ABSTRACT

- Objective: Developed a micro-simulation model of heavy truck CACC when trucks share a freeway with manually driven passenger cars.
- Car following models: Developed for CACC, ACC, and CC
- Other behavioral models: Implemented lane changing, lane cooperation, lane use restrictions, and switch from automated mode to manual mode
- Case study: Calibrated Aimsun model for a 15-mile corridor

Car Following Model (Cont.)

For Cruise Control (CC) mode:
\[ a_{cc}(t+1) = 0.3907(v_{ref}(t) - v(t)) \]

\[ v_{ref}(t): \] Reference speed
\[ v(t): \] Speed of the subject vehicle

For Adaptive CC (ACC) mode:
\[ a_{acc}(t+1) = 0.0561[d(t) - v_{des}(t)] + 0.3939[v_{pre}(t) - v(t)] \]

\[ d(t): \] Distance gap
\[ v_{des}: \] Desired time gap, selected to be 2.2 sec
\[ v_{pre}(t): \] Speed of the preceding vehicle

For Cooperative ACC (CACC) mode:
\[ a_{cacc}(t+1) = 0.0074 [d(t) - v_{des}(t)] + 0.0805 [v_{pre}(t) - v(t)] - v_{des}(t) \]

\[ v_{des}: \] Desired time gap, evenly distributed between 1.2 sec and 1.5 sec

MECHANISM OF AUTOMATED VEHICLE FOLLOWING

Effect of penetration rate (PR) on VMT

Effect of 100% PR on speed at detector locations:

Traffic dynamic at the most congested detector:

CONCLUDING REMARKS

- Developed a framework to simulate automated truck platoon, manual passenger cars and manual trucks
- Comparison of 0% penetration rate vs. 100%:
  - For trucks: Speed and VMT increased by 20.5 % and 7.2%, respectively
  - For cars: Speed increased by 5.8%; marginal effect on VMT

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