Acceptance for I2V cooperative services - studying elderly drivers' preferences

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Agenda

- Our background / our specific research focus
- Underlying project history
- What is known from other projects / state of the art
- What we have done
- Limitations
- Some early results
- Discussion + what is known from other projects
- Our research roadmap and cooperation interest
part of the problem: traffic info?
The key idea behind infrastructure-to-vehicle information services

- display information inside the car
  - (dynamic) traffic speed limits,
  - road works warning,
  - traffic jams,
  - incident warning,
  - green wave guidance,
  - ...

in vehicle signage: infrastructure part of a solution / a future
in vehicel signage and the elderly – how much, where and when?
rather different context
Our background / our specific research focus

- **Jörg Pfister:** pwp-systems

- **Walter Aigner / Wolfgang Schildorfer:** HiTec, Vienna, Austria
  - European user acceptance studies in ITS and cooperative driving (16 European Framework projects since 1997)
  - ICT and elderly: preparation and co-authored European ambient assisted living programme (AAL) in 2007
Underlying project history

- Coopers (FP6) one of three FP6 flagship projects on infrastructure-to-car cooperative driving
- Testfeld Telematik
- ECo_AT
- Urban Mobility Living Lab Vienna Austria

- The same team has been dedicating (internal) resources on researching elderly populations
- So this is a rather reflective and self-critical contribution to the typical deployment project and flagship tradition
Testfeld Telematik + ECo-AT

- Aim: to provide Austrian drivers with safety and efficiency targeted real-time information to optimize traffic capacity and facilitate a (multi-)modal shift.
- Cooperative services - incident warning, speed limits, congestion warning, weather information, etc.
- Testfeld Telematik: 2011 - November 2013
- ECo-AT: European Corridor-Austrian Testtrack 2013 - 2016
- Both funded by KliEN - the Austrian climate and energy fund
- Validation study by an independent team including pwp-systems
What is known from other projects / state of the art

- CVIS
- SafeSPOT
- Coopers
- FOT/SIS
- Testfeld Telematik
- ECo-AT

- Entirely different focus in: HUMANIST, FERSI, ECTRI, AAL, …
What is known from other projects / state of the art

- Elderly drivers have never been the focus in any of those large-scale projects – but for this specific conference let us look into more detail …
What is known from other projects (e.g. Humanist)/ state of the art

- So far, assessing elderly drivers' acceptance and feedback on I2V cooperative services has not integrated strategic choices and precautions of the smarter half of this specific population segment. Many of them have successfully established routines of:
  - avoiding rush hour traffic,
  - avoiding driving under time pressure as well as
  - establishing their personal comfort zone towards the car in front as well as the cars around them.
What we have done

- In some preparatory studies within the frame of Austrian cooperative services testbed projects Testfeld Telematik and ECo-AT we have tried to blend
  - the traditional Extended Technology Acceptance Model and questionnaire;
  - participating observation (partly veiled when helping our elderly with other non-C-ITS-study-related work);
  - indirect reports from partner, non-driving passengers;
  - exploratory driving-simulation in a gaming context
  - with elderly drivers' specific mobility context.
- However we focussed on elderly drivers with strong internet usage behaviour
Limitations

- Not the typical convenience sample;
- Sample out of a historically grown specific group of elderly internet users with more than the usual relation to the researcher;
- Context of technology-deployment projects (not specific HMI or elderly-related research programmes);
- No controlled longer usage pattern;
- No validation via GPS-tracks;
- Most information from preparatory qualitative studies (small-scale forms of "driving simulation/game", bilateral exchanges (not the typical interviews);
- Significant elements of lessons learnt not within the frame of interviews/participant observation but from (rather delayed) shared stories on a voluntary basis.
Some early results I

- **Elderly’s driving reality can be significantly more complex and very different from what we expected:**
  - Many elderly drivers tended to cooperate nicely *on paper* when explicitly asked to do so („for the purposes of my work“, „my gathering answers“) but showed a broad and creative spectrum in perceiving, „reporting“ and behaving in real-time traffic situations.
  - Confirmed: importance of personal comfort zone towards the car in front as well as the cars around them.
  - Some weak evidence (participating observation):
    - long waiting time until they feel comfortable to react
    - lower than expected speed (without visible cause)
  - **We tend to have many entirely new questions**
Some early results II

- Elderly’s driving reality can be significantly more complex and very different from what we expected:
  - indirect reports: some extreme forms of speeding and lane changing where all additional information was simply „not welcome“;
  - unexpected „escalation“ issues with elderly couples;
  - severe distraction issues with some drivers (have to explicitly learn „not to focus on the device but on the real traffic“);
  - some elderly drivers seem to drive in a different reality that you do neither want to study, nor to report about ... (or some of us simply wonder how they arrive safely with hardly recognizing anything that we considered relevant). Full-body perception vs. cognition?
  - We tend to have many entirely new questions and „Driving must be very important for many in our specific sample of elderly drivers ....“
So this is a rather reflective and self-critical contribution to the typical deployment project and flagship tradition;

Probably smarter driver-assistance approaches do exist / are emerging

Probably cognitive capacity and absorptive capacity do not capture or sufficiently explain real mobility behaviour.

We assume we need to include forms of car-related self-efficacy

Studying 50+ might not be truly studying elderly drivers;

We tend to suggest elderly-specific research approaches - fully aware that this raises additional questions and ethical issues;

Typical market-research studies with their samples seem to capture only the easier part of the real population;

Probably variance increases with elderly (mobility) behaviour and a person's individual life-style and mobility-context;
Discussion – from what is known in similar projects
Perceived usefulness but other „options/tactics“ for elderly drivers?

Technology evaluation
Very high acceptance and willingness to use

If... were standard equipment in my car, I would use it regularly.

I think this technology is useful.

This technology increases my safety.

This technology is very innovative.

This technology increases my comfort.

I feel enthusiastic about this technology.

I think that this technology works reliably and faultlessly.

Driving is less stressful due to this technology.

My overall driving style would be changed through the use of...

I would purchase this technology if it is offered as special equipment.

Source: Final Evaluation Survey; n = 128 *Confidence intervals 90% ** Items mirrored to original questions
Do we all give due attention to the real mobility context of elderly?
Are elderly drivers what we expect: considerate drivers or ... different?

Driver segments

35% PERFORMANCE MINDED DRIVER
- Safe and reliable driver
- Driving means fun and enjoyment
- Tendency to exceed speed limits
- Likes to explore driving skill
- HIGH ACCEPTANCE

23% CAREFREE DRIVER
- Driving itself is not very important
- Is not too particular about traffic rules
- Occasionally drives after one or two drinks
- No emphasize on safety or ecological features
- MEDIUM ACCEPTANCE

42% CONSIDERATE DRIVER
- Avoids stressful situations when driving
- Drivers carefully and follows traffic rules
- Wants to feel safe while driving
- Is environmentally conscious when driving
- HIGH ACCEPTANCE
Where are younger researchers aware of elderly’s subtle tactics?
Why studying elderly is of double importance: The revised Innovation Adoption Life Cycle (G. Moore)
Speculative conclusion to a reflective research activity

- Maybe studying actual GPS-tracks will reduce some of our intermediate findings to phenomena of little relevance?
- Maybe a “model” of interacting with smartphones AND with users is a valid conception?
- There seem to be effective self-selection processes (certain members of the population do not use some devices or services)?
- Maybe we will somehow contribute towards a re-conceptualisation of “ageing and safe mobility”?
- Limitations: Maybe we are studying marginal or marginalised behaviour
- Interaction with transport infrastructure will remain a field of study
Our research roadmap and cooperation interest

- Hassle-free individual car usage is an important element in many elderly drivers’ mobility / quality of living
- Dense traffic situations in urban hotspots will increase
- Interaction between infrastructure and cars can significantly improve safety and efficiency
- Interaction between infrastructure, cars and USERS has further benefits - even in scenarios of autonomous driving and semi-autonomous driving
- What is the role of „smartphones“ and how can we include elderly in a dynamically changing urban mobility future?
- The term “integrated” currently shifts towards integrating different mobility stakeholders - elderly, vulnerable, … and behaviours
Our research roadmap and cooperation interest

- Talk to us on
  - European Corridor Rotterdam – Vienna
  - Urban Mobility Lab Vienna (all ideas are highly welcome)
  - C-ITS-related Horizon2020 projects
  - Blending GPS-tracking and user studies in validation approaches

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nomadic devices
Options from an infrastructure perspective
Options from an infrastructure perspective
Options from infrastructure perspective
Acceptance for I2V cooperative services – studying elderly drivers’ preferences

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ABSTRACT

Infrastructure-to-vehicle information services have the potential to increase road safety as well as traffic efficiency [1]. Typically these cooperative services display information on traffic speed limits, road works and traffic jams inside the car and provide an optional acoustic signal once new information is displayed. New generations of mobile end user devices (e. g. smartphones) have brought such services to the born digital or digital natives rather than the typical elderly driver or elderly couples in cars. Targeting co-operative I2V services to the so called silver agers and golden agers contributes to broadening the co-operative systems user base and has the potential to avoiding typical drawbacks from targeting digital natives. From a more generalized perspective this challenge has been known as crossing the chasm or marketing to mainstream consumers [2]. So far, assessing elderly drivers’ acceptance and feedback on I2V cooperative services has not integrated strategic choices and precautions of the smarter half of this specific population segment. Many of them have successfully established routines of avoiding rush hour traffic, avoiding driving under time pressure as well as establishing their personal comfort zone towards the car in front as well as the cars around them. Service idea is to support drivers in their practice of driving their car on highways in a large metropolitan area in Europe in those cases where they feel they need to ride a car. Therefore this type of service is ideally combined with adequate pre-trip information and route planners. In some preparatory studies within the frame of Austrian cooperative services testbed projects Testfeld Telematik and ECo-AT we have tried to blend the traditional Extended Technology Acceptance Model [3] and questionnaire with elderly drivers’ specific strategic mobility context. However we focussed on elderly drivers with strong internet usage behaviour.

Keywords: older drivers, technology acceptance, I2V cooperative services, extended technology acceptance model, preparatory study.

Section Choice:

REFERENCES