Panel on “Control of transportation in the age of connectivity and autonomy”

Saurabh Amin | July 6, 2019

Collaborators: Li Jin (NYU), A. A. Kurzanskiy (Berkeley), Kalle Johansson (KTH)

NSF CNTS workshop at ACC 2019
Control of highway traffic under perturbations

Current strategies for highway control do not account for perturbations (incidents, platoons)

Design of control strategies in face of stochastic capacity perturbations (incident hotspots).

Modeling traffic flow with autonomous vehicle platoons, assessing their impact on congestion.

Our approach:

- Fluid Queuing Models
  - Capacity perturbations
  - Vehicle platoon integration

- Performance Analysis
  - Stability (boundedness of ramp queues)
  - Throughput and delay

- Control Design
  - Capacity-aware ramp metering
  - Platooning for max. throughput

L. Jin [Amin], IEEE TAC (2018); L. Jin [Amin], IEEE TAC (2018); L. Jin, Kurzhanskiy, [Amin], Automatica (R&R) L. Jin et al. [Amin, Johansson], HSCC (2018).
Multi-world semantics of hierarchical systems


Kalle Johansson. Previous talk!

- **Modeling challenge:**
  Connected vehicles in automated highways impact semantics in each layer

- **Robustness challenge:**
  Disturbances in lower layers need to be accounted for in design of higher layers

Macroscopic (system)

Network
Trip schedule, route assignment

Link
Ramp metering, lane control, speed limit

Planning
Target speed, lane changes, platooning

Regulation
Throttle/break, steering

Interventions

Routing games

Queuing models

Congestion models (cell transmission)

Car-following models

Connected vehicles in mixed traffic