Tuning highways for future use
The role of the elderly driver

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Outline

- Setting the object of interest
- Some benchmarks in ‘how we work’
- Project Verzilvering
- Future scenario and microsimulation
- Future is now!
- Conclusion
Demographical change: ‘Silver drivers’ (Source: Eurostat)
Geographical change: % 65+ in 2009 vs 2040 (Source: PBL/CBS)

Aandeel (%)
- 15 of minder
- 15 – 20
- 20 – 25
- 25 – 30
- Meer dan 30
Socio-economical change (Source: Brabants Dagblad 28th Oct. 2014)

Het autobezit groeit het snelst onder 85-plussers. Slecht nieuws voor het aantal verkeersdoden.

Aantal auto’s per 1000 inwoners per leeftijdscategorie.

18 tot 65: 479
65 tot 75: 534
75 tot 85: 437
85 en ouder: 590


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Some benchmarks
Object of interest: complex object requires multi-disciplinarity

Ben Immers

Consultant at TrafficQuest (a cooperation of TU Delft - TNO - Rijkswaterstaat) and former Professor in Traffic Engineering at TU Delft (NL) and KU Leuven (B)

Marieke Martens

Professor in AIDA (Applications of Integrated Driver Assistance) at University Twente and consultant at the Department of Traffic Behaviour at TNO Human Factors
Object of interest: societal phenomenon requires ‘community building’
RWS NEXT: theme mobility (also government, water, climate)
Next to this a project-based approach: Verzilvering

- *Leitmotif - Leitmotiv*: Road administration and maintenance
- Target group 65+ drivers
- Design for all: solutions acceptable/useful for all traffic users
- THE average road user does not exist
- *Problem -> Cause -> Goal -> Solution* (not problem -> solution)
- Calling solutions ‘senior proof’ ≠ being ‘senior proof’ solutions!
- Project structure copied from orientation phase:
  1 *Vision & Lighting*
  2 *Intersections*
  3 *Road design*

... above all: practical approach
"What's right is what's left if you do everything else wrong."
Some example results

COTS within Rijkswaterstaat

- Road marking type II standard
- led lighting standard in tunnels (also highway A44)
- CROW manual 343: paragraph on ‘senior proof’ traffic signaling
Future scenario: more elderly drivers on the road


effects on traffic?
implications for road authorities?

Approach AIMSUN micro simulation (Advanced Interactive Microscopic Simulator for Urban and Non-Urban Networks; integrated transport modelling software product TSS co., Spain)

Compare Reference condition (‘ref’_2013) with Senior condition (‘senior’_2025):

- simulate scenario’s traffic volume/ users/ roads in ‘runs’
- vary characteristics of each individual car (so: ‘each driver’)
- vary road design and layout (geometry, dimension, etc.)
- increase number of ‘silver drivers’ from ‘ref’_2013 towards ‘senior’_2025
- analyze specific manoeuvres (entering, leaving, weaving on highway)
Parameter settings
(Source: ‘Ageing and Safe Mobility’ paper Immers et al.; p. 4)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Reference group 80%</th>
<th>Mildly disabled seniors 12%</th>
<th>Moderately disabled seniors 8%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed acceptance</td>
<td>1.1</td>
<td>1.0</td>
<td>0.9</td>
</tr>
<tr>
<td>Response factor</td>
<td>1.0</td>
<td>1.1</td>
<td>1.2</td>
</tr>
<tr>
<td>Reaction time</td>
<td>0.75</td>
<td>1.0</td>
<td>1.25</td>
</tr>
<tr>
<td>Position on the road</td>
<td>Preferably right lane (except trucks)</td>
<td>Preferably right lane (except trucks)</td>
<td>Preferably right lane (except trucks)</td>
</tr>
</tbody>
</table>

Response factor: measure for ‘reactivity of a driver’ (relevant in keeping distance, also in merging and overtaking)
Simulatie: zware verkeersbelasting

REFERENTIE
15% VRACHT

SENIOREN: 12% LICHT BEPERKT
SENIOREN: 8% ZWAAR BEPERKT
15% VRACHT

Lijdenen licht beperkt
Lijdenen matig beperkt
Merging (entering highway) manoeuvre
(2 lanes, 15% trucks; 10 ‘runs’, grey line=AVG)

'off peak traffic'

'busy traffic'

'ref'

'senior'

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Merging manoeuvre (2 lanes, 15% trucks; 10 ‘runs’)
Disclaimers (too many to be honest)

- Mild or moderate disability not necessarily add up to behavioral mistakes
- AIMSUN ≠ VISSIM ≠ PARAMICS ≠ ...
- Simulating = simplifying: *WYPI IWYG*O (what you put in, is what you get out)
- A future scenario ≠ the future scenario
- Traffic simulation ≠ mobility simulation
- Parameter settings standard for all variations
- 10 runs per scenario
- ‘silver driver’_2025 ≠ ‘silver driver’_2013
- Etc. etc.

**Big methodological disclaimer:**

Comparison of different road/traffic scenario’s:

*Reference condition* ('ref’):2013 ‘silver drivers’ implicitly present

*Senior condition* ('senior’): 2025 ‘silver drivers’ explicitely present
‘In theory there’s no difference between theory and practice, in practice there is.’ In other words: knowledge ≠ know how or COTS

(Source: NRC)
Merging in particular demands great deal of attention from elderly drivers (De Waard et al., 2009; Ying, 2010; Dijksterhuis et al., 2012). Why not simply make a senior proof highway merging facility?

Not ‘simply’ because of human factors: speed choice, acceleration/ deceleration in entering lane, point of entering highway related to point of informing, information overload, etc.
Automotive support systems (only selection, not complete)

- electronic stability control ESC
- anti-blocking system ABS
- adaptive cruise control ACC
  (including stop and go function)
- intelligent speed adaptation ISA/
  speed alert SA
- lane departure warning LDW /
  lane keeping assistance LKA
- forward collision warning FCW
- emergency braking systems EBS
- curve speed warning CSW
- blind spot warning BSW
- anti roll system ARS
- driver condition warning DCWS
- etc. etc.

Automated Highway Driving Assist (AHDA, Toyota)
People buy apps in app store

€ 3,59. Note: version 4.01

Augmented Driving
By imaGinyze
Open iTunes to buy and download apps.

Description
### Major release V4.0 now available with NEW and
The original Augmented Driving app available since
imaGinyze Web Site » Augmented Driving Support

What's New in Version 4.0.1
Augmented Driving now really flies on iPhone 5S 16GB

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Fortunately government, industry, knowledge institutes work together on the introduction of cooperative systems to support mobility and accessibility.
Conclusion

• Despite of all remarks on perhaps too much priority on developing road safety for car drivers: car drivers/driving need our professional attention.
• Merging requires specific attention: elderly drivers find it difficult and microsimulation underlines what might happen if... (cet. par., disclaimers, etc.)
• Government – Automotive industry – Knowledge institutes, also engineers – psychologists: we need to work together.
Tuning highways for future use means taking account of human factors, including those of elderly drivers.

Thank you for your attention!

Questions – suggestions – information?

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