4th Workshop on

Bringing Together Indoor and Outdoor Mobility Solutions

Christoph Stahl

Andreas Rumsch

Mobility

- The quality of life is significantly influenced by a person’s own mobility.
- Mobility is a core requirement to participate in society on a social level.
- Factors
  - health
  - cognitive capacity
  - personal sense of safety
  - driving competence
  - access to information
- Assistive systems help the user finding the right way and transportation mode.

Topics

- Navigation, Interaction Design
- Indoor and Outdoor Positioning
- Route Planning, Accessibility
- Environmental Representations, Maps
- Transportation Modes, Transitions
- Safety, Orientation

Previous Workshops

- Bringing Together Indoor and Outdoor Mobility Solutions
  - AAL-Forum 2013, Norrköping
  - AAL-Forum 2014, Bucharest
  - AAL-Forum 2015, Ghent

- Slides and abstracts are published online at
  - **http://mobility-workshop.schwartz-stahl.de**

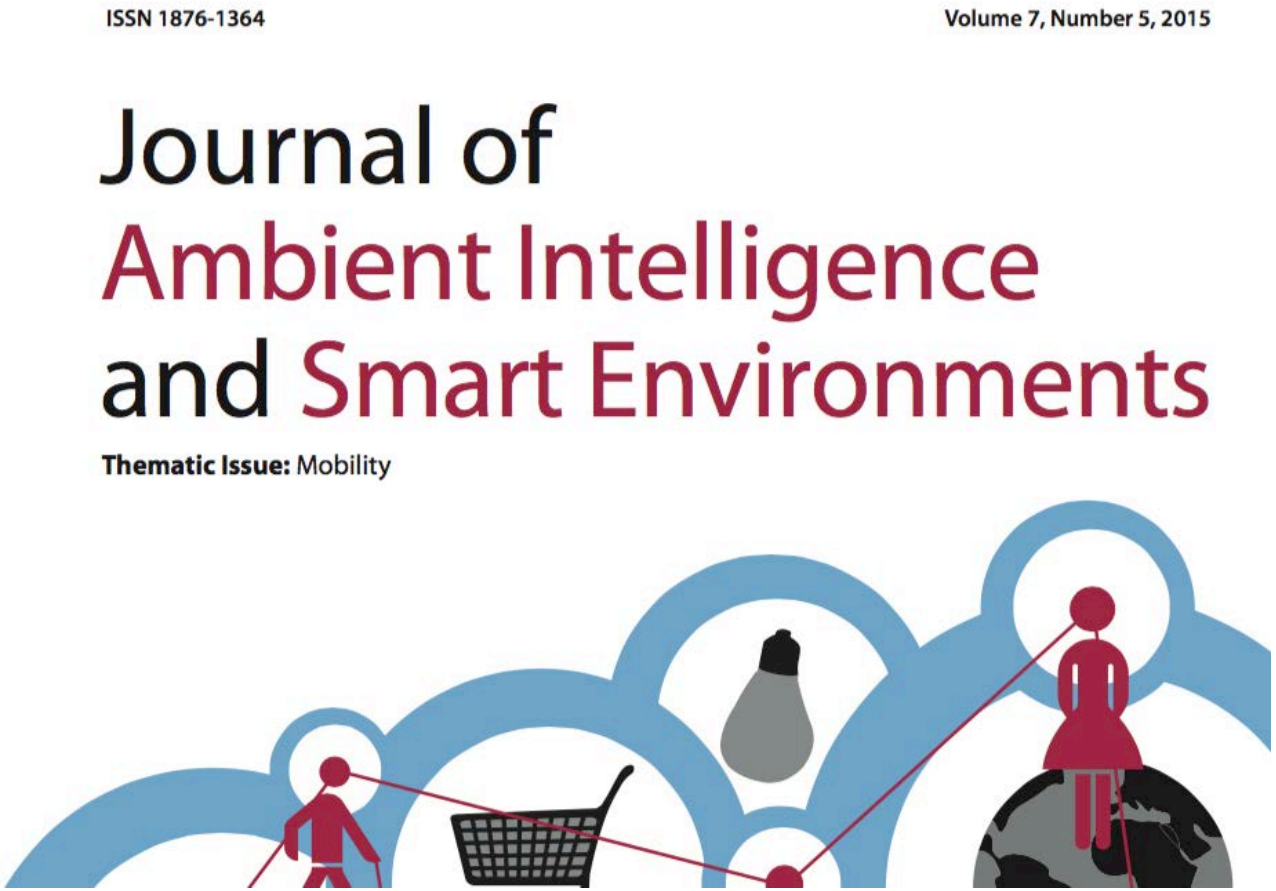
Book Chapter on Mobility Assistance

- Active and Assisted Living: Technologies and Applications, Francisco Florez-Revuelta and Alexandros Andre Chaaraoui (Eds.), IET, 2016, ISBN: 978-1-84919-987-2
  - Chapter 13:
    Outdoor mobility assistance – technologies helping on the way, by René Hempel, Christoph Stahl, Birgit Stockinger, Ferdinand Kemeth and Thorsten Vaupel

JAISE Thematic Issue: Mobility

Christoph Stahl, Bernd Krieg-Brückner, Wolfgang Zagler, Björn Gottfried (Eds.): Thematic Issue on Mobility, JAISE, Volume 7, Number 5, Sept. 2015, IOS Press.

- http://content.iospress.com/journals/journal-of-ambient-intelligence-and-smart-environments/7/5



Aim of the interactive session

- Focus today: **Bringing mobility solutions from the idea to the market**
- Share your experience
  - Problems
  - Solutions
- Goal: Make a statement about mobility solutions regarding
  - Design
  - Development
  - Marketing

Workshop Programme

Session 1		**Pedestrian Navigation**
9:15 – 9:40	**Eva Nuhn** and Sabine Timpf	Provision of personalized landmarks for the elderly
9:40 – 10:05	**Cornelia Schneider** and Viktoria Willner	Combining mobility solutions and preventive measures for prolonging independent living
10:05 – 10:30	**Daniel Bieber**, Kathleen Schwarz, Jan Alexandersson, Maurice Rekrut, Jochen Britz, Johannes Tröger	**mobisaar** – a technology-based service for the public transport
10:30 – 11:00	*Coffee & refreshments*	
12:20 – 14:00	*Lunch break + poster session*	
Session 2		**Pedestrian Navigation**
16:00 – 16:25	**Daniel Bieber**, Kathleen Schwarz, and Hartmut Asche	**EasyGoing** – Framework conditions for a nationwide and cost-effective pedestrian navigation in Germany – a feasibility study
16:25 – 16:50	**Frank Verbeek**	How smartphones will completely change the way we age
16:50 – 17:30	**Discussion** Bringing mobilty solutions from the idea to the market	

Provision of personalized landmarks for the elderly

Eva Nuhn

geoinformatics group Augsburg

Kornhausstrasse 7

9000 Sankt Gallen, Schweiz

Auf Kornhausstrasse nach Südosten Richtung St. Leonhard-Strasse

21 m

Rechts abbiegen auf St. Leonhard-Strasse

77 m

Rechts abbiegen auf Gutenbergstrasse

33 m

Gutenbergstrasse

9000 Sankt Gallen, Schweiz

https://www.google.de/maps

http://m.bahnhofplatz.stadt.sg.ch/index.php?apid=691589&jsr=1

What is a landmark?

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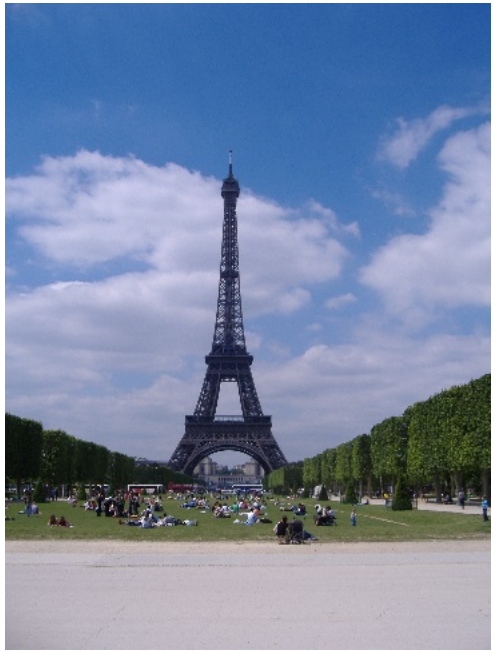
- Object which serves as external reference point
- Anything that stands out from the background may serve as a landmark
- E.g. buildings, signs, stores, or mountains
- They can be recognized through contrasts of cleanliness, age, cultural status, or use



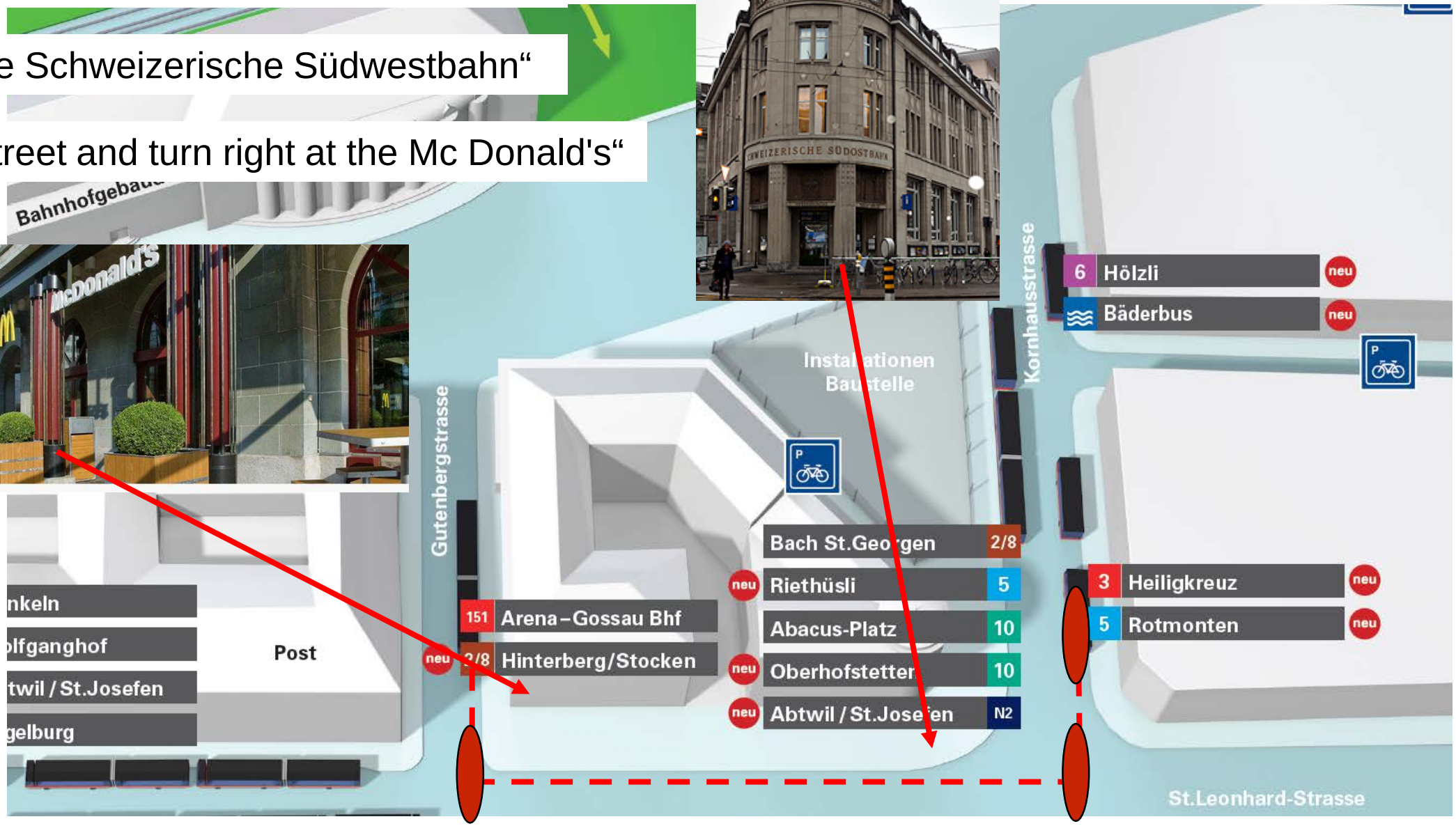
http://www.bahnonline.ch/wp/wp-content/uploads/2015/03/Verwaltungsgebaeude-SOB-Bahnhofplatz-1a-St-Gallen-84064_01.jpg

http://www.mcdsg.ch/fileadmin/_processed_/csm_restaurant-sg_1_8bcfc785d4.jpg

„Turn towards the Schweizerische Südwestbahn“

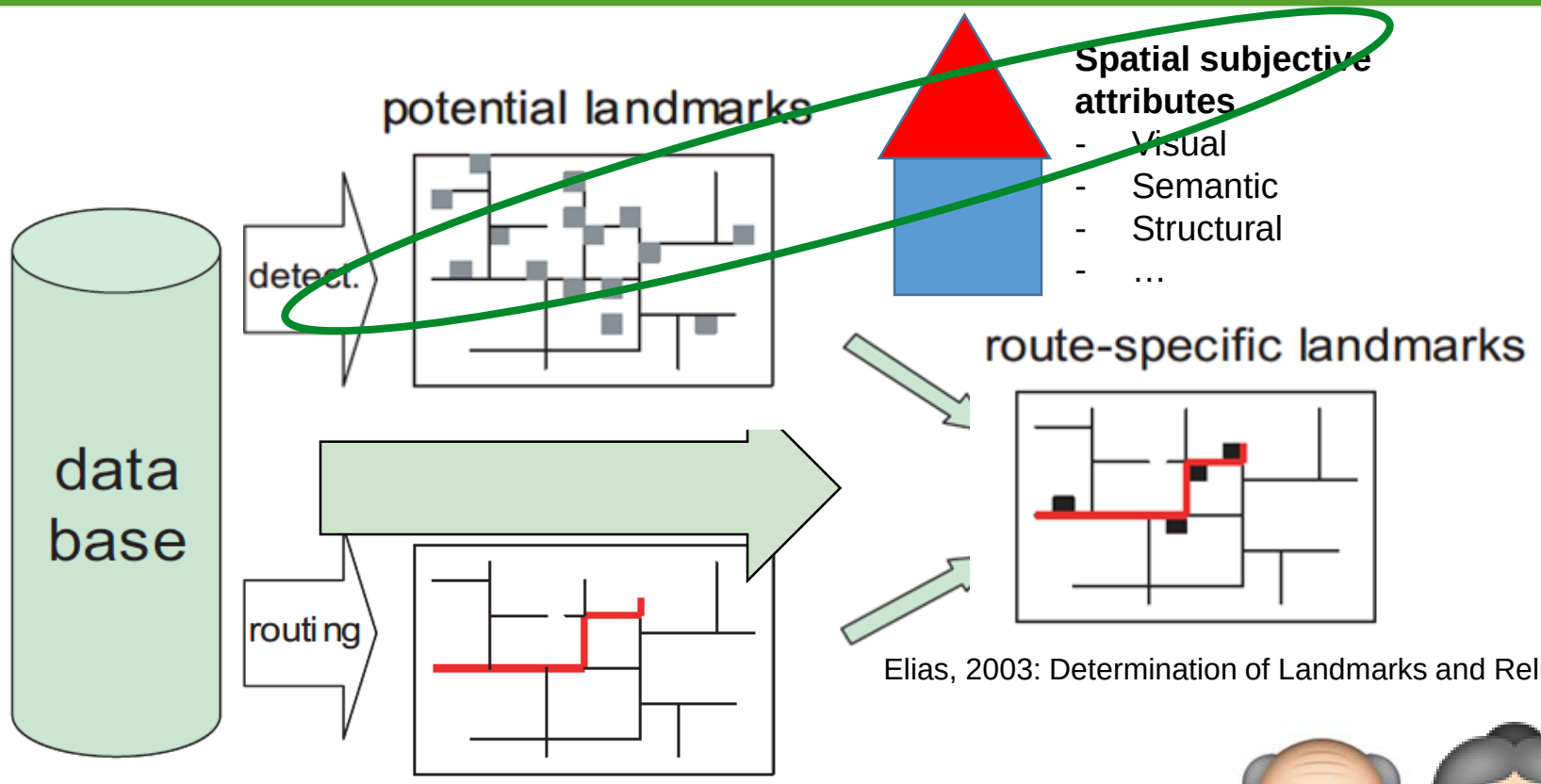
„Turn right at the Schweizerische Südwestbahn“

„Go down the street and turn right at the Mc Donald's“

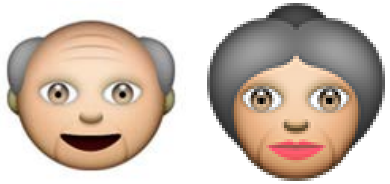


http://m.bahnhofplatz.stadt.sg.ch/index.php?apid=691589&jsr=1

Current landmark research



Elias, 2003: Determination of Landmarks and Reliability Criteria for Landmarks



- No considerations of **the personal dimension of landmarks**
- No investigation of the **integration of personal landmark information** directly **in the routing algorithms**

Why do we need personalized landmarks?

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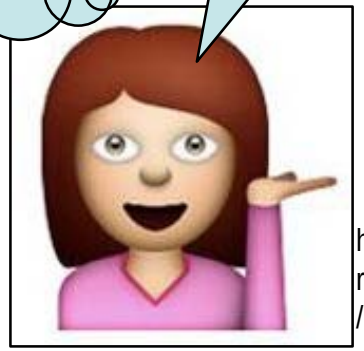
http://www.maclife.de/media/maclife/styles/tec_frontend_fullscreen/public/images/editors/2015_09/image-62924--89465.jpg?itok=okkjQn3F

„go down the street and turn right at the Apple Store“



http://0.tqn.com/d/webtrends/1/S/6/Y/-/-/infodesk.jpg

http://www.appgefahren.de/app/uploads/2013/02/Apple-Shop.jpg

http://www.martinsapples.com/media/images/retailhome.jpg

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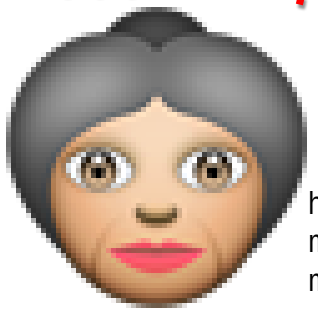

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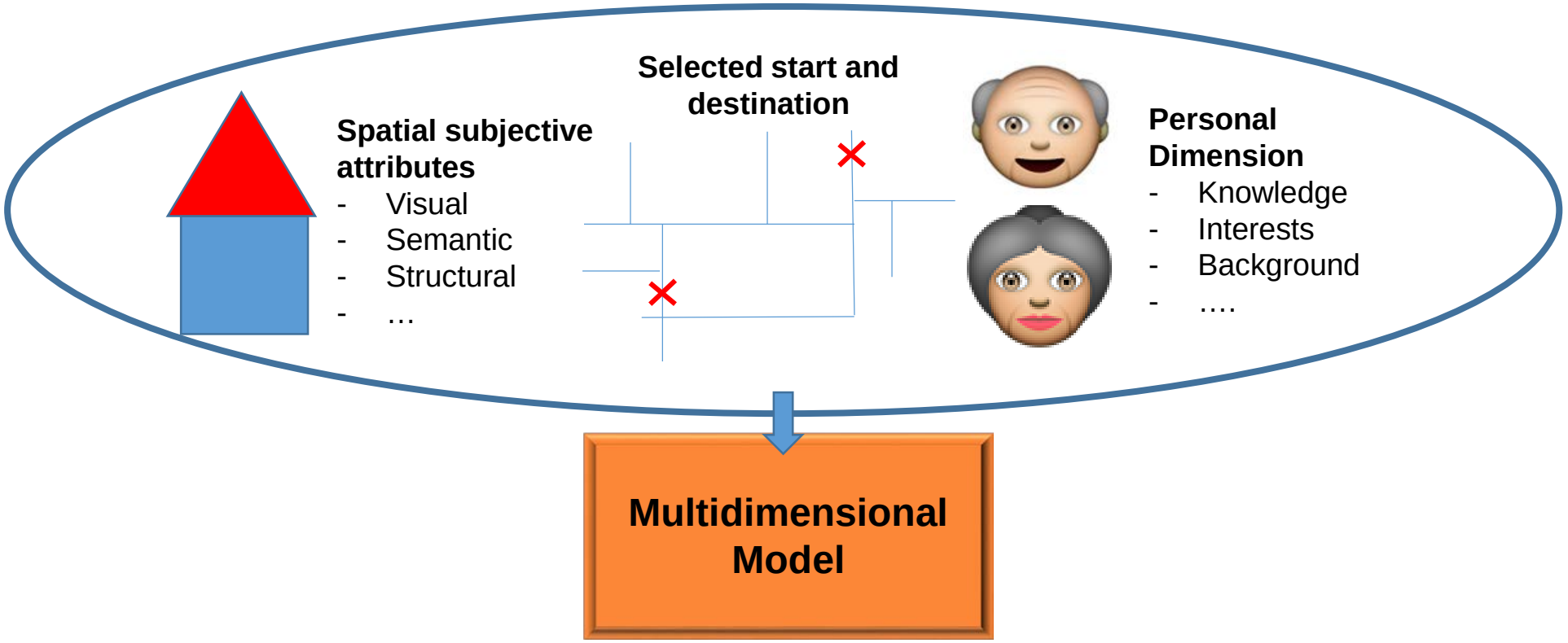
Personalized landmarks could be very helpful for the elderly to navigate through space especially if they were tailored exactly to their needs.

How can we provide personalized landmarks?



How can we provide personalized landmarks?

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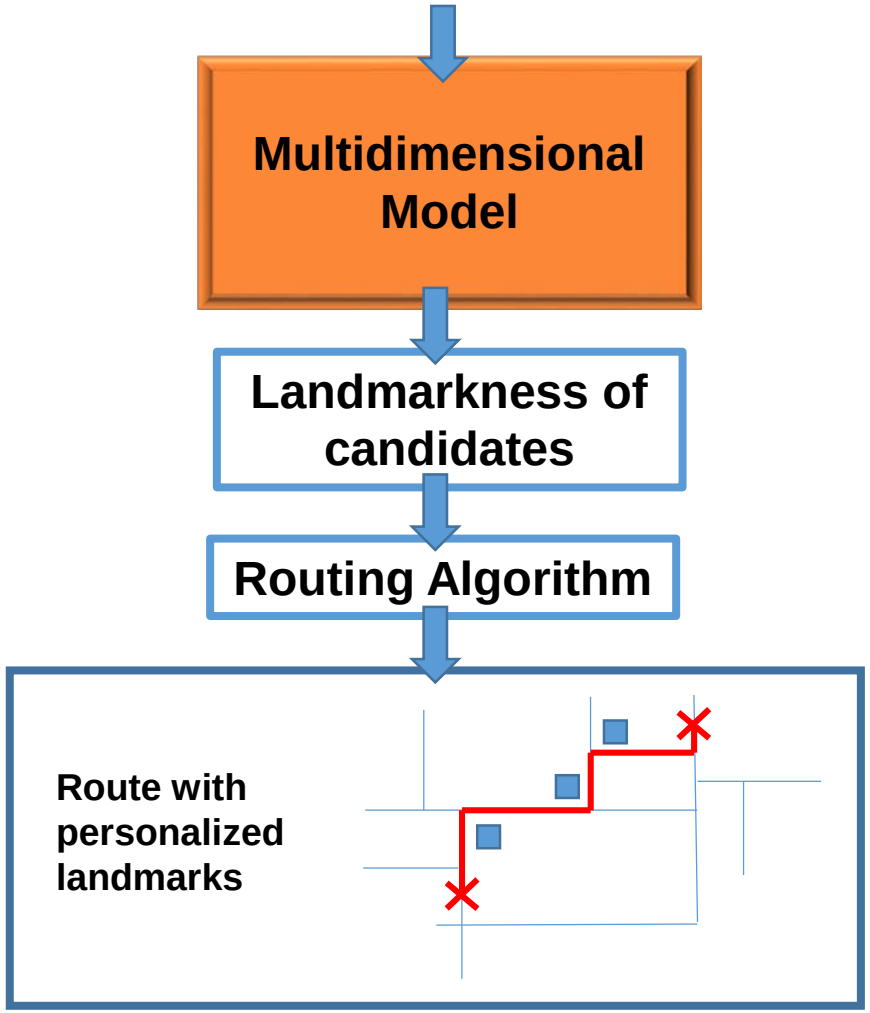

Which attributes are important for the personal dimension?

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- Personal dimension
  - User's background (Gender, age, place of birth, education)
  - User's interests (e.g. arts, theater, ….)
  - User's goals (reaching a familiar destination, reaching a novel destination, exploratory travel)
  - User's knowledge

User's knowledge

Knowledge

Familiarity has an influence on the preferences of certain types of landmarks (Quesnot & Roche, 2015)

Degree of Familiarity

Degree of Personalization

„My home“

„the city museum“

„The corn cob“

https://de.wikipedia.org/wiki/Augsburger_Hotelturm#/media/File:Augsburg_Dorint-Novotel-Hotelturm_Maiskolben.jpg

User‘s knowledge

→ in general **older adults** have **lower spatial abilities** (Ziefle and Bay, 2006)

→ Elderly people commonly have greater **difficulty retracing routes and memorizing maps** (Goodman et al., 2005)

→ Elderly people have more problems in **utilizing allocentric cognitive maps** for navigating three-dimensional environments (Wiener et al., 2013)

→ People with **dementia**: long-term memory is often less affected → older memories are often more firmly established and are more likely to be recalled than newer memories (Alzheimer’s Society, 2016)

„My former school“

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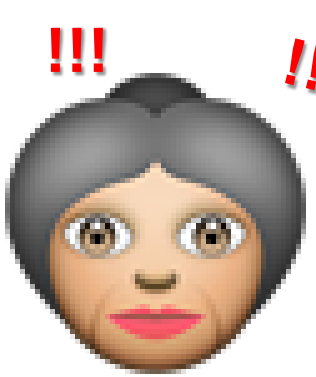

http://emojisaurus.com/images/emoji/older_woman.png

„My parent’s home“

→ *A need for personalized landmarks for elderly people?*

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Thank you for your Attention!

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Cornelia Schneider

Combining mobility solutions and preventive measures for prolonging independent living

27.09.2016

Idea of AAL

- Maintaining and improving the quality of life of older people by helping them to live independently as long as possible.

© Pixabay

Lessons learned from previous projects

- … where the focus has been on frail older people

- Challenges
  - Poor general condition
  - Suffer from several diseases (physiological and psychological)
  - Have to deal with their diseases

- Technology comes into their life
  - Additional burden rather than relief
  - Stress, particularly in the introductory phase
  - Little pleasure with the system hence little benefit

Idea

- … focus on younger seniors with little or no support needs

- Advantage
  - Good general condition
  - Are curious
  - Have time to deal with new things
  - Like to give feedback and talk about their experiences

- Technology comes into their life
  - Try it out like a toy
  - If something does not work like they expect they try again
  - Learn how to deal with new technologies when they are healthy and fit

  - Are able to use technology when it is needed
  - Technology can additionally be used for maintaining their health status

ZentrAAL - AAL Pilot Region Salzburg 1/2

- 60 younger seniors (60 – 79 years)
- Little or no support needs
- Equipped with Ambient Assisted Living (AAL)[1] services

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[1] AAL – Ambient Assisted Living: Innovative ICT-enhanced solutions/services for ageing well

ZentrAAL - AAL Pilot Region Salzburg 2/2

In ZentrAAL the term “comfort” is interpreted differently:

- Empowering older people (in sheltered housing schemes) to be able to deal with (simple) activities themselves
- Maintaining or even improving functional abilities
- Prolonging independent living (and to reduce/delay care demand)
- Being supported in dealing with the system by employees of social care organizations

ZentrAAL areas

My fitness - preventive measures for prolonging independent living

- Maintaining the current health status through enhancing everyday life activities by proposing individually tailored motion activities
  - Vital signs
  - Everyday life activities
  - Overview
  - Self assessment
  - Exercises
  - Rewards

Devices - fitness/activity monitoring

- Smartwatch for activity recording
  - Accelerometer
  - GPS
  - Heart rate
  - Emergency button
- Tablet
  - Exercises
  - Daily activities
  - Emergency button
- Scale (ANT+)

Data fusion for fitness/activity monitoring

- Automatically
  - Step count
- Activity recognition
  - Cycling
  - Running
  - Walking
- SOS – outdoor emergency
  - Call centre
  - GPS position (if older than 15 minutes - ignored)

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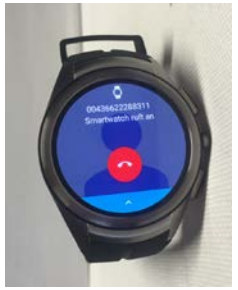

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Outlook

- Field trial May 2016 – June 2017
- Evaluation 2017

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Questions?

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Thank you for your attention!

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mobisaar

A Technology Based Service and a Service Based Technology for the Elderly and Handicapped in the Public Transport

4th Workshop at the AAL Forum 2016

Bringing Together Indoor and Outdoor Mobility Solutions

September 27, 2016
St. Gallen, Switzerland

Prof. Dr. Daniel Bieber, Kathleen Schwarz
iso-Institut, Saarbrücken

Dr. Jan Alexandersson, Maurice Rekrut, Jochen Britz, Johannes Tröger
DFKI, Saarbrücken

GEFÖRDERT VOM
Bundesministerium für Bildung und Forschung

mobisaar
Mobilität für alle

Three Prime Reasons

- **Demographic Change**

  Decreasing and ageing population with a raising number of disabled citizens

- **Spatial Development**

  Vicious circle of public transport:
  Lower demand → progressive reduction of supply

- **Sustainable Development of Mobility**

  Great necessity of economic, environmental and social innovations due to increasing number of disabled inhabitants and of persons with chronic deseases

Three Prime Elements of mobisaar

Three Target Groups

- Elderly population
- Disabled citizens or residents with reduced mobility
- Citizens who are cut off from public transport system

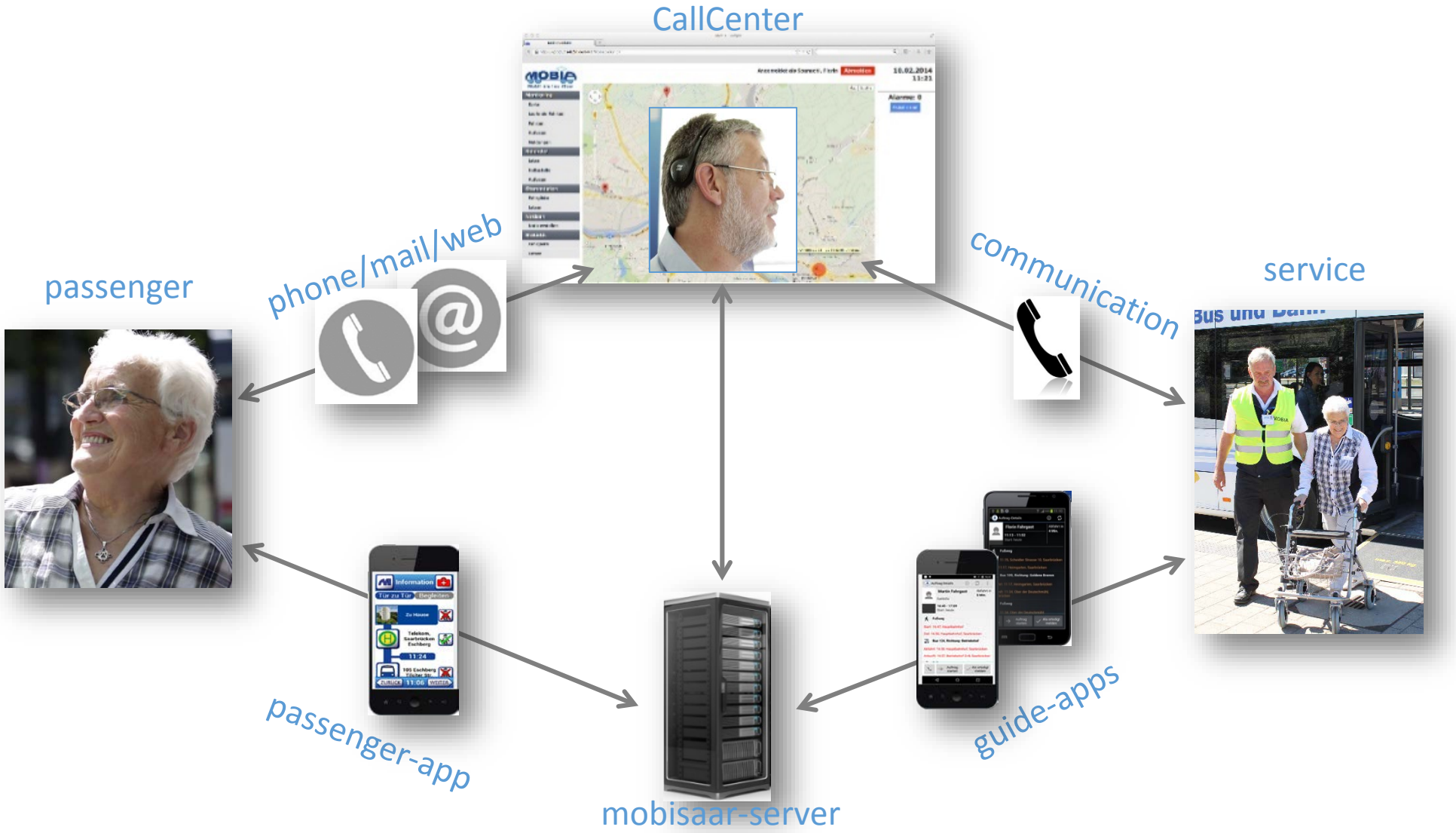
Three Types of Guides

- Full-time guides, financed by state-subsidised employment
- Volunteers
- „Spontaneous guides“ – organized by apps on smartphones (e.g. students)

In the City and in the Countryside

- In densely populated urban and sub-urban areas
- In rural areas with hardly existing public transport services
- In rural areas with non-existing public transport services

Processes of mobisaar

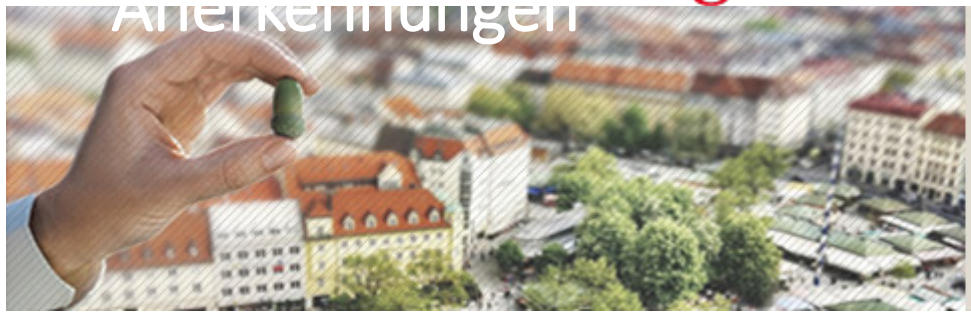


mobility for every citizen!
innovative services for the public transport in the demographic change

mobisaar

AWARDS

Robert Bosch Stiftung



Der Deutsche Alterspreis
Ideen im Alter. Ideen fürs Alter.

2015

http://www.bosch-stiftung.de/content/language1/film/mp4/Senior_Award_2015_Mediathek.mp4

Research in Germany
Land of Ideas

2013/14

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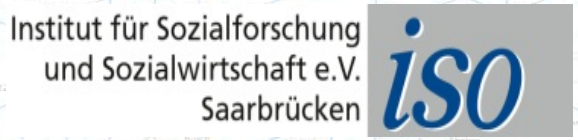
InnovaKomm-competition:
1 of 5 winners, 5 Mio. €, 5 years

2015

Cooperating Partners of mobisaar



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66117 Saarbrücken

Service-Hotline: 06898 500 4000

www.mobisaar.de

mobisaar
Mobilität für alle

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9:15 – 9:40	**Eva Nuhn** and Sabine Timpf	Provision of personalized landmarks for the elderly
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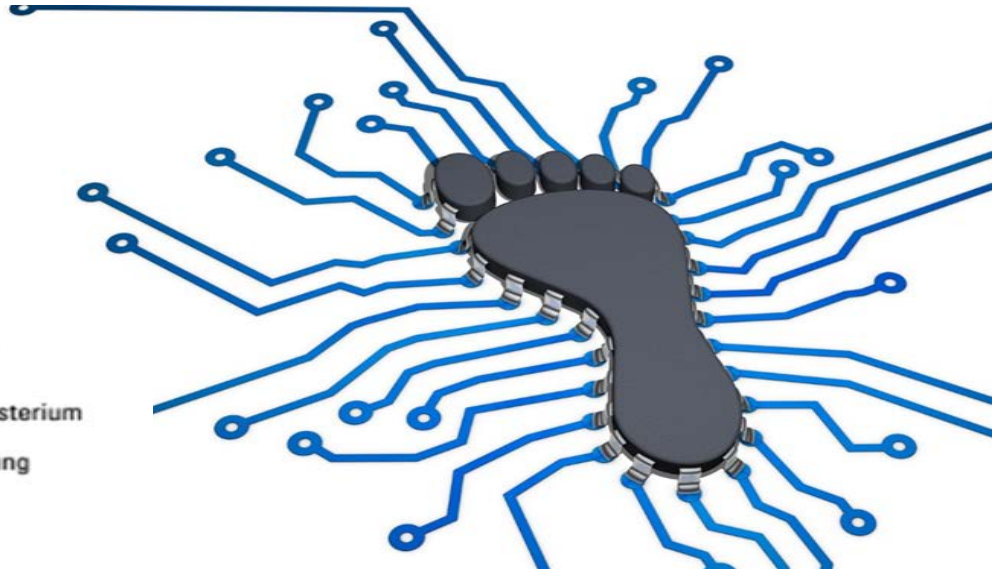
EasyGoing

AN APPROACH TO IMPLEMENT COST-EFFECTIVE AREA WIDE DATA SOURCES FOR THE PEDESTRIAN NAVIGATION IN GERMANY –

A FEASIBILITY STUDY

Prof. Dr. Daniel Bieber, Kathleen Schwarz, ISO-Institut, Saarbrücken
Prof. Dr. Hartmut Asche, Universität Potsdam



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Universität Potsdam
VDI|VDE|IT
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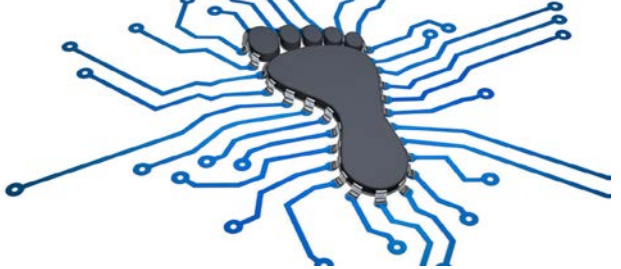
Pedestrian Navigation – What is so special about it?



- Mobility at low speed
- Main focus on the orientation
- Orientation by the use of landmarks
- It ensures a great freedom of movement

Who is „the“ Pedestrian?

Characteristics

- Without disabilities
- Reduced mobility
- Motor impairment
- Visual impairment
- Hearing impairment
- Mental disabilities
- Analphabets

Devices

- (Power) wheelchair
- Walker-rollator
- Other devices

Pedestrians

Requirements

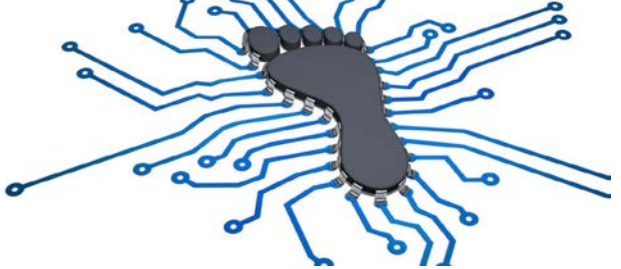
- Security
- Accessibilty (incl. buildings)
- Social participation
- Temporary hindrances
- Time-disctance-economy

Motivation

Leisure
- Culturel activities
- Sightseeing
- Shopping

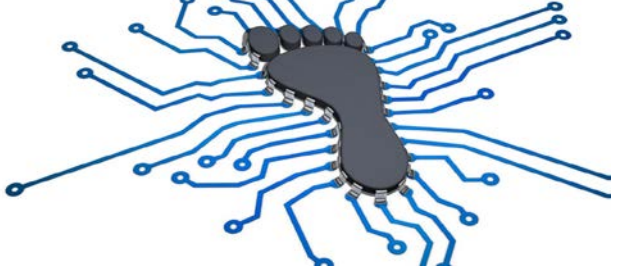
Business trip

Qualitative Survey of potential users



- Qualitative interviews (n=11)
- Guideline with items to determine…
  - which geographical data are relevant for pedestrians,
  - the reasons for the use of technology,
  - description of experiences made with systems currently available on the market,
  - personal details.
- Evaluation through content analysis

Qualitative Survey
- Results I -

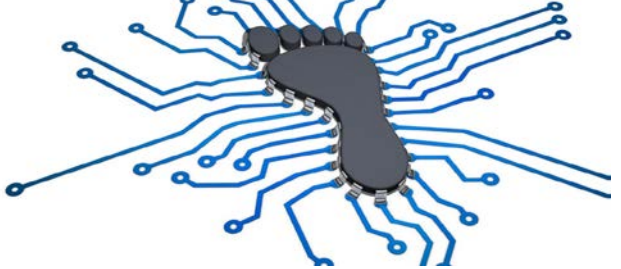


Typical characteristics?

- Programme: Google Maps
- Typical: the route planning is first made on the PC,

  if one wants to be on the safe side, a smartphone is taken along the way

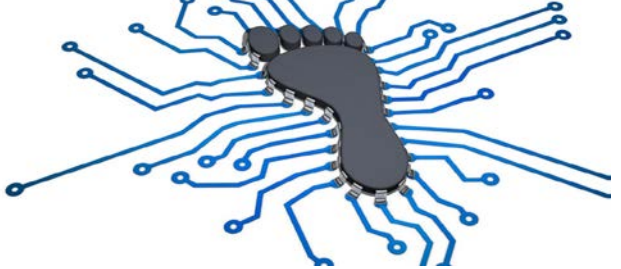
Qualitative Survey
- Results II -



Technical Solutions for the use of pedestrian navigation (away from an entire smartphone solution)

- specific user requirements (visual impairment/reduced mobility/motor impairment)
  - voice guidance
  - vibration
  - smartWatch
  - intelligente clothes
  - augmented Reality (additional information/gamification)
  - man-implants interface
  - intelligent white stick

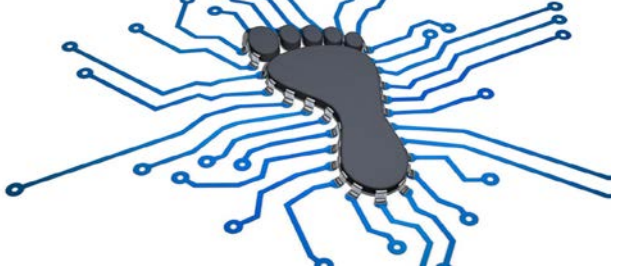
Qualitative Survey
- Solutions III -



Technical problems that have to be solved!

- the battery power dwindles too fast due to GPS-tracking and mobile data use
- how should we deal with the large amount of data resulting from the complexity of maps in future?
- how should the user requirements friendly data filtering look like?
- smooth transition from outdoor to indoor-navigation (administrative bodies, rail stations, airports, etc.)

Qualitative Survey
- Solutions IV -



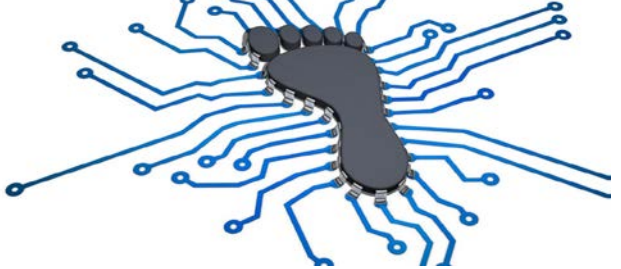
Social participation/independency

- navigation system as a mean for persons with disabilities
- increasing of independency and the feeling of autonomy
- not to be dependent on others

Multimodale journey (beyond national borders)

- Different transportation option can be offered in one single route (board walk, public tranjsport, taxi, car, plane)
- several action alternatives during navigation(restaurant, shopping, meeting friends)

Qualitative Survey
- Solutions V -



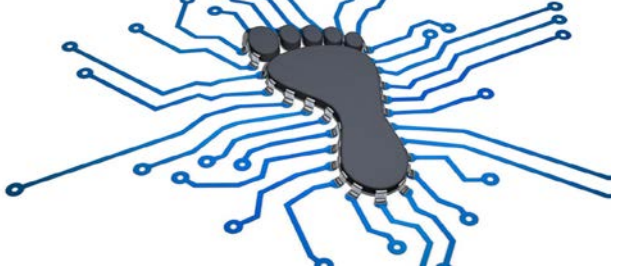
Protection of personal data and transparency

- inadequate knowledge of the saving of appropriate data, the duration and what provider should do with the data
- parties: can not be changes/ can not be accepted

Willingness to pay for pedestrian navigation

- The willingness to pay can only be increased through attractive additional functions / new technical solutions / accurate positioning

Conclusion



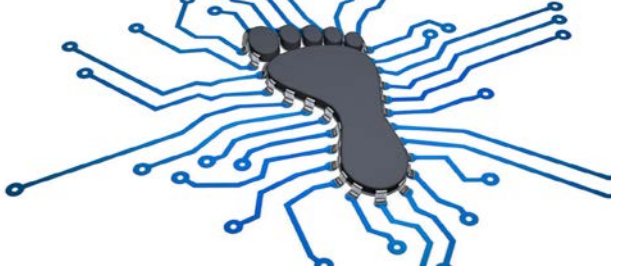
- Results
  - Only isolated solutions are available
  - Heterogeneous data collection
  - Non-existing guidelines and solutions to create data
  - Non-appropiate data set for pedestrian navigation

- Standards for object types and methods for recording are to be developed

- For optimal routing, a high degree of individualisation in filtering data is crucial

- Automation of processes and methods to gather data, to processing data and to updating data for a cost-effective data set

Contact



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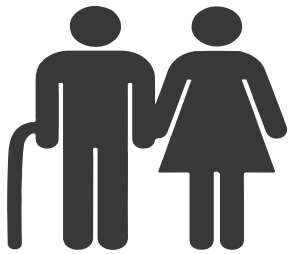
Workshop Programme

Session 1		**Pedestrian Navigation**
9:15 – 9:40	**Eva Nuhn** and Sabine Timpf	Provision of personalized landmarks for the elderly
9:40 – 10:05	**Cornelia Schneider** and Viktoria Willner	Combining mobility solutions and preventive measures for prolonging independent living
10:05 – 10:30	**Daniel Bieber**, Kathleen Schwarz, Jan Alexandersson, Maurice Rekrut, Jochen Britz, Johannes Tröger	**mobisaar** – a technology-based service for the public transport
10:30 – 11:00	*Coffee & refreshments*	
12:20 – 14:00	*Lunch break + poster session*	
Session 2		**Pedestrian Navigation**
16:00 – 16:25	**Daniel Bieber**, Kathleen Schwarz, and Hartmut Asche	**EasyGoing** – Framework conditions for a nationwide and cost-effective pedestrian navigation in Germany – a feasibility study
16:25 – 16:50	**Frank Verbeek**	How smartphones will completely change the way we age
16:50 – 17:30	**Discussion** Bringing mobilty solutions from the idea to the market	

4th International Workshop on Methodological Approaches for Navigation, Localization and Environment Modelling

27 September 2016

Aging challenges:



Loneliness:

30%
feels lonely

Security:

16%
sometimes unsafe

Active:

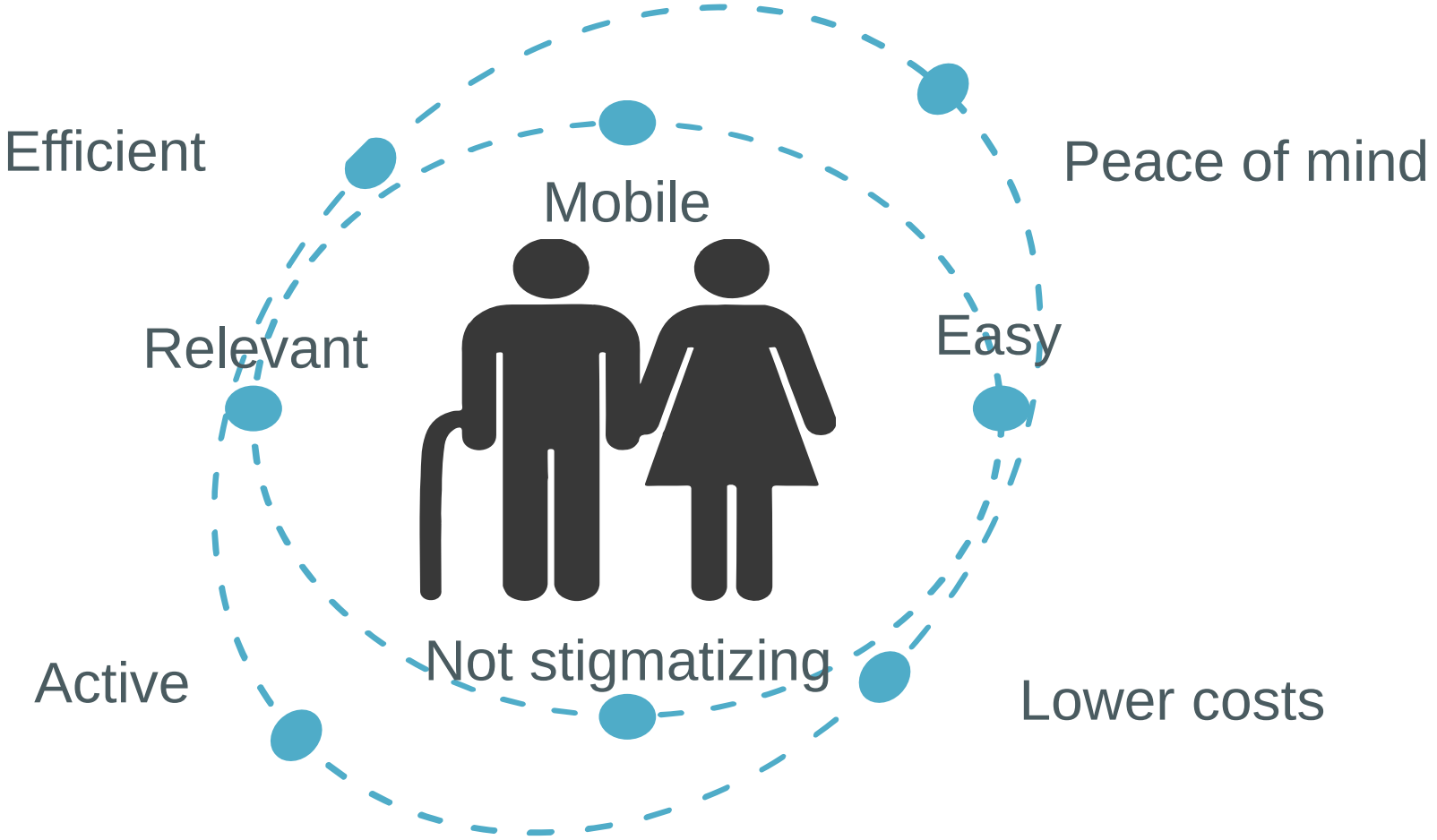
15%
not coming outside

Falls

1% of total health care expenditure

2030

User centric for all relevant stakeholders:

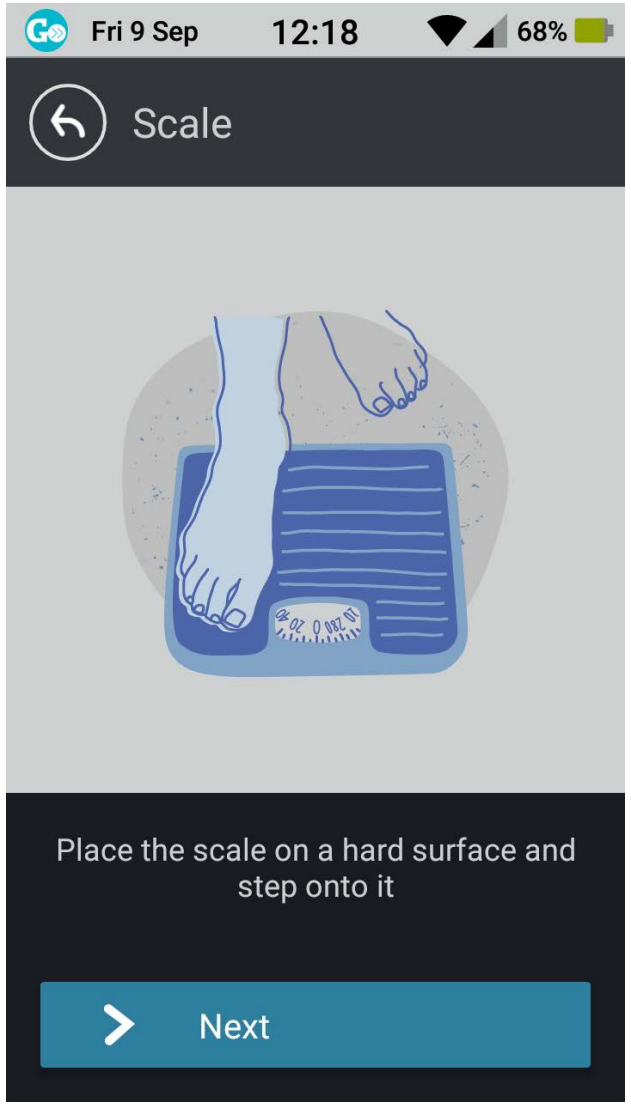


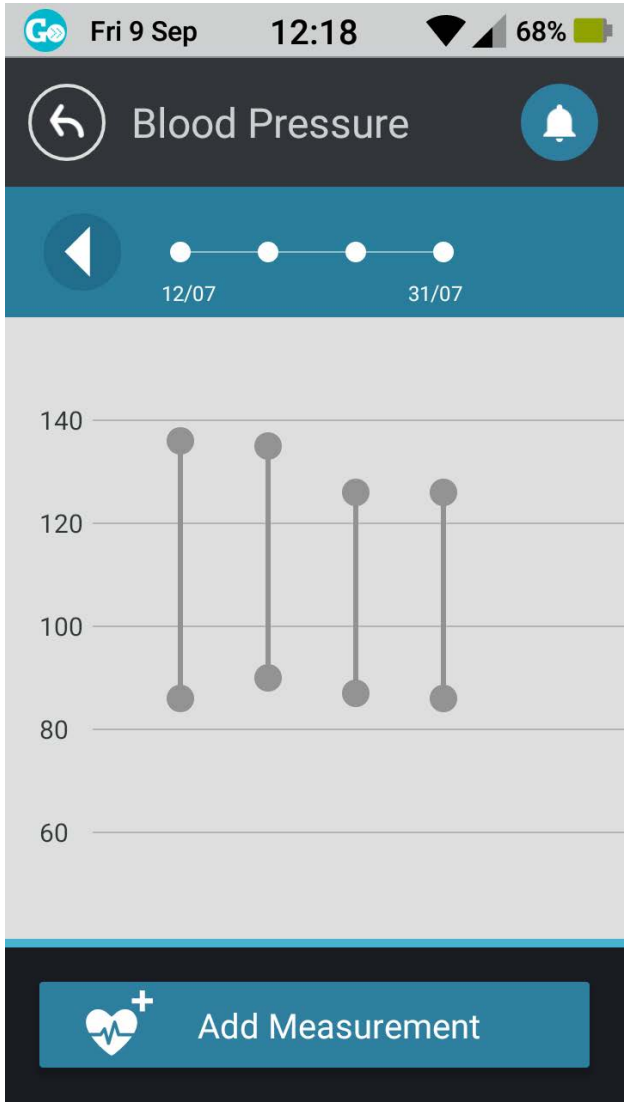
Smartphone more important for seniors than young generation:

The smartphone will become a smart-companion

What we offer:

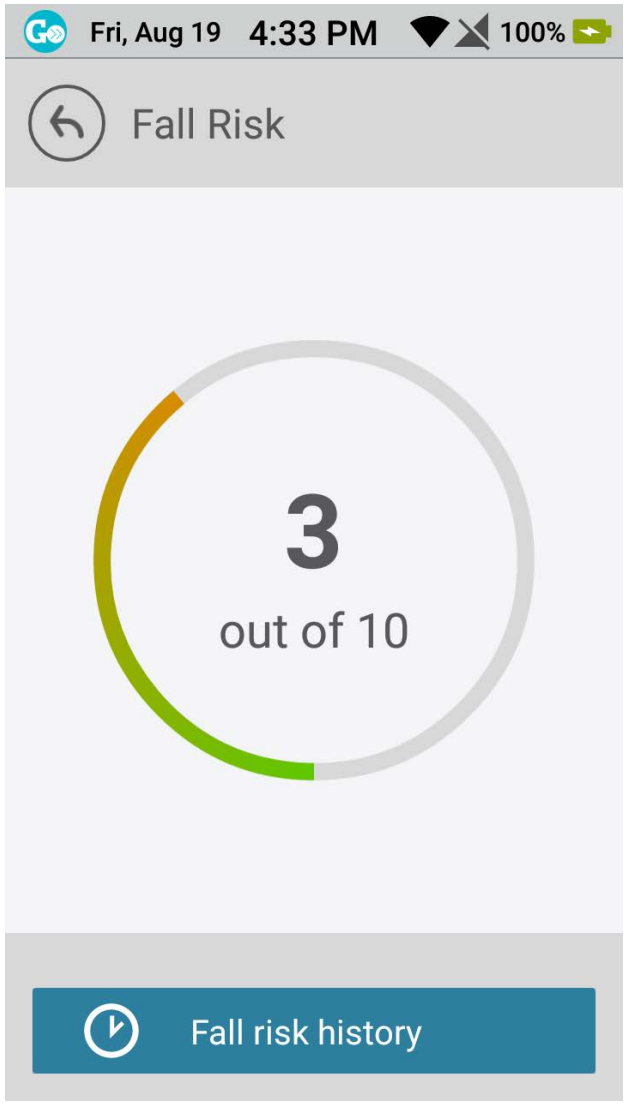
Health analytics:

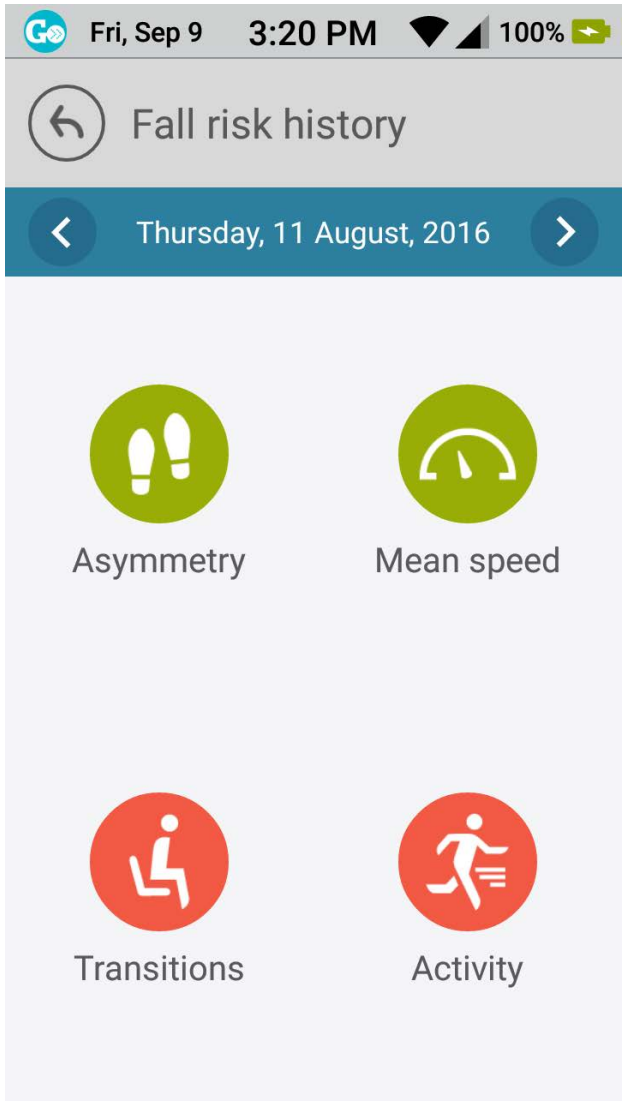




“ Trend and abnormality indication ”

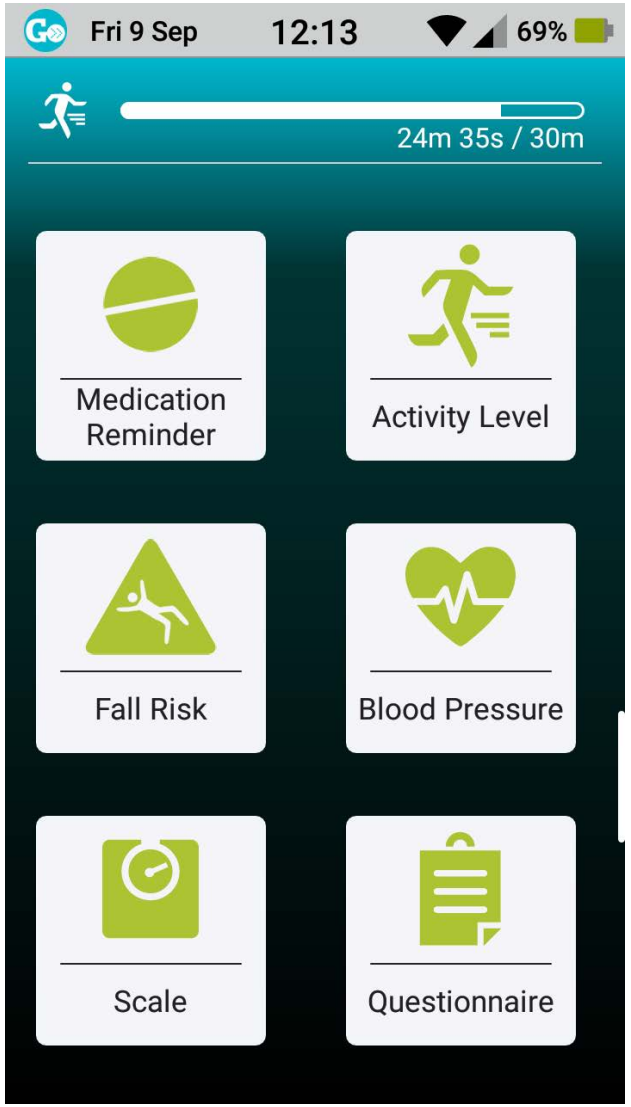
Prevention:

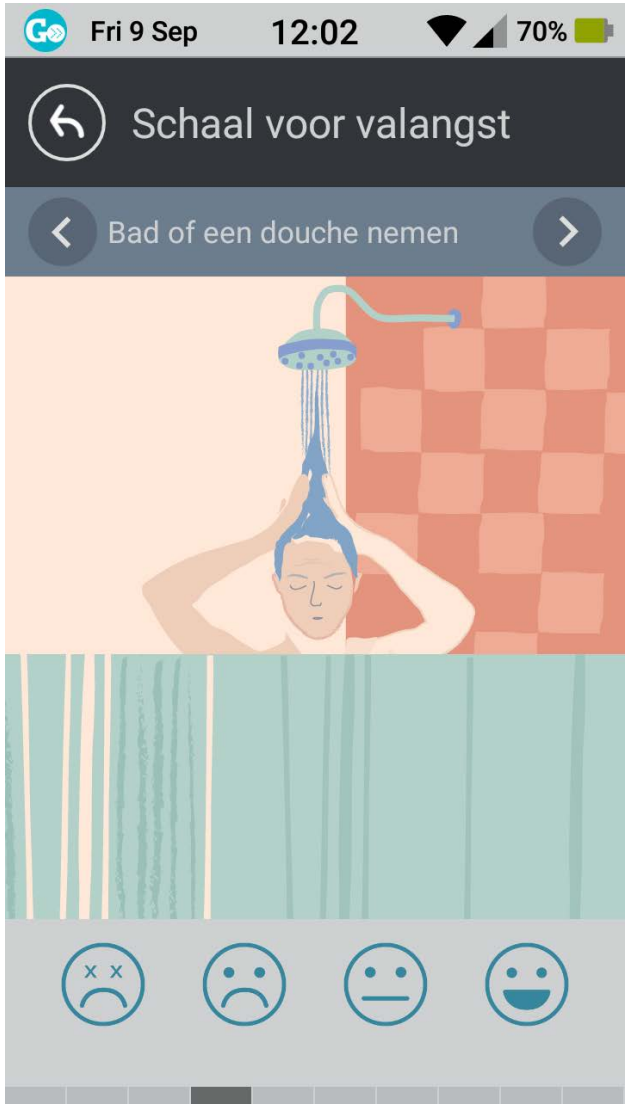




“ Catch your clients before they fall..! ”

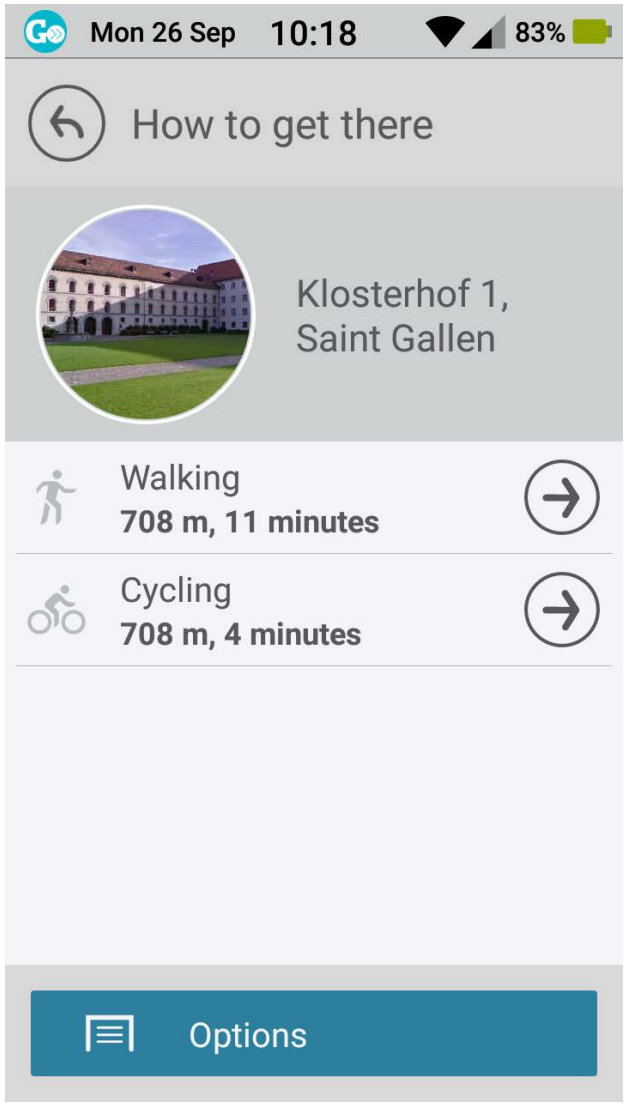
Quality of life:

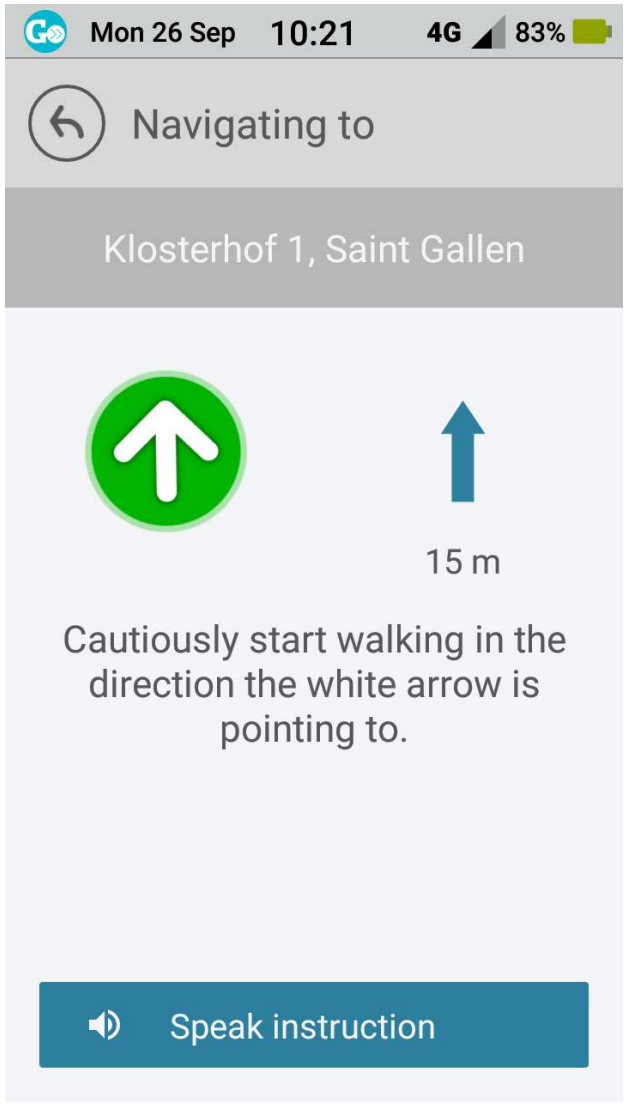




“ besides objective, also subjective data “

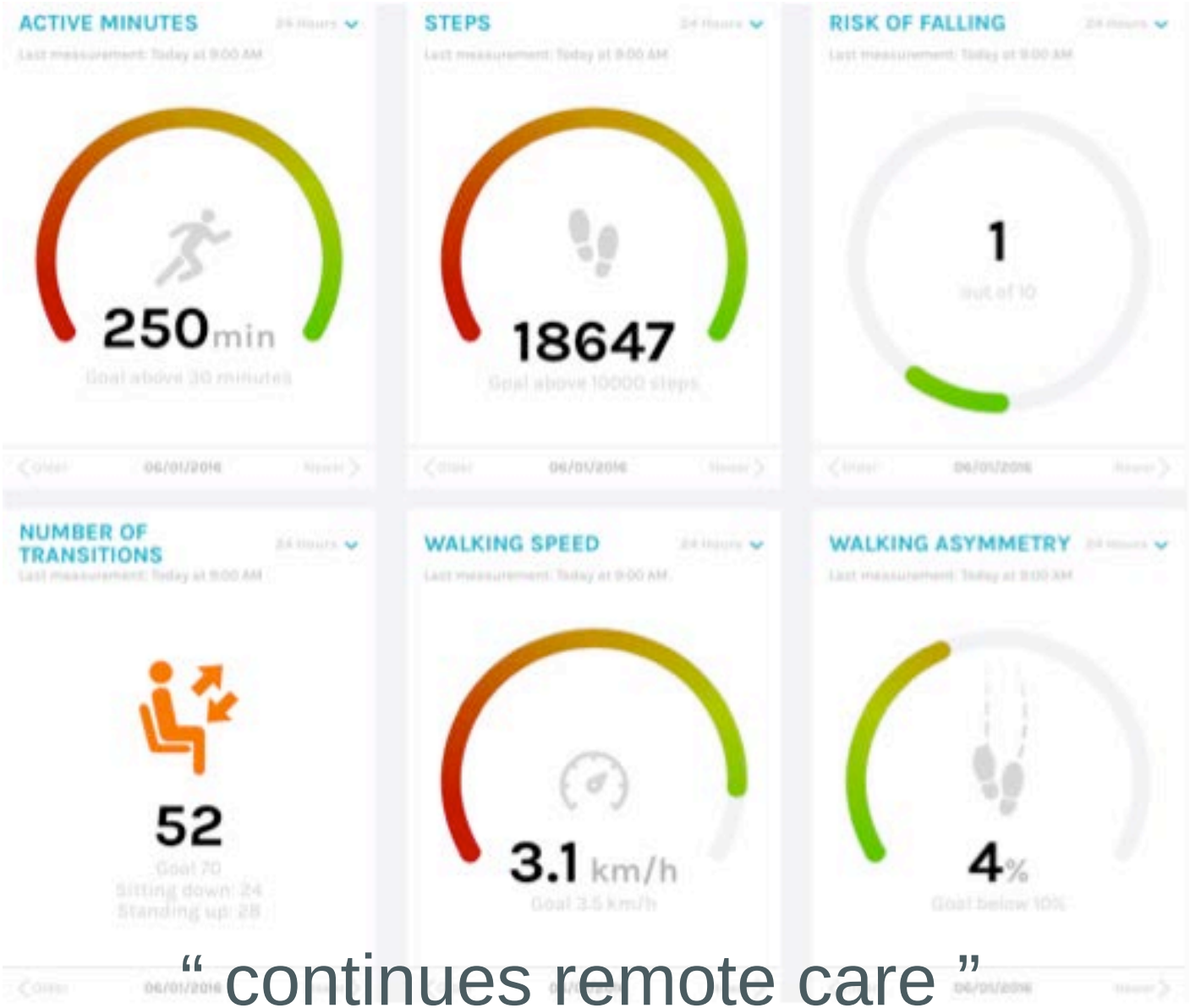
Mobility & safety:





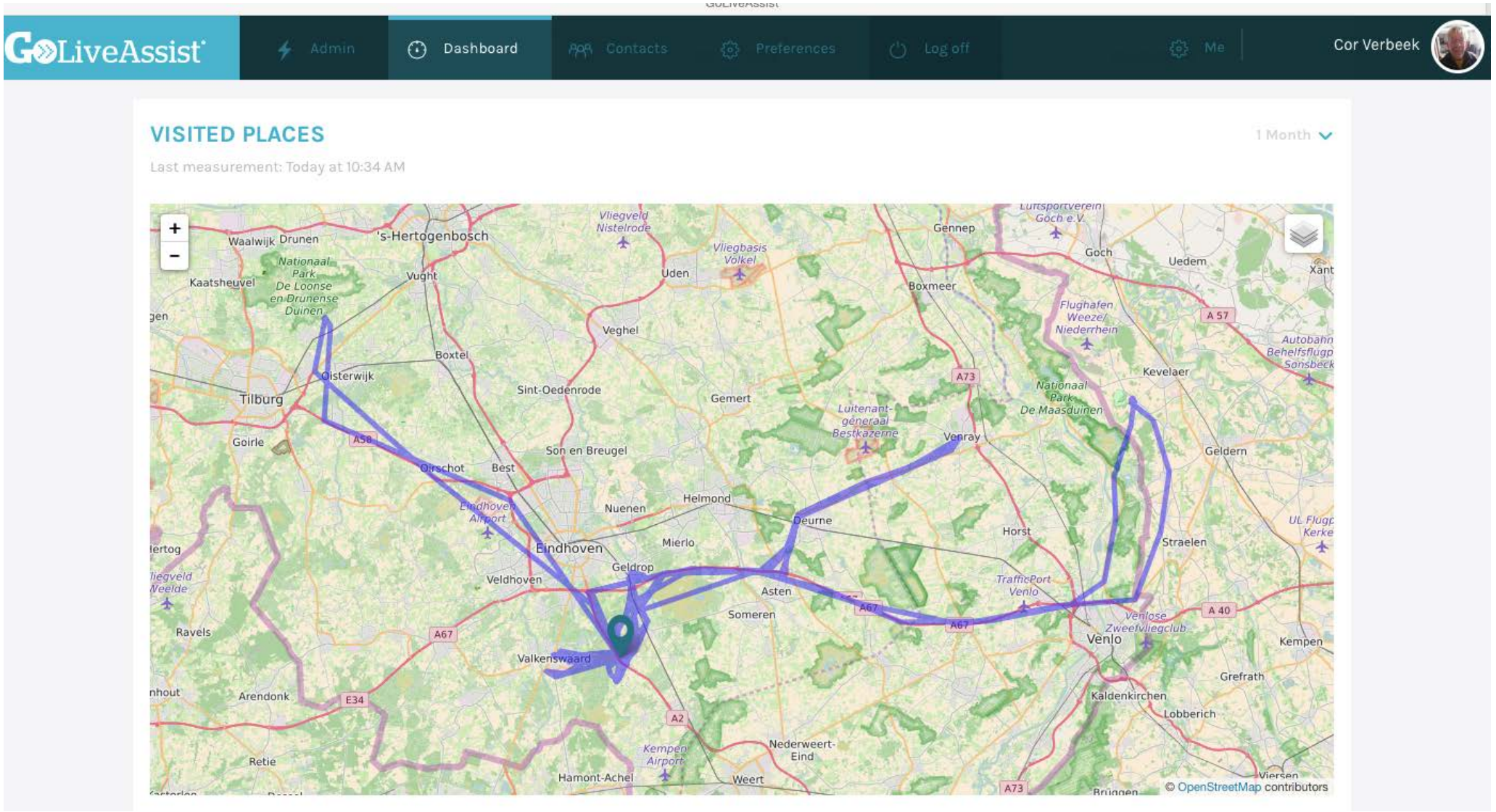
“ Polygonal safe zones “

GoLiveAssist dashboard:



“ continues remote care ”

GoLiveAssist dashboard:



“ continues track & trace ”

Longterm road map:
Tricorder for older adults

“ every six month new functionalities ”

www.gocietysolutions.com

Bringing solutions from the idea to the market

- AAL has invested more than 400 million Euros to initiate ICT-based solutions.
- Why have only a few of these projects found their way on to the market?
- Why is there no major impact?

[Urs Guggenbuehl, Ian Spero]

We should ask the users what they need

- Around 1900, users would ask for a faster horse instead of a car
- User-Centered Design, Participatory Design, Living Labs
  - In research, these methods are well established in AAL
  - Industry? Startups?

Nice solution, but I am not that old to need it

- Acceptance of solutions

Nice solution, but I am not that old to need it

- Acceptance of solutions
  - Stigmatizing effects
- Sales arguments must focus on being smart, stylish
- How to reach the target group
  - TV, WWW, Facebook, what now, what next?

Investments

- Research output: positive evaluation, working prototype
- Should we further invest here?

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- Should we further invest here?
  - High risk
  - Need for tools, industrial design
  - Similar products might have already failed for unknonw reasons
- Big investors required for funding with risk
  - Matchmaking
  - Market research data required for arguments

Distribution

- Where to actually offer and sell AAL products
  - Online
  - TV
  - Shops

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  - Online
  - TV
  - Shops
- History is repeating
  - What happened with new product categories: Radio, TVs, PCs, etc.

Linked Open Data

- Semantic Web technologies
- Make government data available to the public
  - Geodata for pedestrian and indoor navigation