2040 TPP: C/AV Modeling

Transportation Futures Project: Planning for Technology Change
- Published in 2016 for MnDOT by UMN Center for Transportation Studies
- Examines impacts of:
  - Autonomous vehicles
  - Mobility-as-a-Service
  - Electrification and Alternative Fuels
  - Road Pricing

Images of charts and graphs showing the US Vehicle Fleet by NHTSA Automation Level.
Genesis of AV Planning in Major Central City Corridor

- Significant investment in highway infrastructure in the Twin Cities
- Emphasis on improving transit flow, HOT operation
- Questions regarding the impact of Automated Vehicles (AV) on both the need for infrastructure and the function of transit in the future

Role of C/AV in Transit

- First mile/last mile
- Circulator services
- Fixed-route/fixed guideway driverless vehicles
- Platooning BRT
- Paratransit
- Alternative technology for signal priority
C/AV Scenarios

Up

- Less vehicle ownership/ more mobility as a service
- Significant increase in car sharing/ride sharing
- Reduced travel demand due to shift in costs to pay-per-trip
- More premium placed on living centrally
- Parking need / cost is eliminated
- Increase in dead-head trips on the roadways

Out

- More vehicle travel/VMT
- Increased exurbanization
- Continuation of vehicle ownership model
- Reduction of “lost time” while driving (i.e. reduction in the cost of travel)
- Increases in roadway capacity from automation results in a corresponding increase in travel demand

Tests

1. Capacity
2. Cost
3. Auto Availability
4. Vehicle Positioning

Test 1: Capacity

- AV use will increase capacity by
  - Ability to maintain shorter headways on freeways and expressways
  - AV’s have the ability to mitigate the effects of congestion on travel time
- Model Adjustments – Out & Up Scenarios
  - Increase capacity by 50% for freeways and by 10% for expressways
  - Modify the relationship between volume and speed to be more “forgiving” with regard to demand
Test 2: Auto Operating Cost and Parking Cost

- AV’s will have lower operating cost
- AV’s can avoid pay parking

**Model Adjustments:**
- Auto Operating Costs – Current $0.15/mile
  - Adjust to: $0.10/mile
- Parking Costs:
  - Remove all parking cost

Test 3: Auto Availability

- AVs will allow access to autos for populations that previously did not have access:
  - Elderly and disabled
  - Children
  - Low income (partially)
  - Auto-deficient households

**Model Adjustments**
- Adjust inputs so that 95% of Households have sufficient autos to serve adult population

Test 4: Vehicle

- Automated Vehicle will re-position themselves after serving passengers:
  - Travelling to and from remote (free) parking lots
    - Up & Out scenario
  - Travelling to and from home
    - Out scenario
  - Circulation to serve another unrelated passenger
    - Up scenario
Test 4: Vehicle Positioning (Continued)

- **Out Scenario Model Adjustments**
  - Identify trip ends where parking cost is non-zero
  - Generate a mix of driverless trips connecting to home or nearby potential parking lot locations

- **Up Scenario Model Adjustments**
  - Generate a driverless service trip starting at the end of one trip and ending at the start of another trip at a later time.
  - Park driverless cars when not needed.

Questions?

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