Long term effects of Autonomous vehicles

Based on a Drive Sweden project:
Det automatiserade transportsystemets effekter SEVS för AD

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SEVS for Autonomus Drive (AD)

"Det automatiserade transportsystemets effekter på samhället"

Ett projekt inom det strategiska innovationsprogrammet för Drive Sweden, en gemensam satsning av Vinnova, Formas och Energimyndigheten.

Parter: SAFER, SHC, Chalmers, GU, SP, Trafikverket, Volvo Cars, VTI, Uniti, Göteborg Stad

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Systematic method to measure Societal Effects of Autonomous drive

This presentation:
Speculation about effects, based on preliminary driving force analysis.

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A Grauers
Derive effects in many steps

AD Technology
- No driver needed
- Very precise control of vehicle
- Complicated sensors & control

Transport system
- Night time delivery
- Very small goods distribution vehicles
- 2-3 times higher road utilization

Society
- High accessibility for people who cannot drive
- Increased transport
- Flexible use of city road space

Analysis of Driving forces help us find the effects

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David versus Goliath

Low speed < 20 km/h
- Few regulations ⇒ High creativity
- No driver ⇒ Little economy of scale?
- Much lower requirements ⇒ cheap sensors

Small vehicle < 50 kg
- Can stop in 1 sec / 5 m
- OK with incorrect braking
- Goods does not demand quick delivery
- Niche without existing solutions ⇒ Small development steps possible
- Little economy of scale?
David versus Goliath

So, trucks evolve into small distribution vehicles?
No, robot lawn mover evolves into transport vehicle!
What will that do to the trucks?

They will be pushed back to a smaller niche.
Driving Force story - Small distribution vehicles

**Technology**
- High cost for sensor & ctrl → Developing small low-speed vehicles
- Develop Low cost sensor & ctrl → Refine vehicle + cost reduction
- Developing Automatic container handling → Reduced no of vehicle types
- Develop veh. to handle doors, stairs, elevators → Delivery service into the houses
- Delivery service into the houses → Adapting roads for class of small vehicles
- Adapting roads for class of small vehicles → Road pricing for small vehicles
- Road pricing for small vehicles → Regulate new class of small vehicles
- Regulate new class of small vehicles → Problems with vehicles on pavements
- Problems with vehicles on pavements → Expensive delivery service – High Status
- Expensive delivery service – High Status → Refine vehicle + cost reduction
- Refine vehicle + cost reduction → Developing small low-speed vehicles

**Transport system**

**Politics**

**Societal effects**

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Different small distribution vehicles

Competent species enter a new ecosystem
⇒ Quick evolution of new species.

The family tree of Small distribution vehicles

For restricted areas (Campus / Shopping malls/...)

General purpose, mixing with people – 25 kg

In house delivery

General purpose, mixing with vehicles - 500 kg

Flying?

Robots or Vehicles?
Societal effects of Small delivery vehicles

If this happens it is …

a Revolution

for vehicle OME’s and Logistics companies

(Ex. Sensor & control development focussed on small vehicles!)

Perhaps not drastic for rest of society. Lower price & more convenient transport ⇒ just continues the existing trend.
Changes take time

- Changed life style
- New AD related business emerge
- Existing business adapts
- New transport habits
- AD built on existing vehicles
- Vehicles developed for AD
- New buildings adapted
- New infrastructure
- Changes in City structure

Now
3 yr
10 yr
30 yr
100 yr

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One Key factor – Cost & Benefit of transport

- **Commercial vehicles** (taxi, delivery, …):
  - No driver => 50% cheaper & Similar function

- **Private transport**:
  - Similar cost & Useful commuting time.

- **Public city transport**:
  - No driver => 50% less cost
  - Cheaper for user? (Today subsidised 50%)
  - Better service?

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Driving Force – Commuting time more useful

- No driver required
  - Fully Autonomous cars
  - Commuting time useful
    - Goods transport cheaper
    - More traffic
      - More effective road utilization
        - Very precise control of vehicle
      - Congestion
        - Reduced societal cost for commuting time
          - Investment analysis
            - Not cost effective to increase road capacity
        - Longer commuting time
          - Lower property price in city
            - Move further from work
Summary

• Method for analysing effects of AD. Can find and explore unexpected effects

• AD may develop outside traditional vehicle sector

• AD opens up for many new vehicle types, many are robot-like.

• Effects must be analysed in many steps, over long time, often unexpected rebound effects
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