Breakthrough: A Dynamic Optimization Framework For Connected Automated Vehicles In Urban Environments

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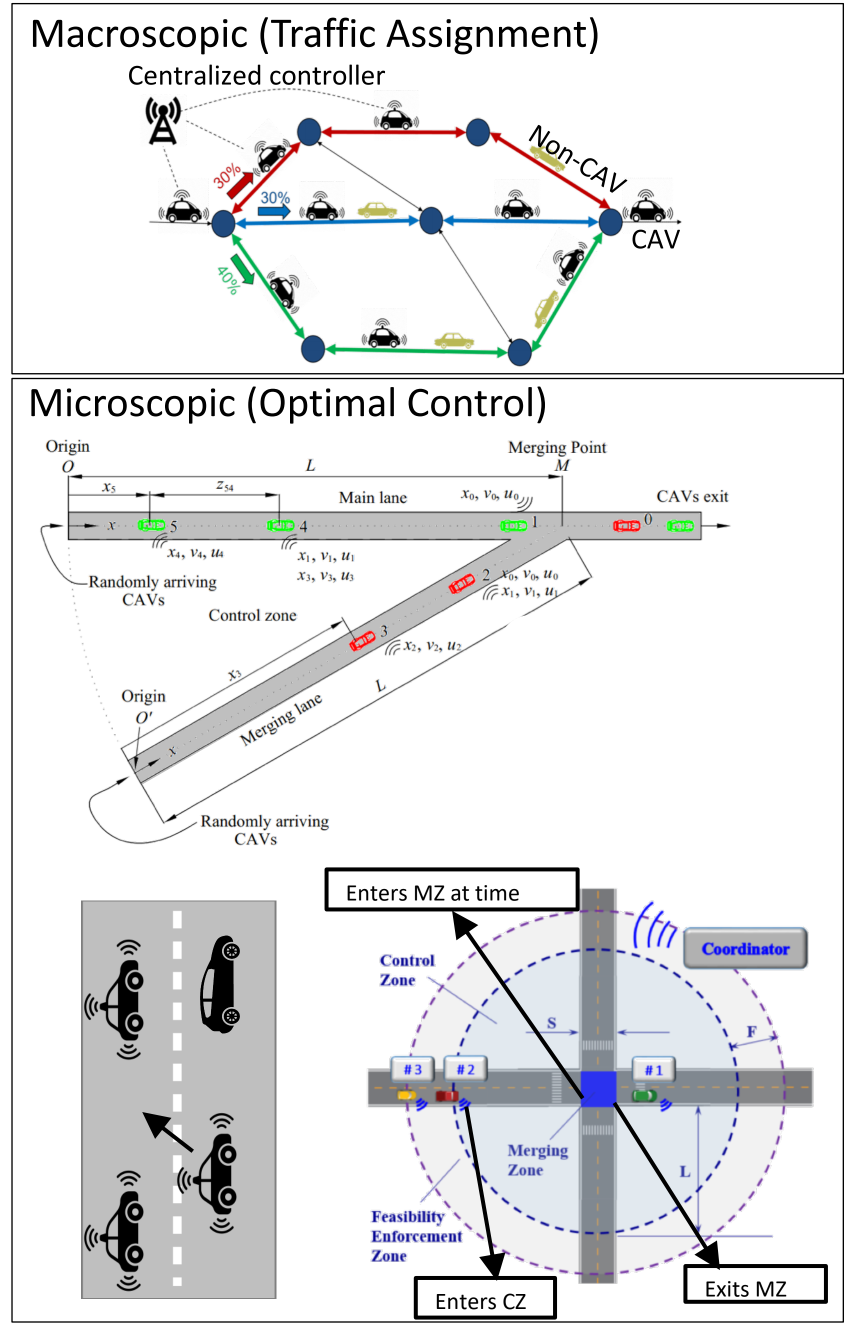
Description

Rational quantification of the best performance achievable by a transportation system consisting of Connected Automated Vehicles (CAVs) relative to the current state of the art

- Understand and Quantify traffic patterns and behavior using data
  - Origin-Destination Demands, Travel Latency Cost Functions
    https://salomonw.github.io/congestionmaps/DynamicPage/AM/
- Measure / Estimate necessary CAV penetration to benefit the entire system
- Development of a Control and Dynamic Optimization Framework to achieve best performance on Control Zones: Intersections, Merging Lanes, Lane Change Maneuvers

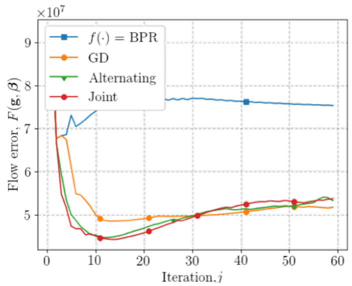
Traffic Network Control with CAVs



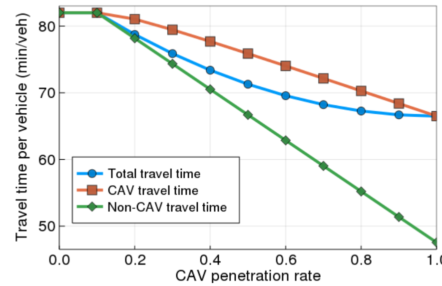
Findings

Traffic Network Optimization and Control with CAVs

Macroscopic (Traffic Assignment)



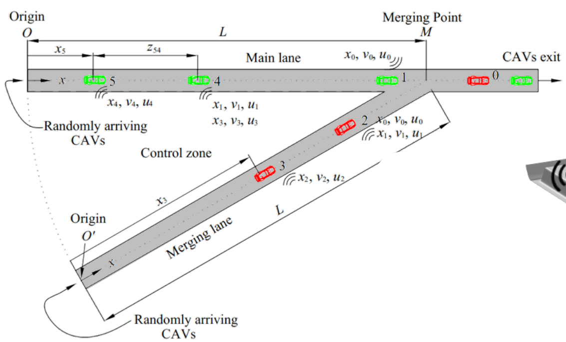
Better estimation of OD demands and travel latency functions when done jointly

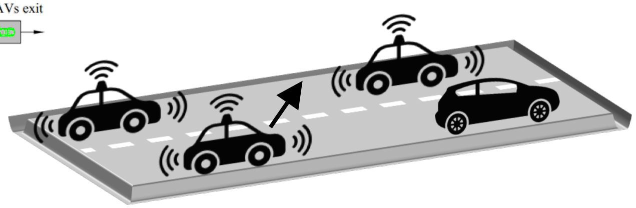


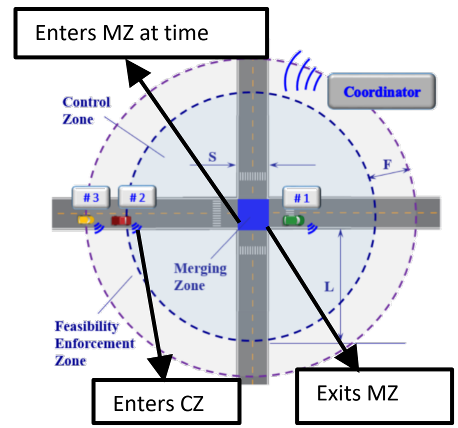
CAVs improve resource allocation for everyone, e.g., they decongest a link so that Non-CAVs using this link benefit

Microscopic (Optimal Control)

Optimal solution is analytically tractable and guarantees all the constraints







~41% travel time
~58% fuel

~50% fuel

~43% travel time
~16% fuel

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