Urban Planning
& Community Design Considerations
in an Era of Driverless Cars

By

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Presented at
Workshop on
Travel Demand Modeling Implications of Driverless Cars

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• What is a “Driverless Car” (aka SmartDrivingCar)
• The Mobility Needs of Today’s “Community Design”
• Suggest some places to try out SmartDrivingCars
“Drive Less” Car

- Well yes, How much Less?
Level 0 (No automation)
The human is in complete and sole control of safety-critical functions (brake, throttle, steering) at all times.

Level 1 (Function-specific automation)
The human has complete authority, but cedes limited control of certain functions to the vehicle in certain normal driving or crash imminent situations. Example: electronic stability control

Level 2 (Combined function automation)
Automation of at least two control functions designed to work in harmony (e.g., adaptive cruise control and lane centering) in certain driving situations. Enables hands-off-wheel and foot-off-pedal operation. **Driver still responsible for monitoring and safe operation and expected to be available at all times to resume control of the vehicle.** Example: adaptive cruise control in conjunction with lane centering

Level 3 (Limited self-driving)
Vehicle controls all safety functions under certain traffic and environmental conditions. Human can cede monitoring authority to vehicle, which must alert driver if conditions require transition to driver control. **Driver expected to be available for occasional control.** Example: Google car

Level 4 (Full self-driving automation)
Vehicle controls all safety functions and monitors conditions for the entire trip. The human provides destination or navigation input but is not expected to be available for control during the trip. **Vehicle may operate while unoccupied.** Responsibility for safe operation rests solely on the automated system
What is a SmartDrivingCar?

Preliminary Statement of Policy Concerning Automated Vehicles

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<td>Increased car sales, many fewer insurance claims, Increased VMT</td>
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<td>“aTaxi”</td>
<td>Always</td>
<td>Chauffeured, Buy Mobility “by the Drink” rather than “by the Bottle”</td>
<td>Profitable Business Opportunity for Utilities/Transit Companies</td>
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**Energy, Congestion, Environment?**
Preliminary Statement of Policy Concerning Automated Vehicles

What the Levels Deliver:

Levels 1 -> 2: Increased Safety, Comfort & Convenience

Primarily an Insurance Discount Play

Levels 3: Increased Pleasure, Safety, Comfort & Convenience

An Enormous Consumer Play

Level 4 (Driverless Repositioning): Pleasure, Mobility, Efficiency, Equity

Revolutionizes “Mass Transit” by Greatly Extending the Trips that can be served @ “zero” cost of Labor.

(That was always the biggest “value” of PRT; zero labor cost for even zero-occupant trips)

A Corporate Utility/Fleet Play
What if a “Community Design” (New Jersey) only had
  – Walking,
  – Bicycling,
  – NJ Transit Rail
  – aTaxis
for mobility.

What are the Societal Implications of that Mobility (Energy, Pollution, Congestion) ?

(Its all about Ride-Sharing)
• **New Jersey’s “Community Designs”** (32 million Trips per day) are Served by
  – The Automobile (~28 million)
  – Walking + bicycling (~3 million)
  – Bus + rail Transit (~1 million)

• **That Demand is enormously diffuse in time and space**
# aTaxi Departures per 0.1 hr. for Originations in MID-1 with DD=300, CD=SP; Total = 673,085

AVO per 0.1 hr. for Originations in MID-1 with DD=300, CD=SP; Daily AVO = 1.116

PaxMiles Served per 0.1hr. for Originations in MID-1 with DD=300, CD=SP; Total = 10,711,914
• If New Jersians are willing to wait around for a little while (< 5 minutes) for someone else to show up that is going in the same direction at the same time (“casual ride-sharing”):
  • AVO ~ 2.0 for the whole State for a whole day, and
  • Substantially higher in peak directions at peak times

• Implications:
  • Congestion is eliminated
  • Energy, Pollution and Environmental Impacts are cut in half.
Preliminary Statement of Policy Concerning Automated Vehicles

What the Levels Deliver:

Levels 1 -> 3: Increased Safety, Comfort & Convenience

Primarily a Consumer Play

Level 4 (Driverless Opportunity) : Mobility, Efficiency, Equity

Revolutionizes “Mass Transit” by Greatly Extending the Trips that can be served @ “zero” cost of Labor.

(That was always the biggest “value” of PRT; zero labor cost for even zero-occupant trips)

Primarily a Fleet Play
• Needs to be Driverless
  – With Excellent Pedestrian Recognition

• Doesn’t Need To Be...
  – Fast
  – Everywhere

• Let’s start Slow and Narrow:
  – Like CityMobile2...
  – Say 10-25 mph
    • Along a Corridor, or
    • Throughout one of the Sun Belt’s Retirement Communities
What About......
Driverless electric shuttle to be trialled in Singapore (video of Luxembourg Demonstration)
What About......

2nd Ave. Sagas
What About......
Arizona/Florida Retirement Community
Discussion!

Thank You

alaink@princeton.edu

www.SmartDrivingCar.com