CAREER: Multi-Resolution Model and Context Aware Information Networking for Cooperative Vehicle Efficiency and Safety Systems

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Motivation

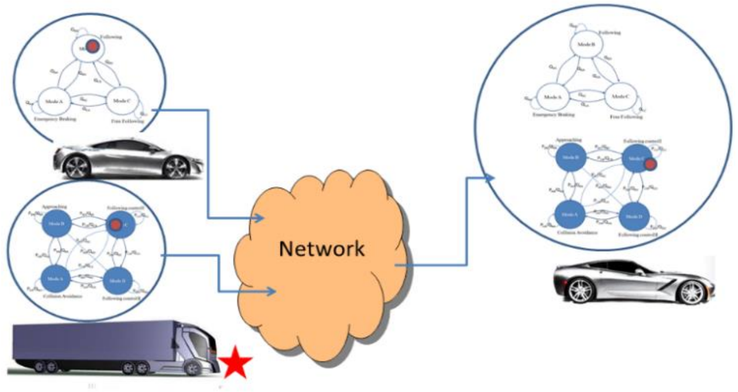
Connected vehicles rely on V2V networks. Scalability is one of the main challenges, preventing rich collaboration and sensor information sharing.

Proposed approach:

replace *data communication and networking*

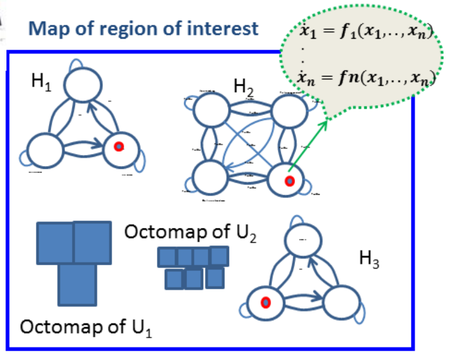
with *model communication and networking*

Model-Based Communication relies on exchange of models and model updates instead of raw sample data.

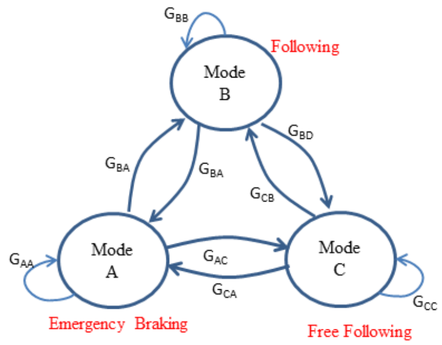


Example Application: Forward Collision Detection

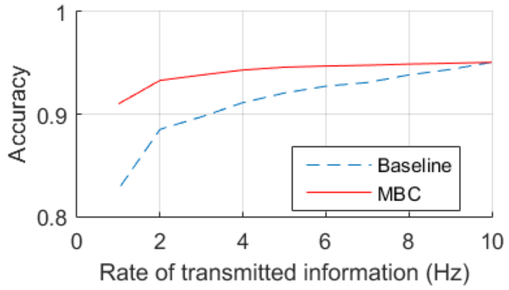
Example application of **Model Based communication (MBC)** : If vehicle movement model is communicated and updated, instead of vehicle position information, higher accuracy of error detection is possible at much lower communication load levels.



Other sponsors and collaborators: General Motors, Toyota ITC



Example of vehicle movement model



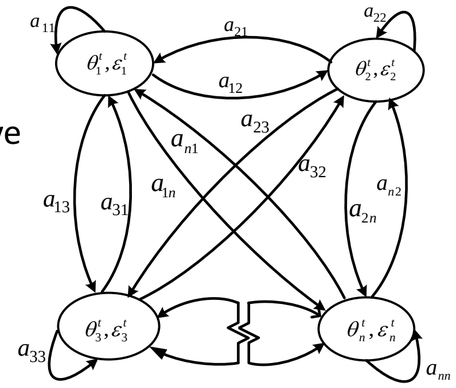
Accuracy vs Rate for Baseline and MBC methods, assuming PER =0

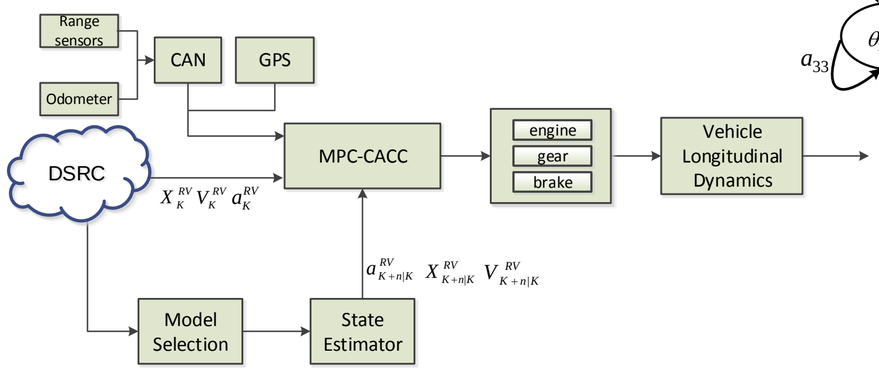
Example Application: Cooperative Adaptive Cruise Control

Learn and update model : Use a switched system structure such as HMM + ARX hybrid system.

Control: Use exchanged models in model-predictive CACC controllers

Result is an order of magnitude improvement in spacing error in CACC





5 vehicle platoon