School of Engineering

Civil and Environmental Engineering

IDSS MIT INSTITUTE FOR DATA, SYSTEMS, AND SOCIETY

OPERATIONS RESEARCH CENTER

Panel on "Control of transportation in the age of connectivity and autonomy"

Saurabh Amin| July 6, 2019

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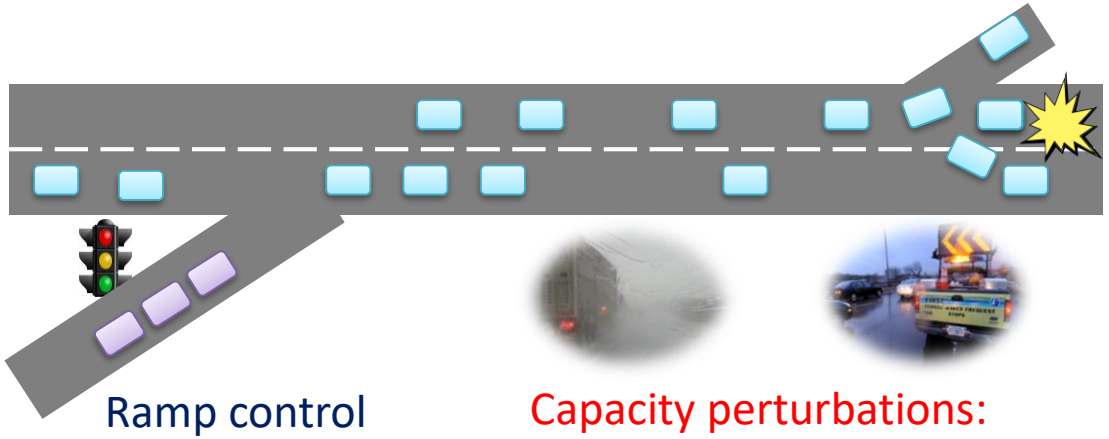
NSF CNTS workshop at ACC 2019

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.



Ramp control

Capacity perturbations: weather, incidents

Connected & Autonomous Vehicles (CAVs)
Moving bottlenecks to lagrangian controllers?

Our approach:

Fluid Queuing Models
- Capacity perturbations
- Vehicle platoon integration

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

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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

Pravin P. Varaiya. "*A question about hierarchical systems*" (2000).

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