey of Simulation Tools

- State of the Art Modelling report – COMING SOON.
- 'Snapshot' of how we work, what we work on, what we understand, what we do.
  - Web survey, Q4 2010, 215 responses
  - 2/3 use 'the big 3'
  - Warm up time, number of runs, types of data etc..
- 63% found NOT to be performing calibration, or were doing so intuitively, without using guidelines.
- Paper 12-2606 Session 807, Thursday
  - Possible re-launch to (re)investigate key questions.

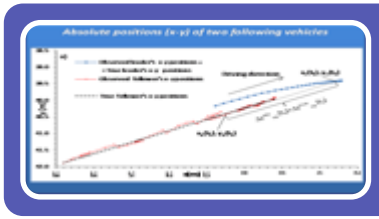
2. Highway modelling

Ciuffo, Farah & Wagner

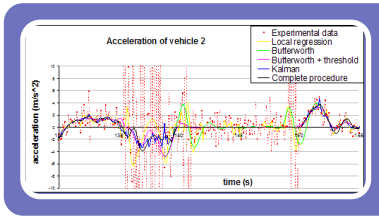
EUROPEAN COMMISSION
DIRECTORATE-GENERAL
Joint Research Centre

KTH VETENSKAP OCH KONST

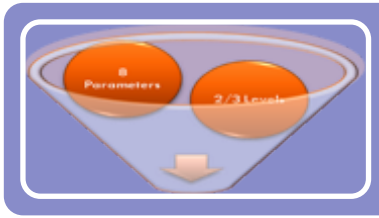
DLR



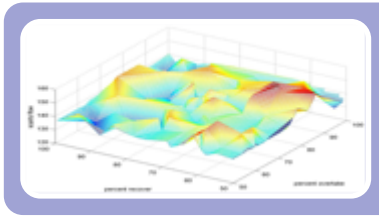
Task 2.1. Exchanging and sharing advanced traffic datasets



Task 2.2. Defining contents, quality and estimation techniques for advanced traffic datasets



Task 2.3. Understanding the role and impact of parameters on model outputs



Task 2.4. Developing techniques for highway model estimation and validation

Sharing and Exchanging Data Sets

- Prepare data directory – summary of data useful for modelling. Projects with:

- **USEFUL AND AVAILABLE DATA**
  - EuroFOT, 100-Car naturalistic driving study, sim^{TD}

- **POTENTIALLY USEFUL DATA**
  - ICC FOT, DaCoTa, Pay As You Speed, Aktiv, CNDS, SHRP2

- **USEFUL DATA BUT NOT AVAILABLE**
  - TeleFOT, PROLOGUE, SeMiFOT

SHRP2

TeleFOT
Field Operational Tests of Aftermarket and Nomadic Devices in Vehicles

PROLOGUE

Sensitivity Analysis

- **Global sensitivity analysis -** family of theories and techniques aimed at defining how "*the uncertainty in the model outputs can be apportioned to the different sources of uncertainties in the model inputs*"
- Application of may provide considerable benefits for **models comprehension and also for their calibration**.
- May play an important role to ***uncover technical errors*** in the model, to ***identify critical regions*** in the space of the inputs, to ***simplify models*** etc.

JRC EUROPEAN COMMISSION

ETH

DLR

Aimsun

IFSTTAR

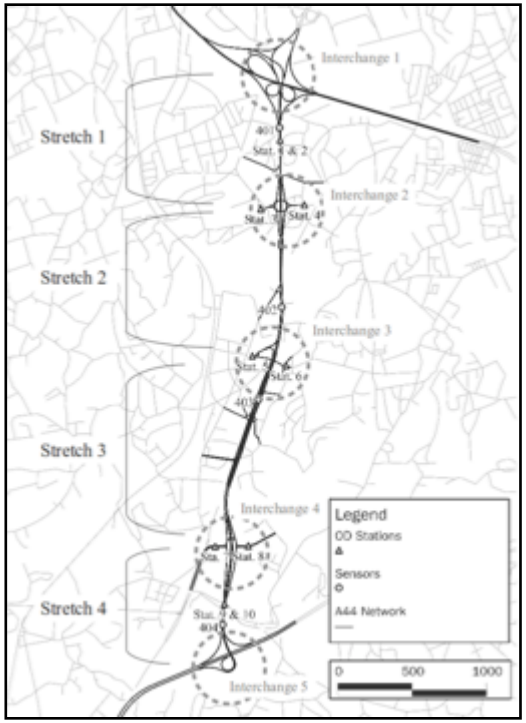
Summary of the studies (1)

Models involved

- 3 microscopic models (MITSIM, VISSIM, AIMSUN)
- Several car-following models (IDM, Gipps, etc.)
- 1 mesoscopic model (AIMSUN meso)
- 1 macroscopic model (SYMUVIA)

Simulated scenarios

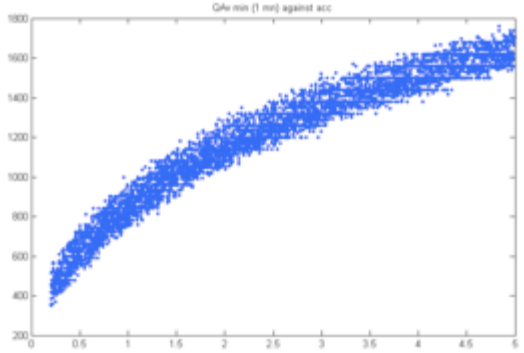
- 1 urban scenario (City of Zurich)
- 1 mixed scenario (City of Genova)
- 1 freeway scenario (A44 Freeway in Portugal)
- 5 types of toy networks (roundabout, signalized intersection, give-way intersection, on-ramp, weaving section)



Summary of the studies (2)

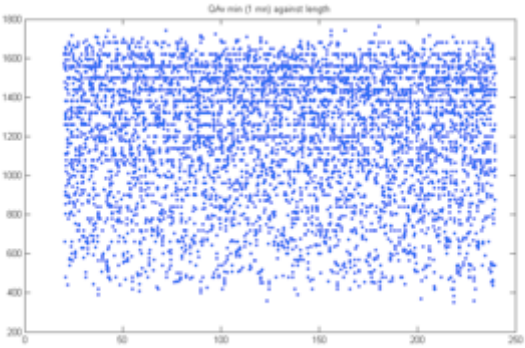
Inputs involved

- model parameters (for most of the cases)
- traffic demand (for 1 case study and foreseen on other case studies)



Sensitivity analysis approaches

- Variance based approach (most of the cases)
- Meta-modelling based approach (1 scenario)
- Elementary effect approach (for 1 scenario)
- Derivative-based approach (in 1 scenario)



Aim of the studies

- Factor fixing (model simplification)
- Factor prioritization (model analysis)

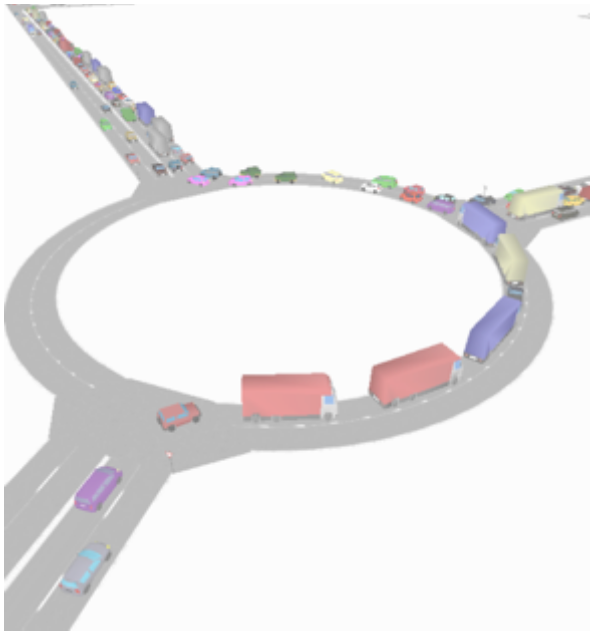
Calibration of traffic simulation models

Exploratory study to compare the different optimization settings applied so far in the literature for the calibration of microscopic traffic flow models

2 case studies:

-calibration of a traffic simulation model (AIMSUN) against aggregate measure in a freeway context

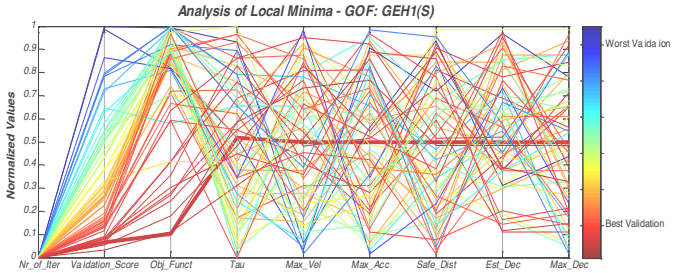
-calibration of a car-following model (the Gipps' model) against trajectory data in both an urban and a highway scenario



Objectives of the studies

Main objective

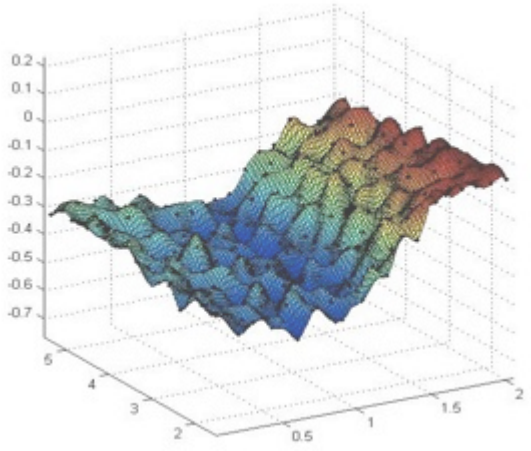
Understanding if the common settings applied so far in the field literature are really able to provide reliable calibration results



Further objectives

Understanding the impact on calibration results of different

- Measures of performance
- Measures of goodness of fit
- Optimization algorithms

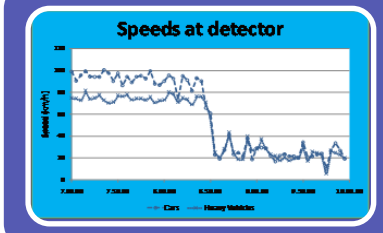


3. Network modelling

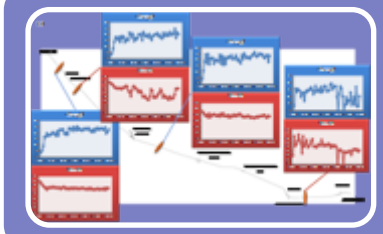
Barcelo, Liu & Antoniou

UPC

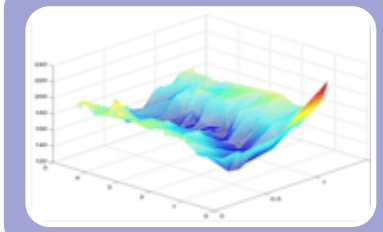
UNIVERSITY OF LEEDS



Task 3.1. Exchanging and sharing standard traffic datasets



Task 3.2. Defining contents, quality and data reduction techniques for standard traffic datasets



Task 3.3. Developing techniques for network model calibration, validation and O/D matrix refining

Benchmarking OD estimation and prediction approaches

- Develop a **common framework** for the benchmarking of OD estimation and prediction algorithms
  - Matlab based script and interfaces to AIMSUN
- OD estimation algorithms
  - Non-linear Kalman filter extensions
  - LSQR, Simultaneous GLS, SPSA variants …
- Will be tested on common scenarios

Scenarios setup

- OD interval
- Simulation duration
- Algorithm (previous slide)
- Demand profiles
- Network
- Coverage of the network by sensors
- Quality of historical information
- Quality of surveillance data
- MOEs/goodness of fitness measures

Planning and next steps

- 13 January 2012: experimental design finalized
- End January 2012: interfaces with AIMSUN operationalized in script
- February-May 2012: execution of simulation experiments
- May 2012: Meeting in London / preliminary results presented / issues resolved
- June 2012: simulation results available

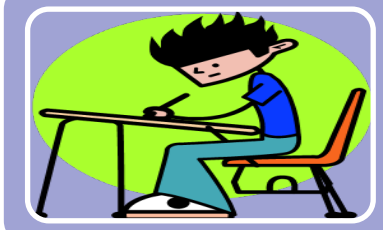
4. Synthesis, dissemination and training

Brackstone & Antoniou

inform observe model innovate

Task 4.1. Harmonizing approaches and outputs

Task 4.2. Guidelines and best practice manual for model calibration and validation – Concludes Spring 2013



Task 4.3. Training end users to the correct use of traffic simulation tools – Series of Training Schools

Guidelines

- Subgroup to examine existing guidelines, compile roadmap, undertake gap analysis
- Validation by Questionnaire
- Stakeholder workshops – Government + Consultants
  - UK (Feb.) + DE (Feb.) + NL (March) + FR
- End-user outreach and education
  - Summer 2012 onwards
  - Countries where simulation is not so well understood/regulated.

Summer School on "Assessment of ITS Solutions"

- Location: ***European Commission Joint Research Centre, Ispra, Italy***
- Period: **June 6-8, 2012**
- *Evaluation* of ITS measures, *core methodologies* for the quantification of the *impacts*, *multi-criteria analysis* and *uncertainty management*.
- Three *case studies*
- ***Practicum*** in the afternoons
- Sponsors: MULTITUDE, NEARCTIS, EC JRC - IET
- Organizers: Vincenzo Punzo (JRC), Christine Buisson (IFSTTAR), Winnie Daamen (TUDelft)
- Draft program at ***www.multitude-project.eu/its-school***

Questions?

- General + Summer School
  - Vincenzo Punzo
  - vincenzo.punzo@jrc.ec.europa.eu
- Surveys & Reviews
  - Winnie Daamen
  - W.daamen@tudelft.nl
- Data sets
  - Haneen Farah
  - Hanin.farah@abe.kth.se
- Sensitivity analysis
  - Biagio Ciuffo
  - biagio.ciuffo@jrc.ec.europa.eu
- Network Modelling
  - Jaume Barcelo
  - Jaume.barcelo@upc.edu
- OD Estimation
  - Costas Antoniou
  - Antoniou@central.ntua.gr
- Guidelines + Mailing list
  - Mark Brackstone
  - Mark.brackstone@iomi.eu

www.multitude-project.eu

MOCoPo

Measuring and mOdelling traffic COngestion and POllution

MOCoPo:
status of data collection tasks in January 2012

January 2012

MOCoPo team

MOCoPo: Some facts

- A project funded by the French Ministry of Transportation (350 k€)
- Dates:
  - Beginning: January 2011 End: December 2013
  - First year: Measurements Second and third years: Modeling enhancements
- 6 partners
  - IFSTTAR (Lyon, Paris, Nantes),
  - INRIA (Grenoble),
  - French Ministry of Transportation (Grenoble, Lyon, Angers)
  - Association of Pollution Measurement ASCOPARG (Grenoble),
  - CEREA (Paris)
  - ENTPE

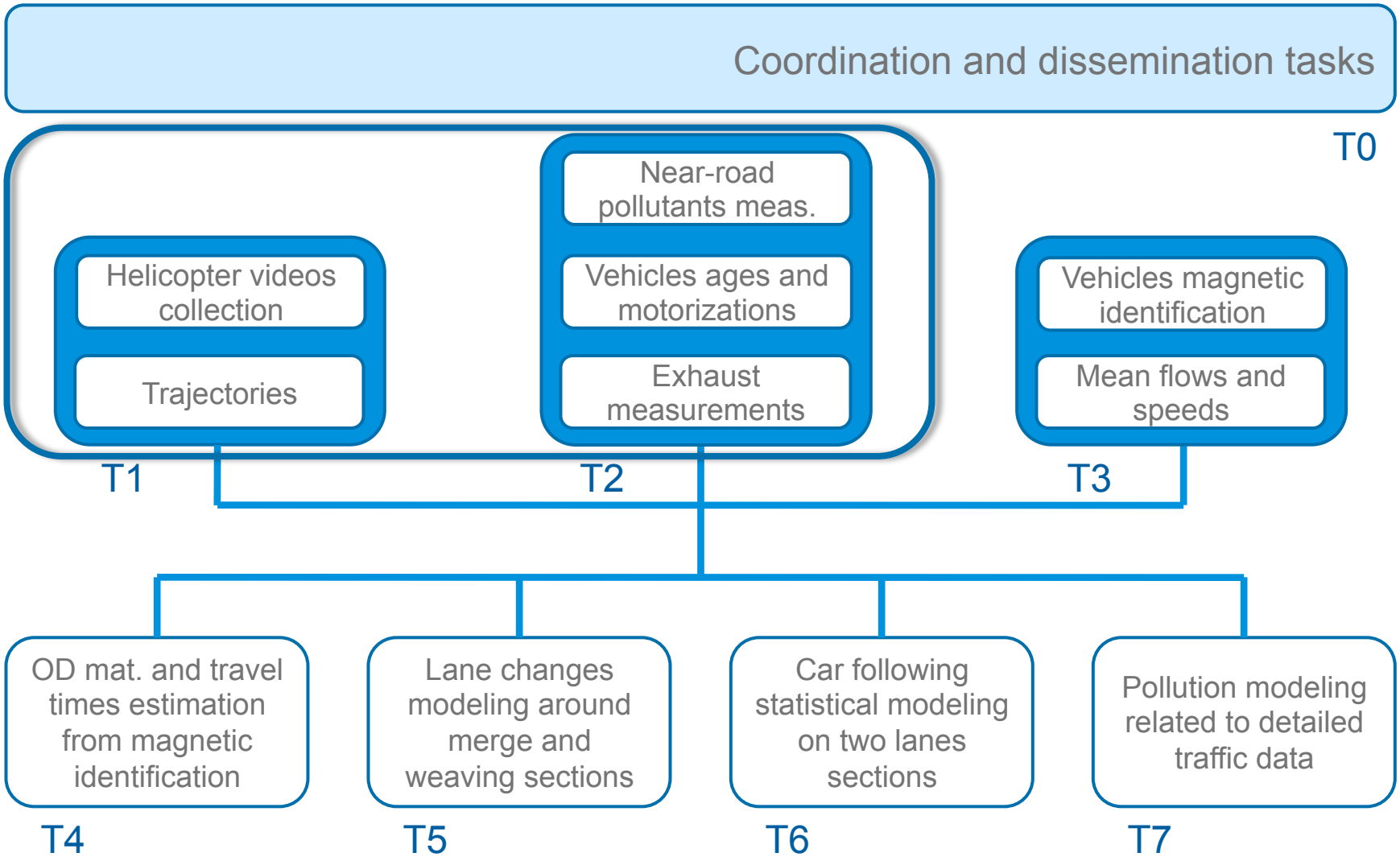
  and more than 30 individuals
- A join data collection project: PM-Drive devoted only to high precision pollution measurements leaded by Aurélie Charron (LTE-IFSTTAR) with the involvement of additional partners: LGGE (Grenoble), LCP (Marseille), LCM (Chambery)

MOCoPo: global objectives

- Collect data on a simple and congested highway
  - The RN87 in South of Grenoble about 10 km long;
  - A 2x2 lanes highway
  - Simultaneously collect
    - Trajectories on 3 zones
    - Pollutants along the road
    - On-road traffic data
  - Thus, allowing better modeling

mocopo.ifsttar.fr

Global organization



MOCoPo

Measuring and mOdelling traffic COngestion and POllution

Trajectories data collection

- Helicopter placed above a congested 2 lanes ring highway at 500 m height
- Monday to Friday **in 3 zones**
  - A merge
  - A standard section
  - A weaving section (2 entrances, 3 exits)

  HD image: 2500 pixels corresponding to 500 m

  High frequency photographs (more than 20 /s)
- Digitalization of trajectories with the help of the TU Delft code
- 2 lateral cameras allowing input and output detailed flow measurements
- **More than 7 hours** of trajectories will be made available to the community

Pollution measurements

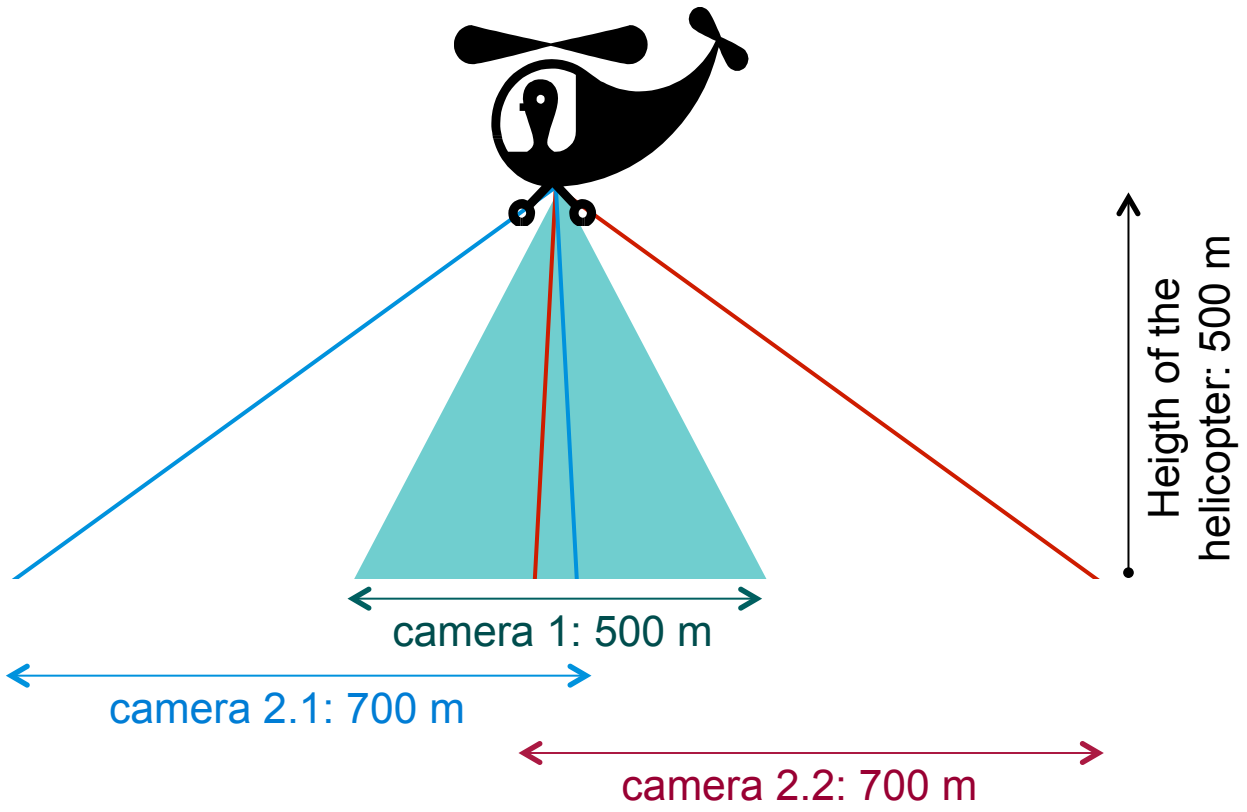
- 3 locations along the highway with **various congestion levels**
- 1 location inside the city to define the urban background
- 4 periods of two weeks during year 2011
  - Winter/ spring/ summer/ fall
- **Various pollutants**
  - NO/ NO_2/ PM10/ PM2.5/ CO/ SO/ O_3
  - Weather data: wind speed, temperature
- Data frequency of 15'

6' traffic data on 6 sites

- Mean flow, speed and occupancy rates

go to mocopo.ifsttar.fr and be kept informed

Three cameras for a complete measurement



- Camera 1
  - 2500*1000 pixels
  - More than 20 images/second
- Cameras 2.1 and 2.2
  - To determine upstream and downstream flows

Summary: **7 h 10** of potentially perfect data and 8 h 40 of analyzable data

	Zone 1 - merge 1h50 (2h40)		Zone 2 - standard section 1h30 (2h10)		Zone 3 - weaving section 3h50 (3h50)	
	duration	Remark/period	duration	Remark/period	duration	Remark/period
Mon. 12	15'	8:16 - 8:32			50'	16:12 - 17:02
Tues. 13	51'	No image of camera 2.1 downstream 7:29 - 8:21	40'	No image of camera 2.1 downstream 8:40 - 9:20		
Wed. 14	45'	Many clouds and rain; helicopter at 450 m	15'	9:26 - 9:41	60'	16:21 - 17:21
Thurs. 15	35'	7:32 - 8:06	50'	8:54 - 9:44	60'	16:17 - 17:17
Fri. 16	60'	7:58 - 8:58	25'	9:04 - 9:28	60'	16:07-17:07

In global, more than 20,000 vehicles will be precisely observed along 500 m

Video analysis

Digitalization made with the help of a software developped by TU Delft

3 steps

- Stabilization
- Determination of the objects moving from one image to another
- Building up the vehicles trajectories from one image to another

Pollution data are already on the web site

One hour of trajectories data should be soon available and progressively all the trajectories dataset

We hope you will enjoy using them!

http://mocopo.ifsttar.fr

Announcements/Future Meetings

- **Midyear Meeting Fort Lauderdale**
- 1st European Symposium on Quantitative Methods in Transportation Systems (LATSIS): September 4-8, 2012
- ISTTT20 July 17-19, 2013, Noordwijk, the Netherlands
- NCHRP Synthesis topics (13) due February 17, 2012 (www.trb.org/Studies/Synthesis/SynthesesSubmittal.asp)
- Others

Program

The LATSIS symposium 2012 program will include **plenary presentations** and **sessions in parallel**. The Symposium will also be an invaluable means to establish communication and collaboration between established team leaders and promising young researches (including PhD and postdocs), thus adding educational value to the conference. To reinforce the educational purpose of the Symposium, we shall organize a **Summer School** the first day of the conference that will provide a more informal setting to discuss implications of transportation research advances for integrated multimodal transportation planning and management, and will allow students and researchers to benefit from valuable advice from the internationally recognized experts invited at the conference.

	4 Sept.	5 Sept.	6 Sept.	7 Sept.	8 Sept.
9:00-12:00	SUMMER SCHOOL	KEYNOTE TALKS	KEYNOTE TALKS	KEYNOTE TALKS	PARALLEL SESSIONS
12:00-13:30	LUNCH BREAK				
13:30-18:00	SUMMER SCHOOL	PARALLEL SESSIONS	PARALLEL SESSIONS	PARALLEL SESSIONS	CLOSING
18.00-	WELCOME RECEPTION	INFORMAL DINNER	GALA DINNER (cruise)	FREE EVENING	

Submission Information

To present a paper at this event, an extended abstract (1000 words) should be submitted electronically to the organizers through the website by 15 March 2012. The evaluation will be undertaken by referees drawn from the International Scientific Committee and other prominent researchers from around the world. Full papers will be requested for a special issue in EURO Journal on Transportation and Logistics.

Deadlines

15 March 2012 : Submission of extended abstracts (1000 words)
15 May 2012 : Notification of acceptance of abstracts
1 October 2012: Full paper submission (only for the special issue in the journal - Open Call)

For more information visit: http://latsis2012.epfl.ch
or contact us at: latsis2012@epfl.ch

Call for Abstracts

LATSIS Symposium 2012

1st European Symposium on Quantitative Methods in Transportation Systems

4-8 September, 2012
Lausanne, Switzerland

Organized by:

ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

LUTS

TRACE

TRANSP-OR

Sponsored by:

FONDATION LATSIS Internationale

http://latsis2012.epfl.ch

ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

LATSIS Symposium 2012
4-8, September, 2012
Lausanne, Switzerland

1st European Symposium on Quantitative Methods in Transportation Systems

Call for Abstracts

http://latsis2012.epfl.ch

The Symposium is an interdisciplinary intermediate-size research conference on transportation research. The Symposium will bring together major experts and most promising young researchers in the fields of Transportation Modeling, Operations Research, Economics, Physics, Logistics in a setting highly suitable for scientific discussion and active interaction in relatively small groups.

Topics

- Traffic flow theory and operations
- Active Traffic Management
- Transportation Economics
- Public Transport
- Discrete choice analysis and modeling
- Intelligent Transportation Systems
- Multimodal Transport Systems
- Travel behavior under uncertainty
- Operations Research
- Demand management
- Land Use
- Agent-Based Modeling
- Networks
- Econometrics
- Logistics and supply chain

Keynote Speakers

Name	Topic	University
Richard Arnott	Economics	UC Riverside (USA)
Mike Bell (UK)	Logistics	Imperial College
Ennio Cascetta	Transport Planning	Un. of Naples (IT)
Carlos Daganzo	Traffic Flow, Logistics	UC Berkeley (USA)
Dirk Helbing	Physics	ETHZ (CH)
Serge Hoogendoorn	Traffic flow, management	TU Delft (NL)
Hani Mahmassani (US)	Networks, Traffic	Northwestern Un.
Eric Miller	Modelling, Land use	U Toronto (CA)
Kai Nagel	Traffic Simulation	TU Berlin (DE)
Amedeo Odoni	Operations Research	MIT (US)
Pravin Varaiya	Control, Traffic	UC Berkeley (USA)
Nigel Wilson	Public Transport	MIT (US)

Organizing Committee

Organizers

Nikolas Geroliminis (chair) **Michel Bierlaire (co-chair)**

International Organizing and Scientific Committee

Costas Antoniou (National Technical University of Athens, Greece)
Kay Axhausen (ETHZ, Switzerland)
Jaume Barcelo (Universitat Politècnica de Catalunya, Spain)
Shlomo Bekhor (Technion, Israel)
Mike Bell (Imperial College, UK)
Ennio Cascetta (University of Naples, Italy)
Teodor Gabriel Crainic (Université du Québec à Montréal, Canada)
Edward Chung (QUT, Australia)
Andres-Gilles Dumont (EPFL, Switzerland)
Jonas Eliasson (KTH, Sweden)
Jack Haddad (EPFL, Switzerland)
Benjamin Heydecker (Univesity College London, UK)
Serge Hoogendoorn (TU Delft, Netherlands)
Matthew Karlaftis (National Technical University of Athens, Greece)
Masao Kuwahara (Tohoku University, Japan)
Ludovic Leclercq (Un. of Lyon, France)
David Levinson (University of Minnesota, USA)
Der-Horng Lee (National University of Singapore, Singapore)
Rico Maggi (Un. della Svizzera italiana, Switzerland)
Hani Mahmassani (Northwestern University, USA)
Yanfeng Ouyang (Un. of Illinois UC, USA)
Alex Skabardonis (UC Berkeley, USA)
Grazia Speranza (Universita' degli studi di Brescia, Italy)
Chris Tampere (KU Leuven, Belgium)
Hans Van Lint (TU Delft, Netherlands)
Yibing Wang (Monash University, Australia)
Mark Wardman (University of Leeds, UK)
Konstantinos Zografos (Athens University of Economics and Business,

New Business

- Predecessor committees
  - Committee on Speed Characteristics (1939-1963) TO-13A
  - Committee on Characteristics of Traffic Flow (**1963**-1970) TO-12
  - Committee on Traffic Flow Theory (1963-1970) TO-9

- Committee on Traffic Flow Theory and Characteristics (1971-present) AHB45

- 50th Anniversary 1963-2013 Commemoration Ideas
  - Sunday workshop and/or Special Session at 2013 or 2014 AM?
  - Special call for papers?
  - 2014 Summer Meeting @Woods Hole w/Circular?
  - Other possibilities?
  - Volunteers?

Thoughts on Triennial Strategic Plan

In addition to missions mentioned in Committee Future Outlook Statement (CFOS), TFTC committee should

serve as the knowledge base of traffic flow theory for today and tomorrow in this rapid changing world

and

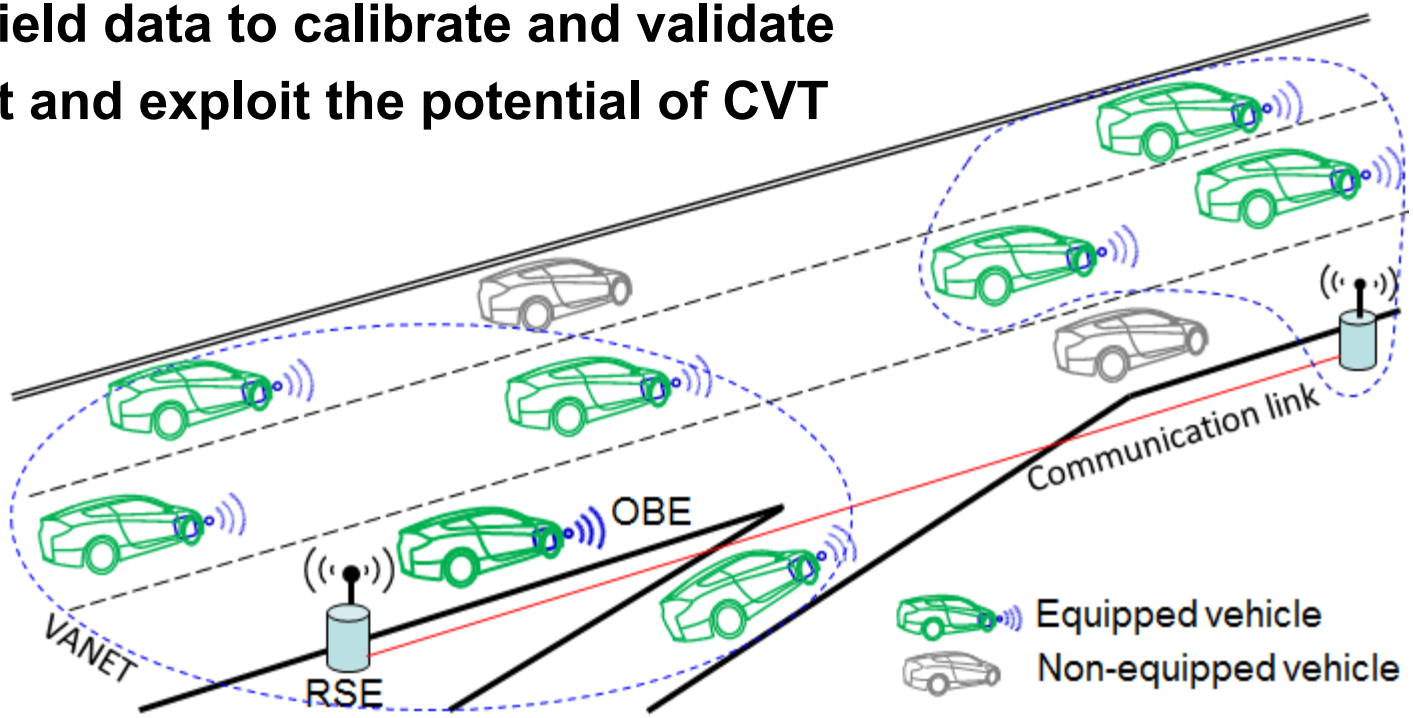
the guidance of application of the knowledge to transform our transportation systems.

A few example directions of thrust are provided below to invite further thinking

Directions of Thrust - Theory

Connected Vehicle Technology

- Cyber-physical integration in transportation
- The paradigm is shifting
- Need new theories/models to represent
- Need field data to calibrate and validate
- Predict and exploit the potential of CVT

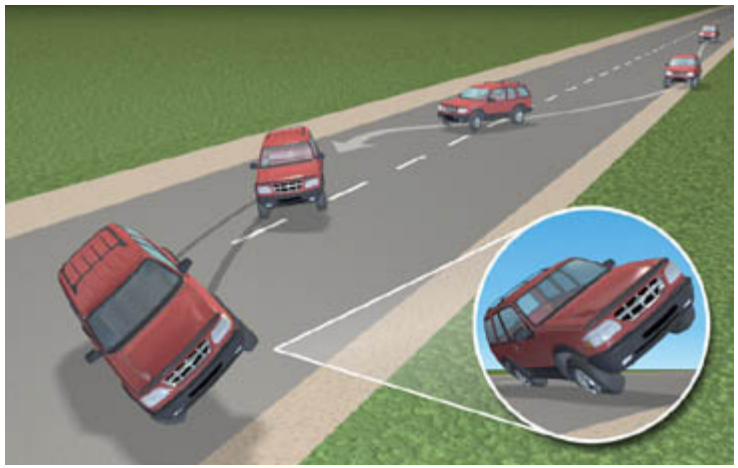


Source: Daiheng Ni

Directions of Thrust - Application

- **Simulation-Aided Highway Design**
  - Respond to outreach by ??? last year
  - Test highway design by running vehicles on the roadway
  - Need to model driver, vehicle, roadway separately
  - Yet each is an entity of an integral system
  - Need 2- to 3-dimensional traffic flow model
  - Currently we only have 1- or 1.5-dimensional models

Source: driversed.com



Source: trulymedia.com

Directions of Thrust - Data

- **Next NGSIM??**
  - **Field data is critical to theory of connected vehicles**
  - **Many federally funded testbeds and pilot projects**
  - **Would it be possible to make the data publicly available?**
  - **Just like NGSIN which has catalyzed development of TFT**
  - **TFTC committee needs to be proactive and take the lead**

Safety Pilot driver clinics

Source: dot.gov

Connected Vehicle Test Beds

Source: dot.gov

New Business

- 2013 Annual Meeting Call for Papers
  - Last year some discussion of joint calls related to International and Mixed Traffic
  - Christine Buisson: Cooperative traffic management: theory and practice (w/ITS committee)
  - Other ideas?

- "Future Products"

- TU Delft Simulation Experiment: H. van Lint and colleagues

Announcement

3D Multi-User Virtual Experiment

TU Delft & National Institute Informatics (NII, Tokyo)

1/30/12

This afternoon: the very 1st official experiment!

4-6PM George Washington University (Foggy Bottom Campus), Computer lab: Tompkins 411

NII & TU Delft Delft University of Technology

Challenge the future

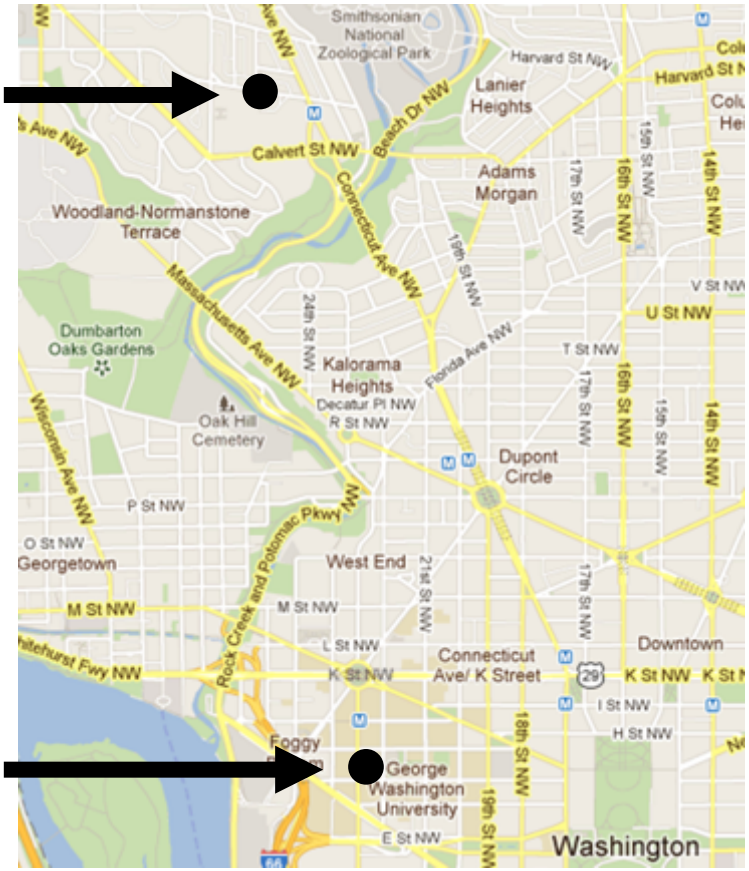
3D Multi-User Virtual Experiment

Transportation to Tompkins 411

Marriott Wardman Park Hotel
2660 Woodley Road NW
Washington, DC 20008

Time: 4 to 6 PM.
Transportation: by taxi (we'll pay!) or Subway

George Washington University (Foggy Bottom Campus)
Computer lab: Tompkins 411
725 23rd Street NW
Washington, DC 20052



3D Multi-User Virtual Experiment

Many, many thanks to

- Prof. Hamdar & GW University
- Prof. Robert Bertini

We hope to see you at our experiment!

Adjourn

Please don’t forget to sign in!