Development, Implementation (Pilot) and Evaluation of a Demand Responsive Transport System

evs30 The 30th International Electric Vehicle Symposium & Exhibition
October 9–11, 2017 Messe Stuttgart, Germany

Mascha Brost[1], Matthias Klötzke[1], Gerhard Kopp[1], Oliver Deißer[1], Eva-Maria Fraedrich[2], Katharina Karnahl[3], Tim Sippel[4], Alexander Müller[5], Stefanie Beyer[5]

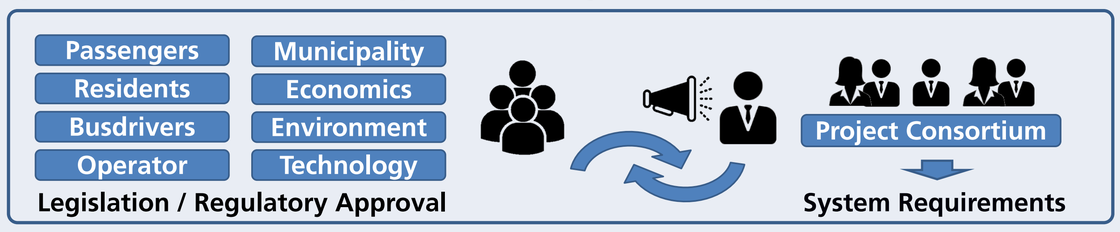
German Aerospace Center, [1]Institute of Vehicle Concepts, [2]Institute of Transport Research, [3]Institute of Transportation Systems
[4]University of Stuttgart, ZIRIUS, [5]Hochschule Esslingen, University of Applied Sciences, Faculty of Automotive Engineering
Corresponding author: mascha.brost@dlr.de

Development of a Demand Responsive Transport System

- Innovative public transport bus system without fixed routes, timetables and stations
- Scientific approach: "real-world laboratory"
- Development of an operation concept and routing algorithm
- Operation via smart phone application and telephone order system
- Implementation and operation in the municipality of Schorndorf for one year
- Development of task-specific vehicle concepts

	Participation	Operation Concept	Vehicle Concept
1	Initial position	Specification analysis	Spec. management
2	User perspective	Architecture	Drafts/Sketches
3	Expert perspective	Implementation	Concepts
4	Pilot phase	Testing/pilot phase	Construction
5	Public dialogue	Evaluation	Demonstrator
Knowledge Management			
Project Coordination			

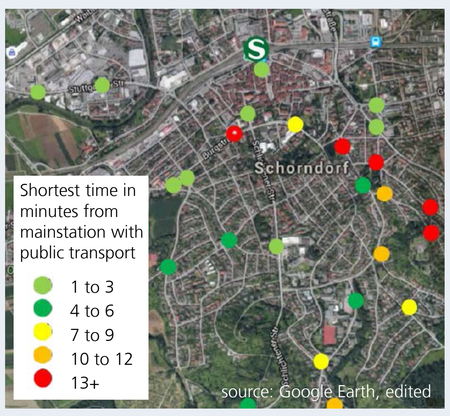
Specification of Bus Operation System Requirements



Participatory, inter- and transdisciplinary requirements derivation:

- Social sciences, technical and computer sciences
- Local stakeholders (e.g. municipality, local citizenship, etc.)

Definition of Operation Area



Analysis of as-in-state conditions:

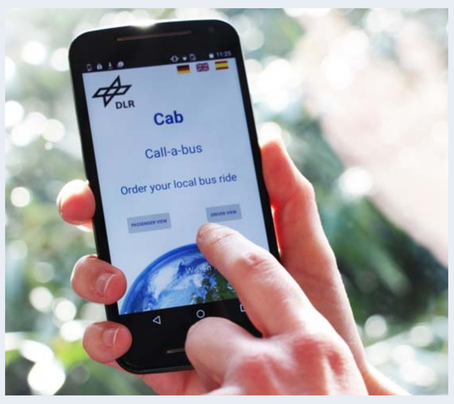
- Points of interest
- Road traffic situation
- Commuter flows
- Existing public transport (e.g. isochrones of accessibility of main station, see figure)

Pick-up Areas / Stopping Points

Discrete stopping points instead of continuous pick-up areas:

- Due to legislation, route planning and usability (stopping point identification)
- Walking distance to stopping points max. 150 m (200 m)
- Digital maps and on-site visits

Routing – Disposition Algorithm



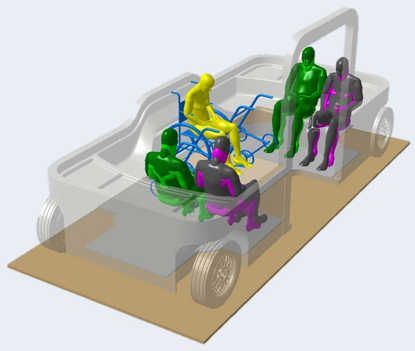
Optimization of route by a specifically designed algorithm. Ride requests collected via:

- Smartphone app
- Web interface
- Telephone service

Vehicle Concept and Constructive Implementation

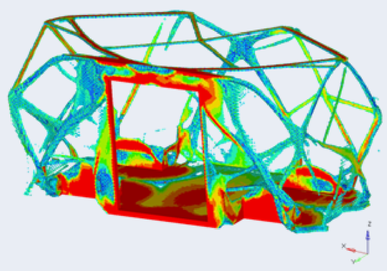
- Pilot phase with existing Mercedes-Benz Sprinter models, one of them modified with hybrid propulsion (ELENA Bus)
- Development of virtual vehicle concepts tailored to the system by scientists of Hochschule Esslingen and DLR together with social scientists and later users
- Automated driving, electric propulsion

Interieur / Exterieur



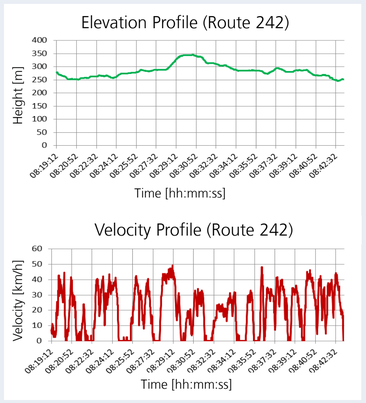
- Centrifugal development strategy: focus on ergonomic aspects, evaluation with the digital man model RAMSIS™
- Multifunctional space
- Consideration of different scenarios, e.g. commuting, transportation of luggage, etc.

Car Body - Structrure



- Systematic lightweight design for optimization of safety, comfort, accessibility, emissions and energy consumption
- Topology optimization
- Evaluation of different types of body architecture with FEM models

Power Unit / Chassis



- Tracking of inner city bus lines of Schorndorf with a GPS data logger
- Derivation of electric drivetrain requirements
- Battery pack will enable 3 hours driving time in urban surrounding, hilly topology

www.reallabor-schorndorf.de

Funded by the state of Baden-Württemberg by the Ministry of Science, Research and the Arts

Baden-Württemberg
MINISTERIUM FÜR WISSENSCHAFT, FORSCHUNG UND KUNST

WISSENSCHAFT FÜR NACHHALTIGKEIT

Project consortium

DLR Deutsches Zentrum für Luft- und Raumfahrt
German Aerospace Center

Hochschule Esslingen
University of Applied Sciences

zirius
Zentrum für Interdisziplinäre Risiko- und Innovationsforschung

VVS

Knauss Linienbusse

SCHORNDORF »
DIE DAIMLERSTADT

Mercedes-Benz
Vans. Born to run.