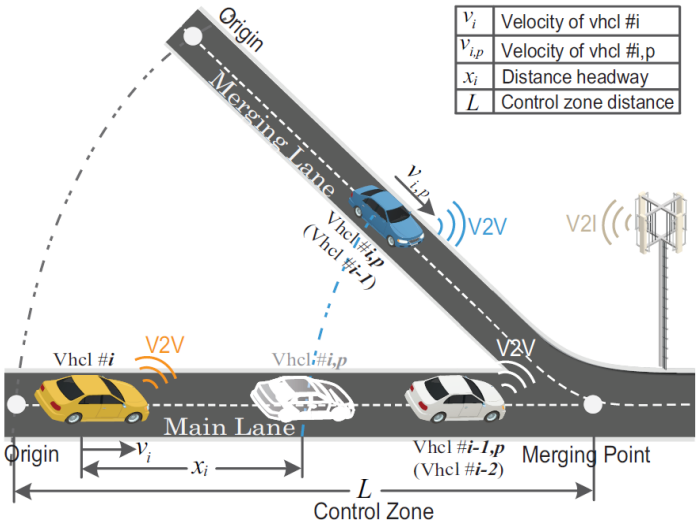
E-Pico Master's Thesis

Control strategies for connected hybrid electric vehicles in merging scenario

Through the development of advanced communication technology, it is possible to achieve the communication of vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I). With V2V and V2I, the driving safety and energy efficiency for connected vehicles can be improved further. On the other hand, HEVs with ability of multi-source to propel vehicle, the energy utilization rate is higher than conversional vehicle by making engine work in high efficiency. However, the powertrain control of HEVs becomes complex, especially when facing with the real-world traffic scenario. In the merging scenario for vehicles on two lanes to merge at a point, usually the traffic jam happens because of unsuitable speeds of vehicles from two lanes arriving at the merging point.



Goals

In connected environment it is interesting to investigate a cooperative control in a merging scenario with co-optimization of powertrain and vehicle dynamics of HEVs. One possible goal, as in [2], could be pass through the merging zone with minimization of energy consumption for the total vehicles. Moreover, the traffic congestion can also be reduced at merging point with effective algorithm.

[1] Fengqi Zhanga, Xiaosong Hub, Reza Langari, Dongpu Cao, Energy management strategies of connected HEVs and PHEVs: Recent progress and outlook, Progress in Energy and Combustion Science, Vol. 73, pp. 235-256, July 2019.
[2] Fuguo Xu, Tielong Shen, Jiangyan Zhang, Decentralized Optimal Powertrain Control for Connected Hybrid Electric Vehicles in Merging Scenario, Proceedings of IFAC World Congress 2020 – Virtual, 2020.

Requirements

You should have a good understanding of *Hybrid Electric Vehicles models, Vehcile dynamics control, Automatic Control Theory, Connected Vehicles, MATLAB-SIMULINK*.

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