The Driverless Future

Annual CEGSS Conference

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Outline

Introduction

Science-Fiction?

Consequences

Conclusion
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Conclusion
Road crashes are one of the most important public health issues and may be the one that gets the least attention.
Road Safety

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- Around 95% of crashes are associated with some kind of human factor.
Road Safety

• Road crashes are one of the most important public health issues and may be the one that gets the least attention
• Around 95 % of crashes are associated with some kind of human factor
• Therefore, the only way to realize Vision Zero is to remove the driver from the loop, to build driverless vehicles
Some Terms and Definitions

- Autonomous vehicles ≈ driverless vehicles ≈ completely automated vehicles
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- **Autonomous vehicles** ≈ **driverless vehicles** ≈ **completely automated vehicles**
- **Autonomous vehicles** $\neq$ **connected vehicles**
## Automation Levels (SAE)

<table>
<thead>
<tr>
<th>SAE Level</th>
<th>Name</th>
<th>Narrative Definition</th>
<th>Execution of Steering and Acceleration/Deceleration</th>
<th>Monitoring of Driving Environment</th>
<th>Fallback Performance of Dynamic Driving Task</th>
<th>System Capability (Driving Modes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No Automation</td>
<td>the full-time performance by the human driver of all aspects of the dynamic driving task, even when enhanced by warning or intervention systems</td>
<td>Human driver</td>
<td>Human driver</td>
<td>Human driver</td>
<td>n/a</td>
</tr>
<tr>
<td>1</td>
<td>Driver Assistance</td>
<td>the driving mode-specific execution by a driver assistance system of either steering or acceleration/deceleration using information about the driving environment and with the expectation that the human driver perform all remaining aspects of the dynamic driving task</td>
<td>Human driver and system</td>
<td>Human driver</td>
<td>Human driver</td>
<td>Some driving modes</td>
</tr>
<tr>
<td>2</td>
<td>Partial Automation</td>
<td>the driving mode-specific execution by one or more driver assistance systems of both steering and acceleration/deceleration using information about the driving environment and with the expectation that the human driver perform all remaining aspects of the dynamic driving task</td>
<td>System</td>
<td>Human driver</td>
<td>Human driver</td>
<td>Some driving modes</td>
</tr>
<tr>
<td></td>
<td>Automated driving system (&quot;system&quot;) monitors the driving environment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Conditional Automation</td>
<td>the driving mode-specific performance by an automated driving system of all aspects of the dynamic driving task with the expectation that the human driver will respond appropriately to a request to intervene</td>
<td>System</td>
<td>System</td>
<td>Human driver</td>
<td>Some driving modes</td>
</tr>
<tr>
<td>4</td>
<td>High Automation</td>
<td>the driving mode-specific performance by an automated driving system of all aspects of the dynamic driving task, even if a human driver does not respond appropriately to a request to intervene</td>
<td>System</td>
<td>System</td>
<td>System</td>
<td>Some driving modes</td>
</tr>
<tr>
<td>5</td>
<td>Full Automation</td>
<td>the full-time performance by an automated driving system of all aspects of the dynamic driving task under all roadway and environmental conditions that can be managed by a human driver</td>
<td>System</td>
<td>System</td>
<td>System</td>
<td>All driving modes</td>
</tr>
</tbody>
</table>
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Volvo develops the 'no death' car: Vehicles which drive themselves and are totally crashproof could be on British roads in eight years

- Vehicle will be fitted with sensors that can detect potential collisions and take action
- Firm claims 'nobody will be killed or injured in a new Volvo by 2020'

By RAY MASSEY, TRANSPORT EDITOR
PUBLISHED: 17:58 GMT, 4 December 2013 | UPDATED: 07:46 GMT, 5 December 2013

Car giant Volvo is developing 'no death' cars that drive themselves and are impossible to crash - ready for launch in showrooms within eight years.

The computerised vehicles will be fitted with high-tech sensors and will 'refuse to be steered' into other objects.

Volvo says they will be on sale to customers by 2020, but that some of the life-saving technology will be incorporated into its vehicles even earlier – from 2014 – it says.

Scroll down for video
Science-Fiction?

- Level 2 and 3 vehicles (on highways) **exist**: Infiniti Q50, Volvo, Tesla, Audi A8
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- Announcements for 2020: GM, Volvo, Ford, Google Waymo, Tesla, Uber, etc.
Science-Fiction?
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Why is it going to work this time?
“We were promised flying cars”

- No need for new dedicated infrastructure
- **Progressive** introduction of technologies: (advanced) driver assistance systems (ADAS)
First Paradigm Change in Transportation for a Century
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Some Consequences

1. Safety
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2. Mobility gains for children and people with disabilities
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6. Jobs, jobs, jobs
Mobility Scenarios

- “Business as usual”: individual vehicle ownership

Parking management becomes the management of curb space (pick-up and drop-in)

Case study of Lisbon and Helsinki: only 10% or 7% of the current fleet is needed to serve the existing demand
Mobility Scenarios

- “Business as usual”: individual vehicle ownership
  - with the addition of trips with 0 passenger (zombie vehicles)
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- Undeniable benefits: the road safety improvements are sufficient in themselves to deploy such a technology
  - the current alternative causes 1.2 million fatalities and more than 50 million injuries per year in the world
- There are risks to repeat history and make society even more car-dependent
Proactive Discussion

The time is now to anticipate and develop this technology in the best possible way

- to meet the mobility needs while minimizing negative impacts
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- to meet the mobility needs while minimizing negative impacts
- to take the opportunities to rethink the cities and our life styles
- to manage the complex and potentially chaotic transition
Eric Schmidt, Google CEO, said in 2010

“**It’s amazing to me that we let humans drive cars. It’s a bug that cars were invented before computers.”**
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Défis

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- Reliability of the system, technical development (cooperation, vehicle-to-vehicle and vehicle-to-infrastructure communications)
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  • cybersecurity
• Homologation
• Legal framework and insurances
• Acceptability of the technology and ethics
• Transition period with heterogeneous traffic of vehicles with various levels of automation
• Interactions with active modes of transportation
• Public transit and inter-city transportation
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