



# HYCON2 Show Day Traffic Modeling, Estimation and Control

- May 13th, 2014 -

<http://www.hycon2.eu/>

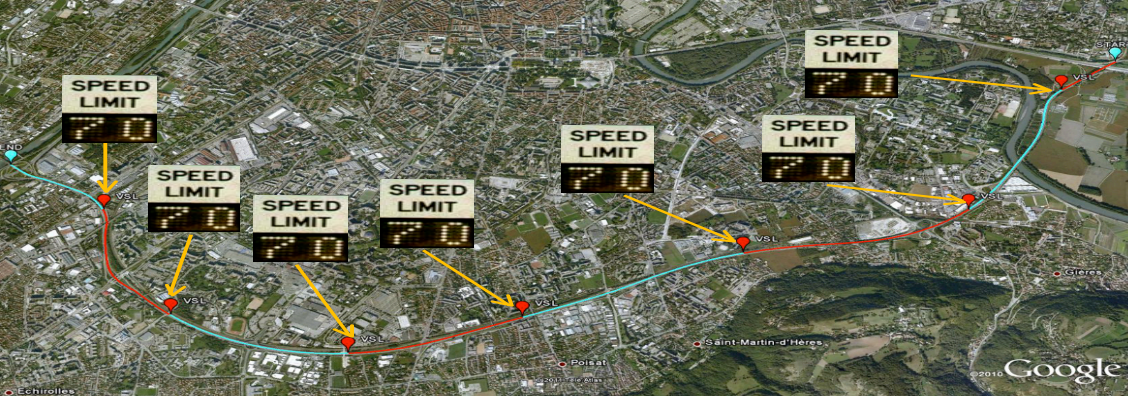


<http://necs.inrialpes.fr/pages/grenoble-traffic-lab.php>



<http://www.inria.fr>





# Traffic Modeling, Estimation and Control

HYCON 2 (Highly-complex and networked control systems) is a EU FP7 Network of Excellence. It aims at stimulating and establishing the long-term integration of the European research community, leading institutions and industry in the strategic field of control of complex, large-scale, and networked dynamical systems. HYCON2 has identified several applications, among which a show-case on “Traffic Modeling, Estimation and Control”.

This show-day presents methods and results for the traffic show-case application, which corresponds to the operation of the freeway network around the Grenoble area; the selected road is Grenoble South Ring (Rocade sud).

This research activity has been performed thanks to the use of the Grenoble Traffic Lab (GTL) initiative: a traffic data center (platform) that collects traffic road-infrastructure information in real time. Sensed information comes from a dense wireless sensor network deployed on Grenoble South Ring, providing macroscopic traffic signals such as flows, velocities, etc.

Some specific tasks realized during this project are:

- Building the traffic data center with magnetic data (data collection, web interface);
- Building the show room (display screens, simulators)
- Calibrating a microscopic simulator from macroscopic data;
- Identifying and classifying a set of specific control and estimation problems;
- Devising innovative methods for: modeling, estimation, and control for the show case;
- Evaluating the proposed solutions with real data when possible, and with synthetic data from the microscopic simulator otherwise.

*The partners of HYCON2 actively involved in this activity have been: NeCS INRIA/U. Grenoble/CNRS, Univ. Pavia, Univ. L'Aquila, TU Delft, Univ. Sevilla, Lund Univ. Moreover, a strong collaboration has been developed with Univ. Genova.*

# PROGRAM

9:00-12:00

## Plenary talks

- **Presentation of the show-case and of GTL (Grenoble Traffic Lab)**  
Carlos Canudas de-Wit
- **Methods and results for traffic prediction (model-free methods)**  
Luis Leon
- **Methods and results for traffic prediction (model-based methods)**  
Fabio Morbidi
- Coffee break*
- **Innovative MPC schemes for freeway traffic control**  
Antonella Ferrara, Simona Sacone, and Silvia Siri
- **Optimal density-balancing control for freeway traffic**  
Dominik Pisanski

12:00-13:30

## Lunch

13:30-15:45

## Demonstrations and poster session

Visit of the GTL show-room and demo of GTL functionalities.  
*Participants are divided in small groups for this visit, while, in parallel the poster session takes place.*

- **Nash Game Based Distributed Control Design for Balancing of Traffic Density over Freeway Networks (+demo)** by D. Pisanski and C. Canudas de Wit (NeCS INRIA/U. Grenoble/CNRS)
- **Hybrid Model Predictive Control for Freeway Traffic Using Discrete Speed Limit Signals**, by J.R.D. Frejo, A. Nuñez, B. De Schutter, and E.F. Camacho (Univ. Sevilla and TU Delft)
- **Distributed Model Predictive Control for Freeway Traffic Systems**, by J.R.D. Frejo and E.F. Camacho (Univ. Sevilla)
- **On Resilience of Multicommodity Dynamical Flow Networks**, by G. Nilsson, G. Como and E. Lovisari (Lund Univ.)
- **Short-Term Multiple Step Ahead Travel Time Forecasting: Model-free Approach (+demo)**, by L. Leon Ojeda, A. Kibangou, and C. Canudas de Wit (NeCS INRIA/U. Grenoble/CNRS)
- **A New Robust Approach for Highway Traffic Density Estimation**, by F. Morbidi, L. Leon Ojeda, C. Canudas de Wit, I. Bellicot (NeCS INRIA/U. Grenoble/CNRS)
- **Innovative Model Predictive Control Schemes for Freeway Traffic Control (+demo)**, by A. Ferrara, A. Nai Oleari, Simona Sacone, and Silvia Siri (Univ. Pavia and Univ. Genova)
- **ECO-Driving in Urban Traffic Networks using Traffic Signal Information**, by G. De Nunzio, C. Canudas de Wit, and P. Moulin (NeCS INRIA/U. Grenoble/CNRS and IFPEN)

16:00-16:30

## Round-table discussion & conclusion