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.

Participants are divided in small groups for this visit, while, in parallel the poster session takes place.

### Plenary talks

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

### Lunch

Demonstrations and poster session

Visit of the GTL show-room and demo of GTL functionalities.

### 13:30-15:45

- Nash Game Based Distributed Control Design for Balancing of Traffic Density over Freeway Networks (+demo) by D. Pisarski and C. Canudas de Wit (NeCS INRIA/U. Grenoble/CNRS)
- 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)