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Driver – Vehicle Models for Cooperative, Connected and Automated Vehicles

A. Car-following

- **(Cooperative) Adaptive Cruise Control/(C)ACC**

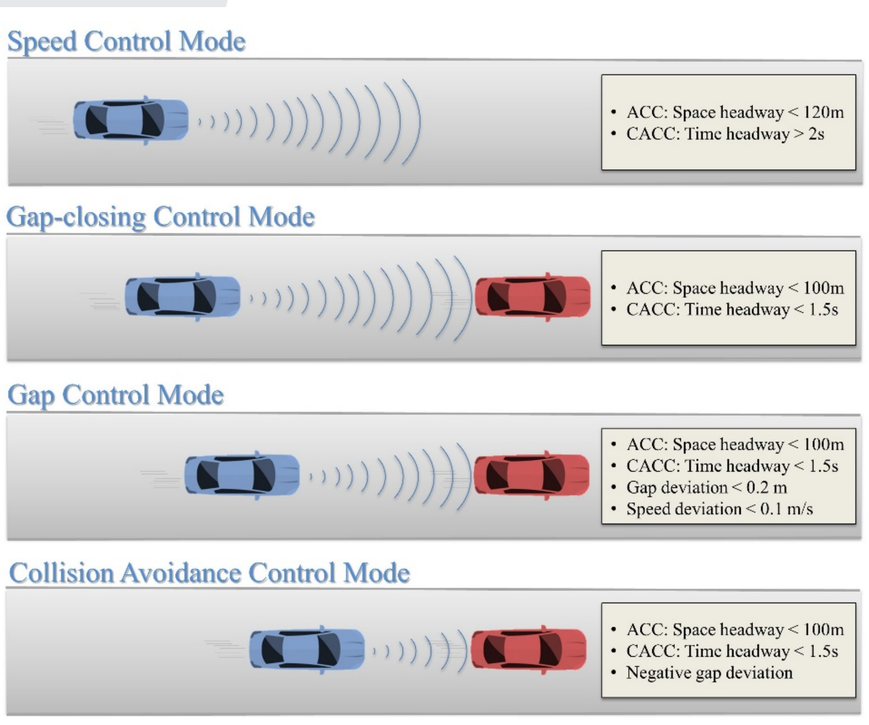

***Fig. 1**. Modes of (C)ACC car-following algorithm*

B. Lane-changing

- **Parametrized SUMO Lane Change Model**
  - **Variance-based sensitivity analysis** → *Influential lane change calibration parameters*
  - ***SUMO lane change output** vs **HMETC lane change data** → Reconciliation*

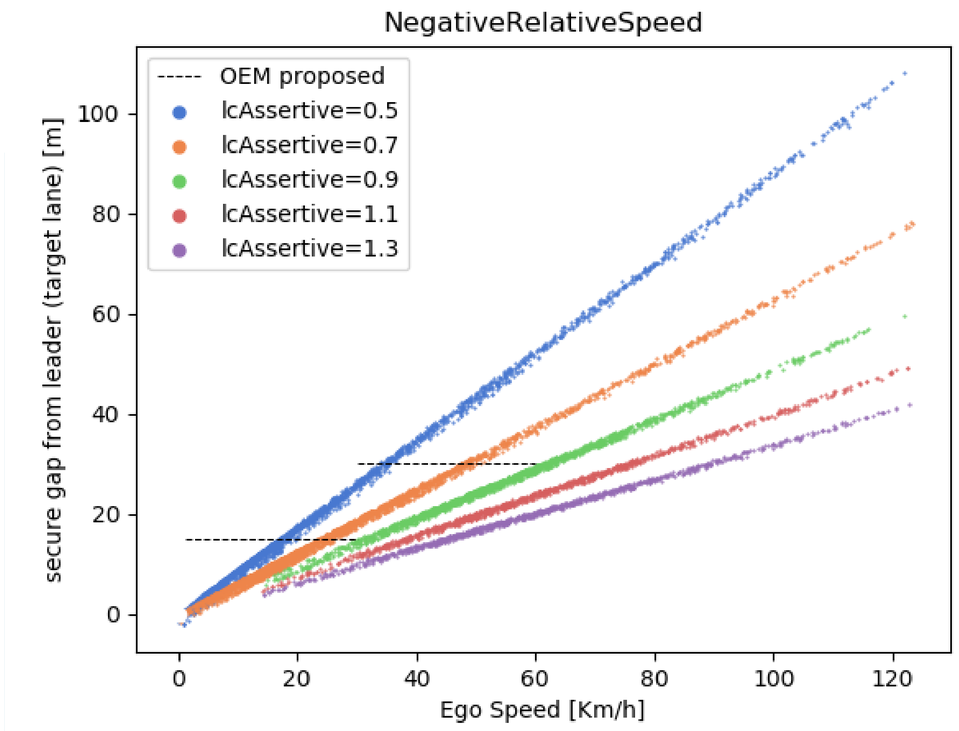

***Fig. 2**. Safe longitudinal gaps to leader on the target lane*

C. Control Transitions

- **Transition of Control (ToC) Model**

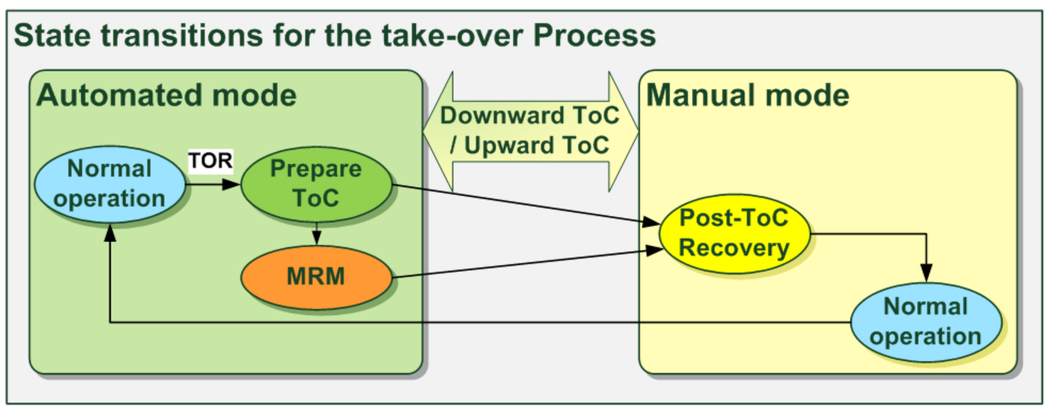

***Fig. 3**. Device state machine for ToC model*

- **Prepare ToC Phase**
  - Automated mode during available lead time
  - Establishment of safe car-following gap
- **Post ToC Recovery Phase**
  - Erroneous car-following – Reduced driver performance
- **Minimum Risk Maneuver (MRM)**
  - Constant Deceleration
  - Current lane or Right-most lane or Safe Harbor
- **Static & Dynamic Take-over Request Triggering**
- **Lane Change Abstinence**
  - Prepare ToC and Post ToC Recovery Phases

D. Cooperative Lane-changing

- **Decentralized Approach (V2V based)**
  - Cooperation between ego CCAV & target follower CCAV → ***Gap Creation***

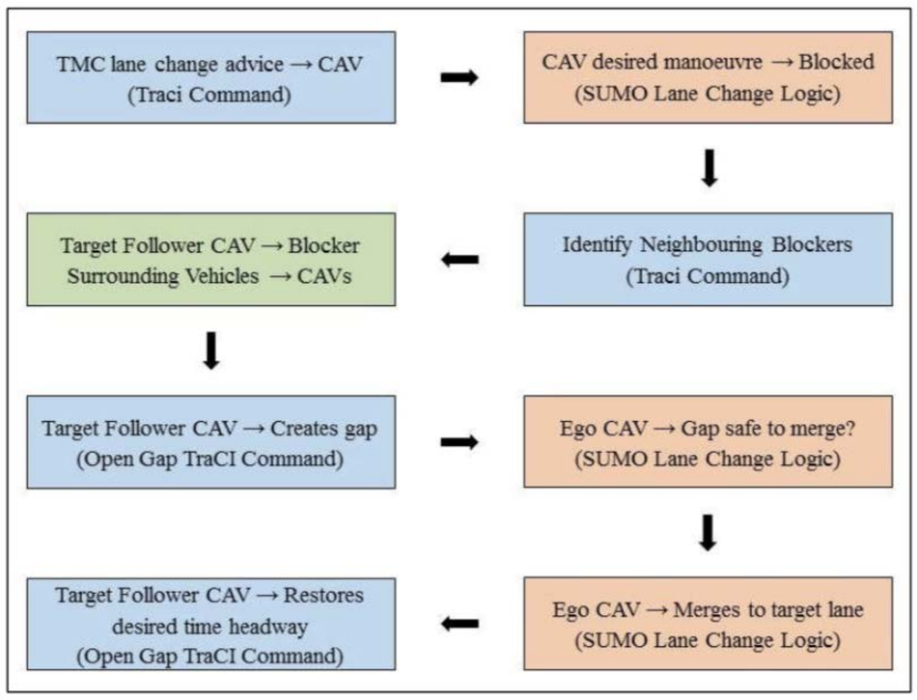

***Fig. 4**. Distributed cooperative lane change algorithm*

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