Autonomous vehicles: The next step in accessibility?

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Expected changes and challenges
Expected changes

Autonomous vehicles:
- Management of the transition until 2025-2040
- Reorganisation of public transport by new fleet operators
- Mobilisation of all current non-car users
- Accessibility gains and related urban sprawl

Behavioural changes:
- On-line shopping growth and its delivery services (drones, delivery robots, delivery points, autonomous delivery/pick-up)
- Timing and location of work
- (Scale of formal work)
Challenges

Making the Paris 2015 real:

• Electrification of regional traffic
• Continuing growth in long distance travel/freight

Balancing work/home locations:

• ‘Optimal’ built density (m$^3$/km$^2$) and human density (m$^2$/head)
• Balanced road use (noise, emissions, quality of stay)

CBDs with radically fewer/other retail outlets

Aging of society

Potential loss of control of traffic flow

• What can the public still do?
Expected AV impacts
Some expected AV impacts

• New travellers in Switzerland:
  • Between 6 and 17: 2.3%
  • Between 65 and 80: 3.3%
  • Over 80: 3%

• Volume of empty trips: 18-53% of current car flows

• Additional capacity:
  • + 78% (Friedrich, 2015)
  • + 270% (Tientrakool et al., 2011)
Some expected AV impacts

- Lower per km costs:
  - Shared fleets (between 10-30% of the current Swiss fleet depending on service levels (See Bösch et al., forthcoming)
  - Market power in purchasing and servicing the fleet
  - Electrified fleet
  - Vehicle pooling, say doubling of the current car occupancy (see Dubernet, Rieser-Schüssler and Axhausen, 2013)

- More comfort and time usability during the ride
Expected AV impacts on accessibility
Switzerland: current general accessibility
Accessibility of Swiss Bezirke since 1850

Source: Axhausen wt al. (2011)
Demand facets | Elasticity wrt accessibility | Elasticity wrt price index
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Share out-of-home | 0.61 | -0.06
Number of trips | 0.44 | -0.19
Number of trips per journey | 0.24 | -1.66
Time out-of-home | 0.10 | -0.84
Daily VMT | 1.14 | -1.95

Accessibilities after 100% AV introduction
+78% capacity, current demand with 100% private AV
+78% capacity, pooling only, 15% more + 100% of transit
Summary of the very first assumption-driven results

• The future of transit hangs in the balance

• The gains need to be translated into a new balance:
  • More street space for pedestrians and cyclists
  • More street space for pick up/delivery points
  • Rethinking urban form

• New price systems for public transport and low income residents
Questions?

www.matsim.org
www.ivt.ethz.ch
www.futurecities.ethz.ch
www.senozon.ch

Bösch, P.M., F. Ciari and K.W. Axhausen (forthcoming) Required autonomous vehicle fleet sizes to serve different levels of demand, *Transportation Research Record*.


