

# Driver – Vehicle Models for Cooperative, Connected and Automated Vehicles

## A. Car-following

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

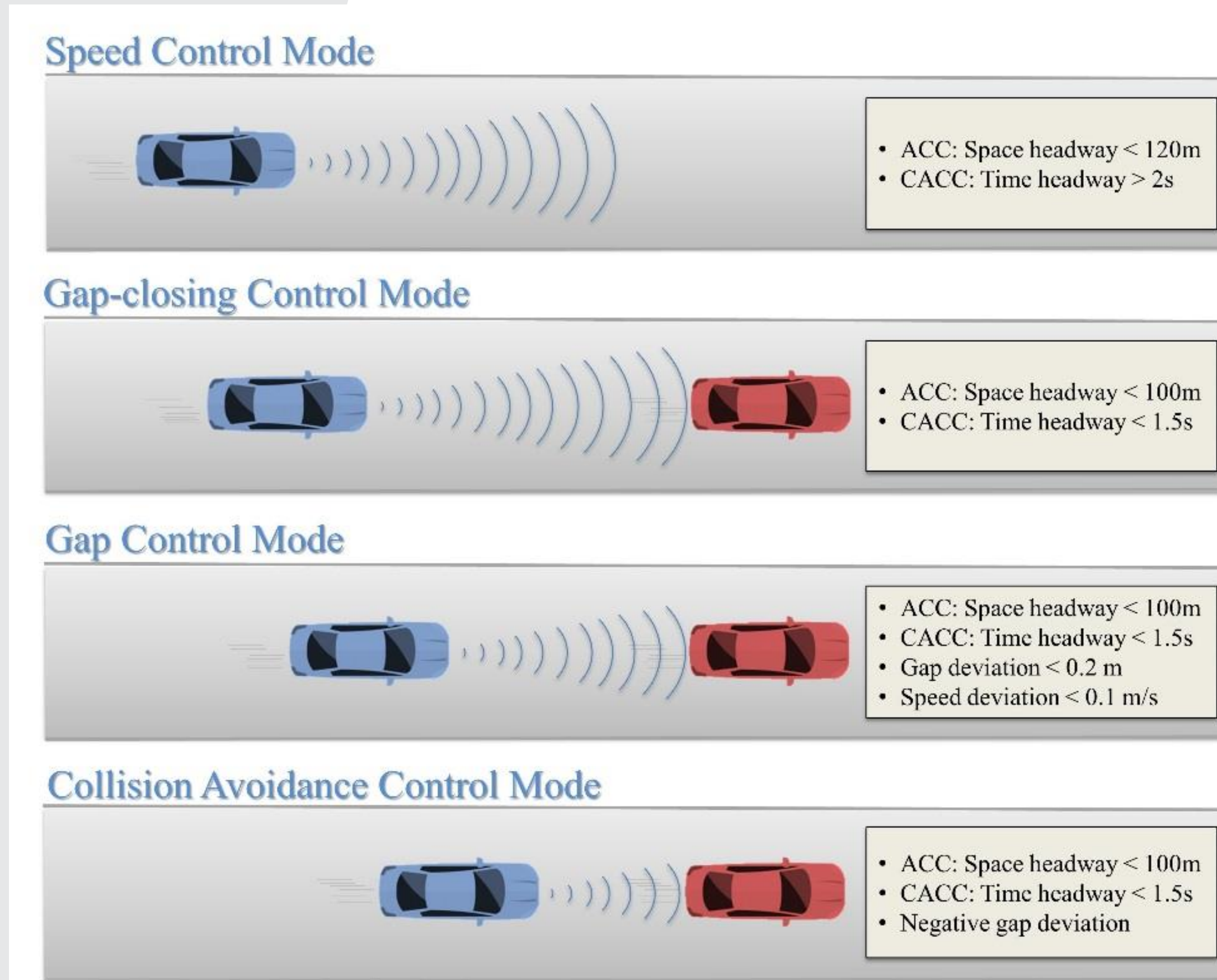


Fig. 1. Modes of (C)ACC car-following algorithm

## 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

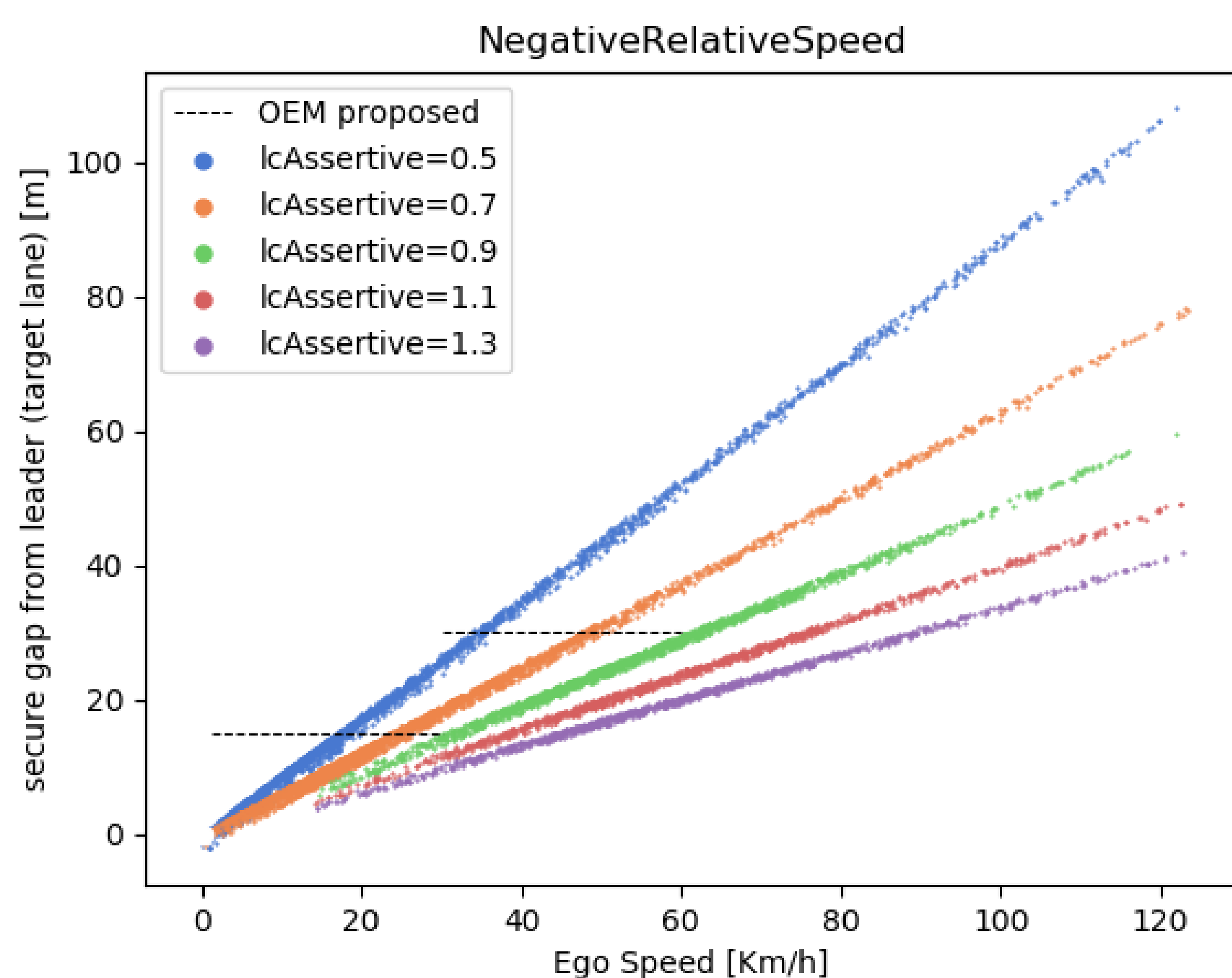


Fig. 2. Safe longitudinal gaps to leader on the target lane

## C. Control Transitions

- Transition of Control (ToC) Model

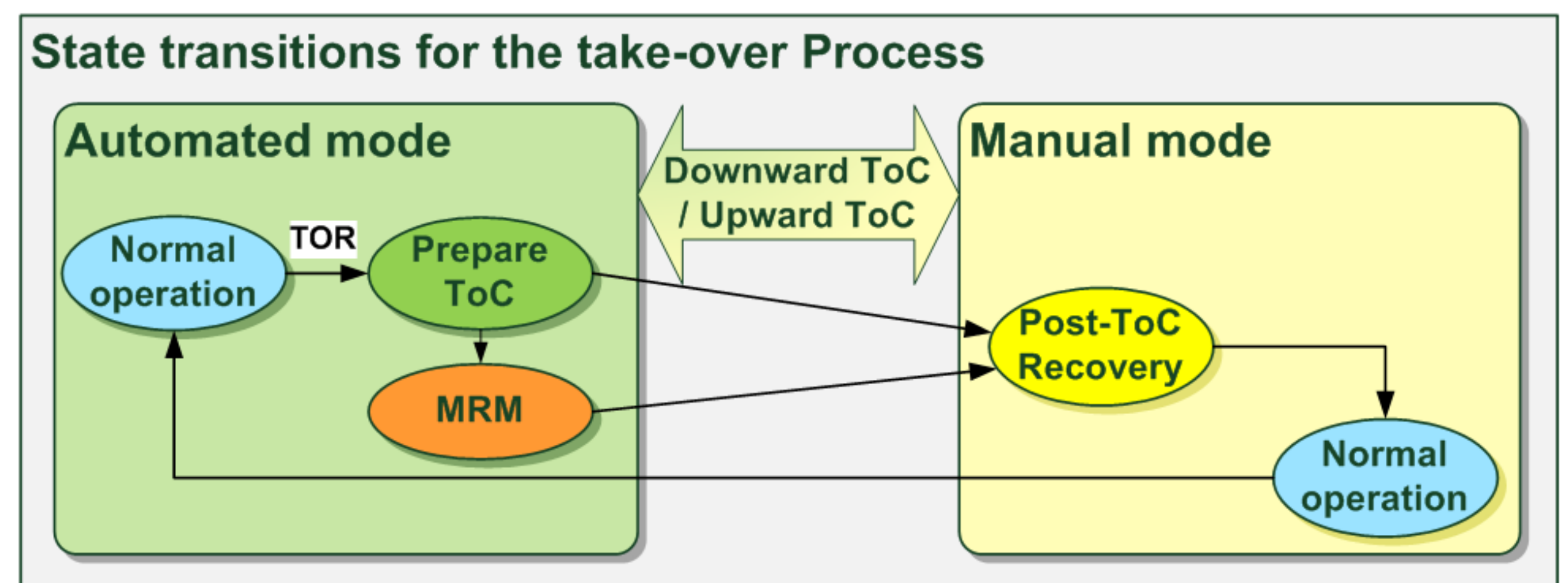


Fig. 3. Device state machine for ToC model

- 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 Abstinance
  - Prepare ToC and Post ToC Recovery Phases

## D. Cooperative Lane-changing

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

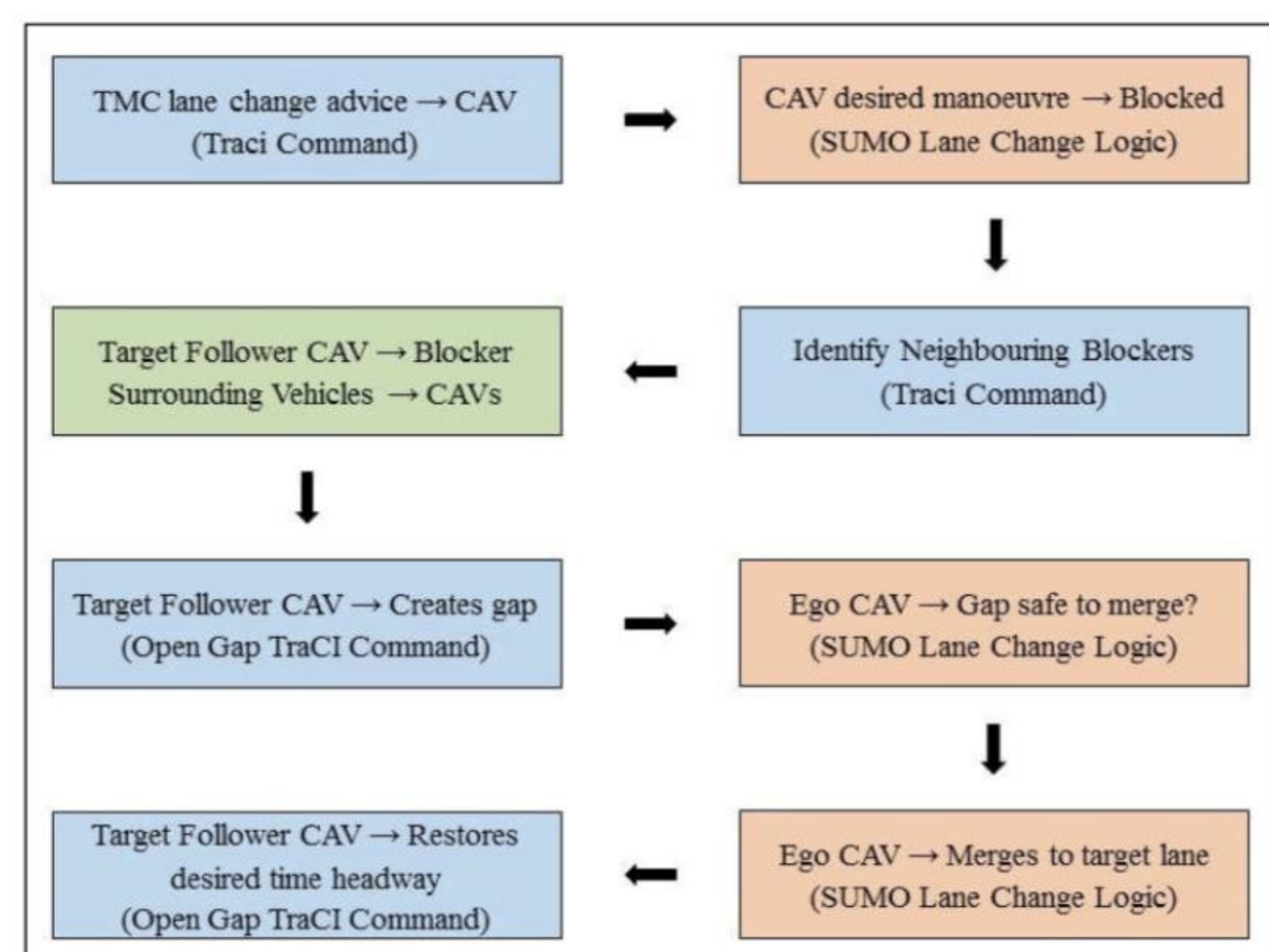


Fig. 4. Distributed cooperative lane change algorithm