Potential Societal Implications of Autonomous Vehicles

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Technical, Legal, and Social Implications of Automated Vehicles

- The majority of the conversation is on technical challenges
  - Sensors, algorithms, etc.
- Some of the conversation is on the legal challenges
  - Who’s responsible, need for insurance, etc.
- Not as much being said about the social implications
Potential Intended and Unintended Consequences

- Not suggesting these changes will happen, just that they could happen
  - We don’t know
  - Changes in the nature of travel
  - Changes in vehicle ownership
  - Changes in interactions between road users
  - Changes at the individual level
Changes in the Nature of Travel

- Will people travel further?
  - If time spent in an autonomous vehicle is more productive, less stressful, then people may spend more time in the vehicle
    - Urban sprawl
    - More energy used
    - Potential overall increase in congestion
    - Increased exposure to crash risk
  - Shared/coordinated delivery of goods and people could reduce this
    - Reduce the need to travel
Changes in the Nature of Travel

- Will people travel more frequently?
  - If autonomous vehicles are incredibly convenient, will people travel more often?
    - More energy used
    - Potential overall increase in congestion
    - Increased exposure to crash risk
    - Additional parking needs
  - Shared/coordinated delivery of goods and people could reduce this
    - Reduce the need to travel
Changes in the Nature of Travel

Will **vehicles** travel further/more often?

- If autonomous vehicles can operate driverless, will they be sent home, to satellite parking?
  - More energy used
  - Potential overall increase in congestion
- Prime real estate for parking reduced
- Vehicle miles traveled (VMT) vs. person miles traveled (PMT)
  - Implications for road funding and crash risk
MORE THAN 86% OF U.S. HOUSEHOLDS HAVE AT LEAST ONE CAR FOR EVERY DRIVER IN THE HOME, AND 28% REPORT HAVING MORE CARS THAN DRIVERS.

AAA FOUNDATION, 2016
Changes in Vehicle Ownership

Will the number of vehicles change?

- If I can afford to, and convenience is great enough, I might own four vehicles
  - Four cellular phones, five laptops, three TVs, etc.
- If shared/coordinated vehicles, or and alternative, are abundant enough I might own no vehicles
- Its likely to be both
  - Some will own fewer vehicles, others own more
Changes in Vehicle Ownership

Can autonomous shared/coordinated vehicles resolve all travel needs?

- Reliable, alternative transportation still needed
  - Personal vehicles and mass transit

- We live our lives by the clock
  - Significant amount of travel occurs in the morning and the evenings, at least on workdays
  - Shared vehicles, without shared passengers, means that the demand is likely to outstrip the supply
  - May not address congestion
Figure 12. Distribution of Vehicle Trips by Trip Purpose and Start Time of Trip
2009 NHTS.

Number of Vehicle Trips by Start Time and Purpose

Start Hour

0 1 2 3 4 5 6 7 8 9 10 11

Midnight 1 2 3 4 5 6 7 8 9 Noon 1 2 3 4 5 6 7 8 9 10 11

Vehicel Trips/Day (millions)

0 2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000 18,000 20,000

Commute Fam/Pers (inc. Shop) School/Ch Soc/Rec Total

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Changes in Interactions Between Road Users

- Eye-to-eye contact and acknowledgement is lost
  - “Do they see me?”, “Will they let me in?”
  - Waiving to a driver/pedestrian/bicyclist to proceed
  - Responding to police hand signals at crash scene or road construction site
Changes at the Individual Level

- Changes in the workforce
  - 3 million taxi, chauffer, bus and delivery jobs
  - Might be replaced by new delivery industry

- Changes in our skills
  - Will we know/remember how to drive?
    - Blackout of 2003 in US and Canada

- Changes in our physical or social activity
  - Will we get more or less exercise than now?
  - Will we get more or less time with our family?
Changes in Services

How will the infrastructure need to change:

- More parking spaces, or less
- Eliminate need for road signs, street lighting, and traffic signals
- Municipal revenue from traffic and parking tickets
- Will the workforce exist with the technical skills to
  - Maintain/repair vehicles
  - Maintain/repair the infrastructure
Changes in Services

- Physical assistance out of a dwelling and to the vehicle
- Physical assistance in and out of vehicle
Changes in Services

- Trip planning (account for traffic or construction)
- Seatbelt or wheelchair anchoring
Changes in Services

What if ....... ?

- Main entrance is closed, or disabled entrance is other than the main entrance
- The destination is new, or private property, and not on map
- No assistance is available at arrival
Understanding the Total Impact

- Autonomous vehicles could clearly provide benefits
- Make sure we understand all potential positive and negative implications
  - Ecosystem approach
- Significant need to deploy the technology to understand the implications
  - We can’t assume that we understand all of the implications in advance
The technical challenges remain substantial to achieve fully autonomous.

- For a level of personal mobility we currently enjoy.

The greatest remaining challenges to vehicle automation are not technical.

- Yet they are receiving the least amount of attention.
Thank You

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