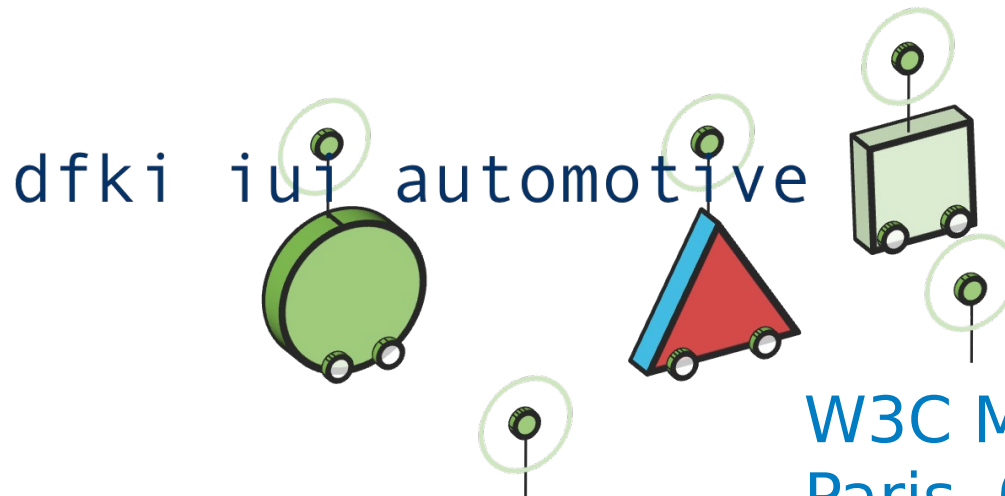


# Standardized Presentation Languages and Situation-Aware Multimodal Automotive Presentation Planning



W3C Meeting  
Paris, 04/23/2012

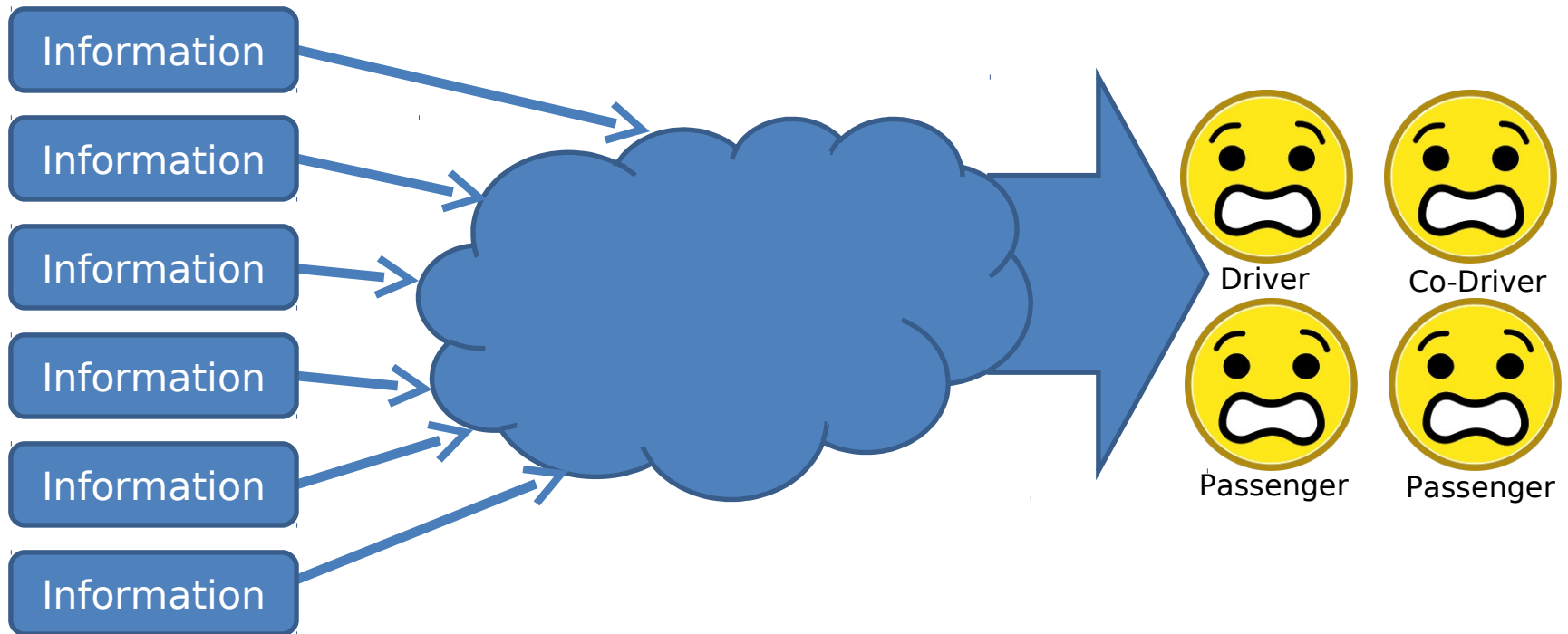
Christoph Endres



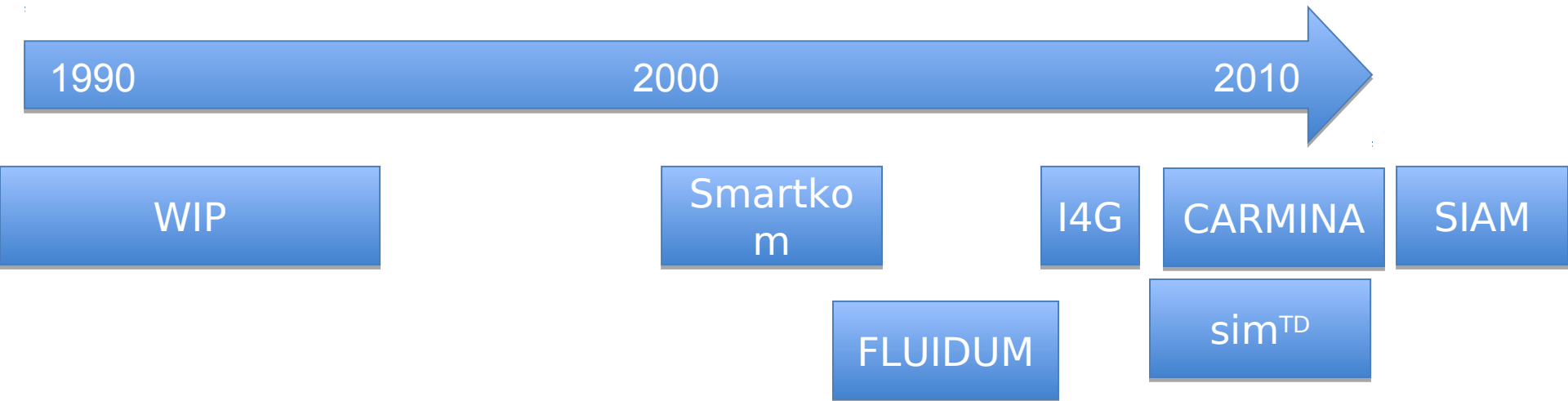
- The scope of traditional presentation planning is usually limited to the process of delivering information. Additional information that is taken into account is for instance the level of knowledge of the user, but not his current mental state.
- We extend traditional presentation planning in order to widen its scope and make it more suitable for real-world applications.
- This novel concept could be used in a variety of ways; one especially suitable area is the automotive domain:
  - Modern cars offer a plethora of information sources, of which some are vital, some are informative, and some are just nice to have
  - At the same time, human beings are inherently limited

# Introduction: Short Problem Description

- The driver and each passenger of a car should be provided with the **right information** at the **right time** without getting overwhelmed or distracted.

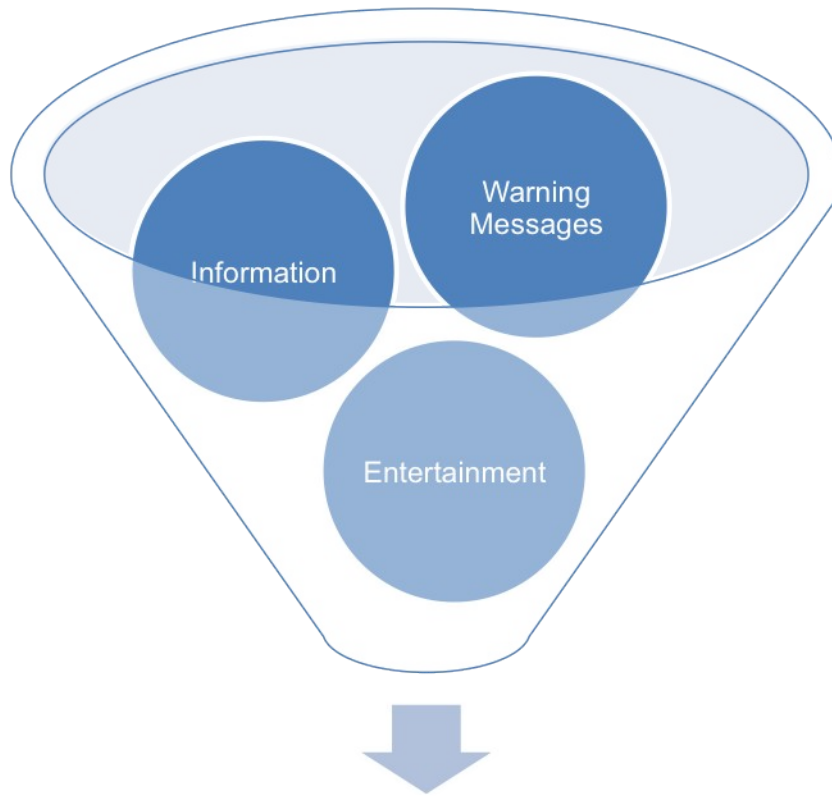


# Multimodal Presentation Planning / Multimodal Dialog Systems



- time critical
  - „real world“
  - Adapting to users mental state
  - Complexity estimation
  - Emotional characters
  - Multi Device Management
  - ubiquitous / disappearing computer
  - Different scenarios
  - Adapting to available modalities
  - Interactive / Dialog systems (real time)
  - Introduction of animated characters
- Presentation Planning
  - Different Modalities (Graphic / Text)
  - Considering user preferences and expertise

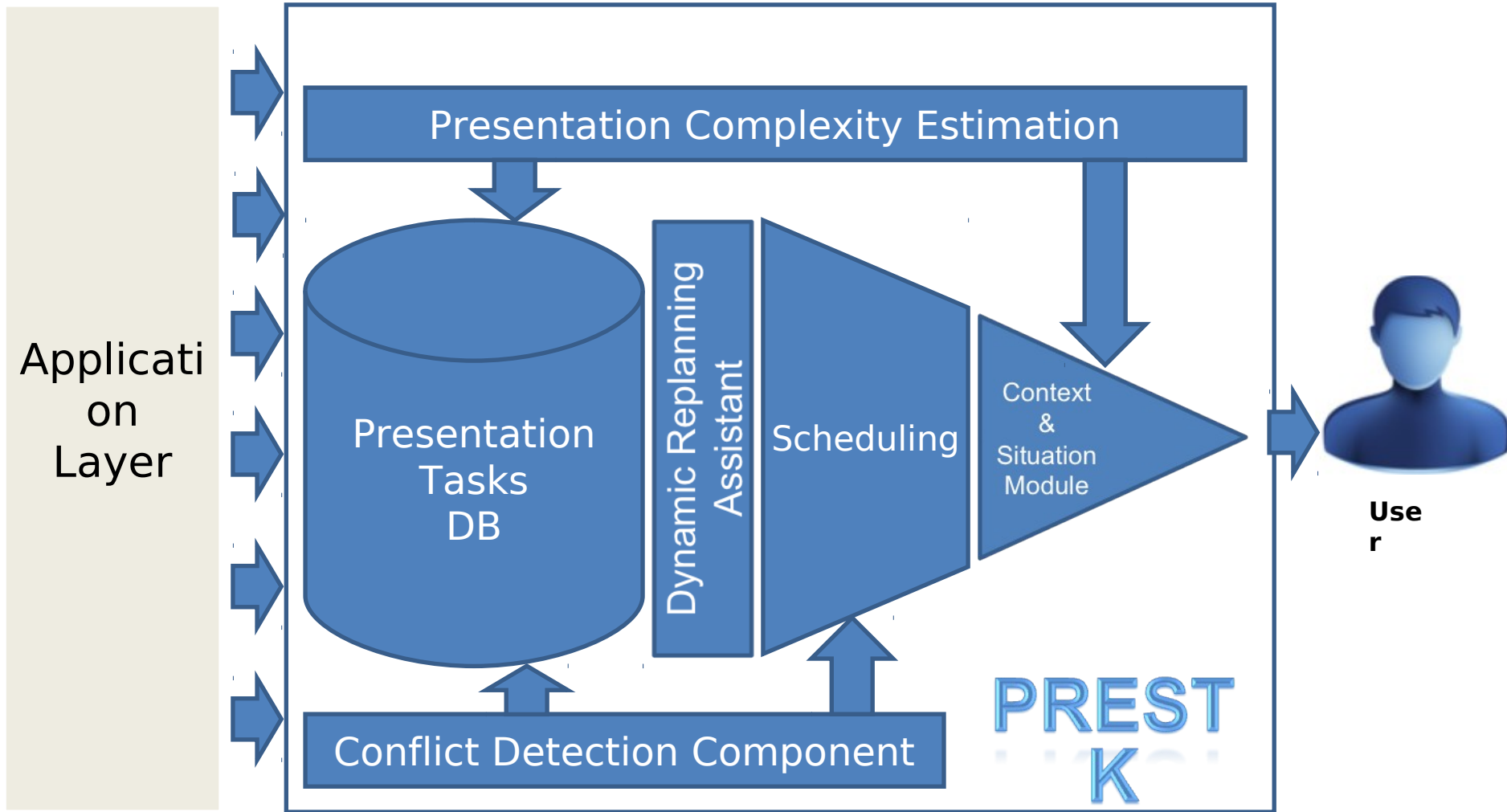
# The ADAS Scheduling Task (ADAS-ST)



Limited Resource HMI

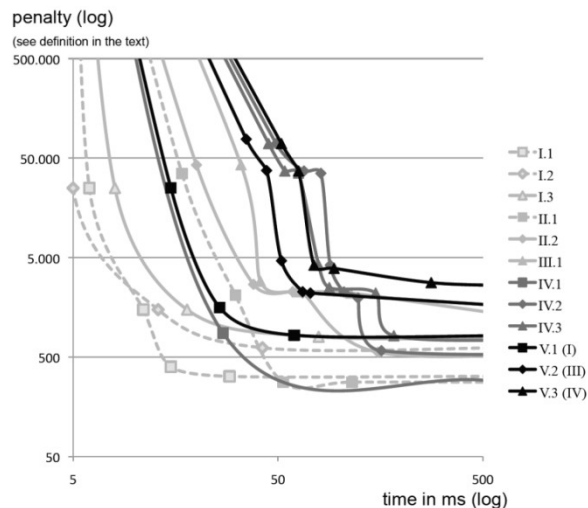
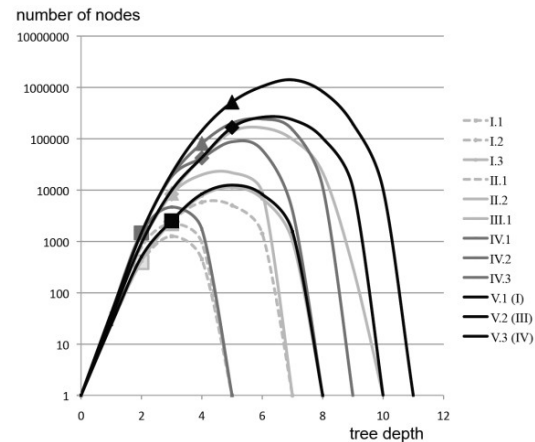
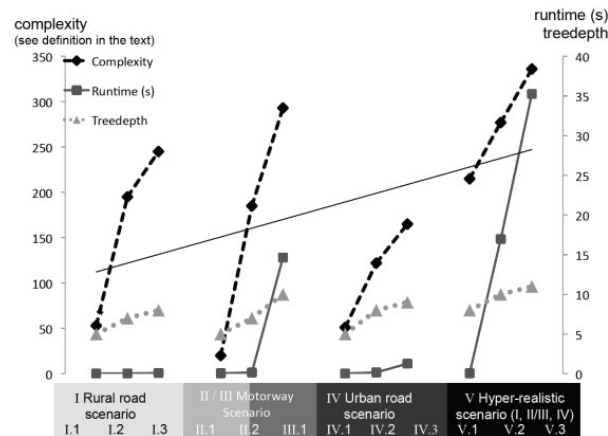
Simultaneous access of limited resources in a dynamic environment

# PresTK - Workflow perspective



- Selection of Scheduler
  - Tree search (ahead and ad-hoc planning)
  - Genetic algorithm (prototype implementation)
  - Rule based (prototype implementation)
- Tree search Scheduler features
  - Anytime behaviour
  - Intelligent pruning
  - Conflict set detection and selection
  - Dynamic replanning
- Cognitive complexity estimation / Context assessment

## Evaluated and measured in terms of performance



Ch. **Endres**, Ch. Müller: *A Graph-Search Approach on Resource-Constrained Scheduling Problems and its Application to Advanced Driver Assistance Systems*  
 4th International Conference on Agents and Artificial Intelligence (**ICAART 2012**, Portugal)

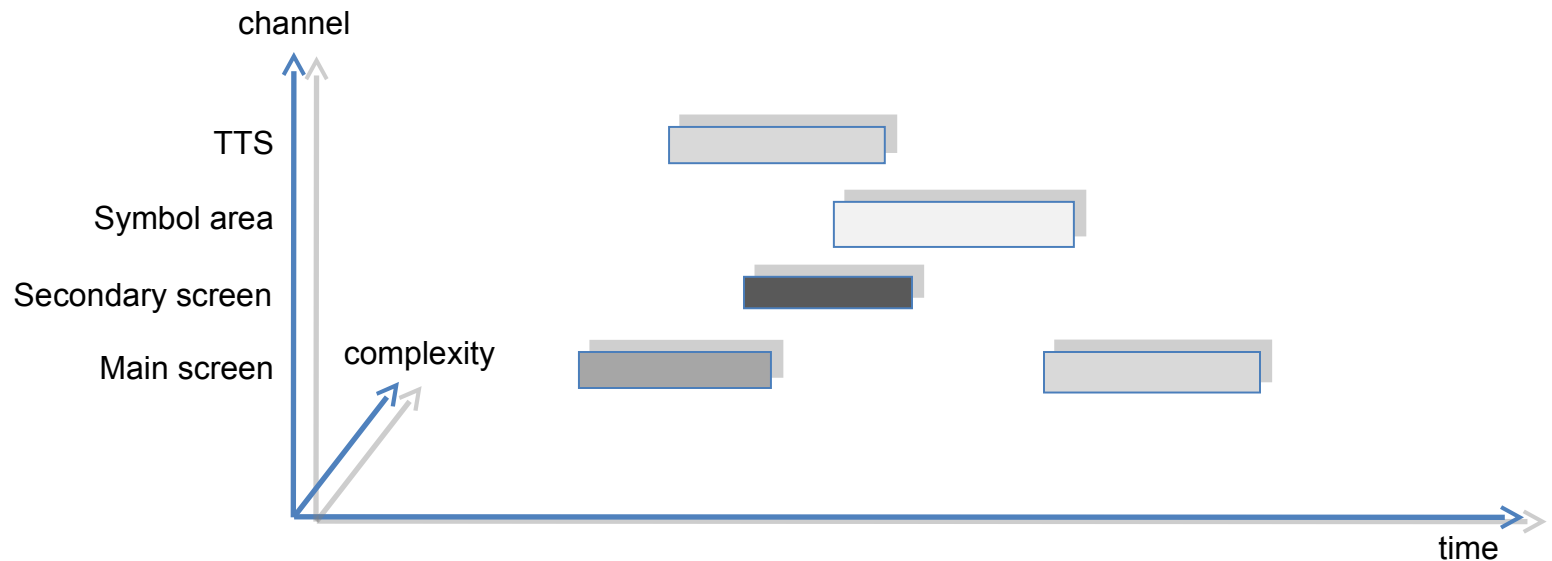


- Complexity Estimation of presentation tasks can be done beforehand and included as information in the presentation task itself
- First step: Evaluation of icon complexity in conjunction with sim<sup>TD</sup> in 2011
- Next steps: Analysis of presentation task components, e.g. textual description complexity, amount of information icons
- Algorithm combines results of component analysis to numerical „complexity value“
- Context assessment using KAPcom (Feld)
- Presentation planning takes complexity of information to be presented and mental state of the user into account

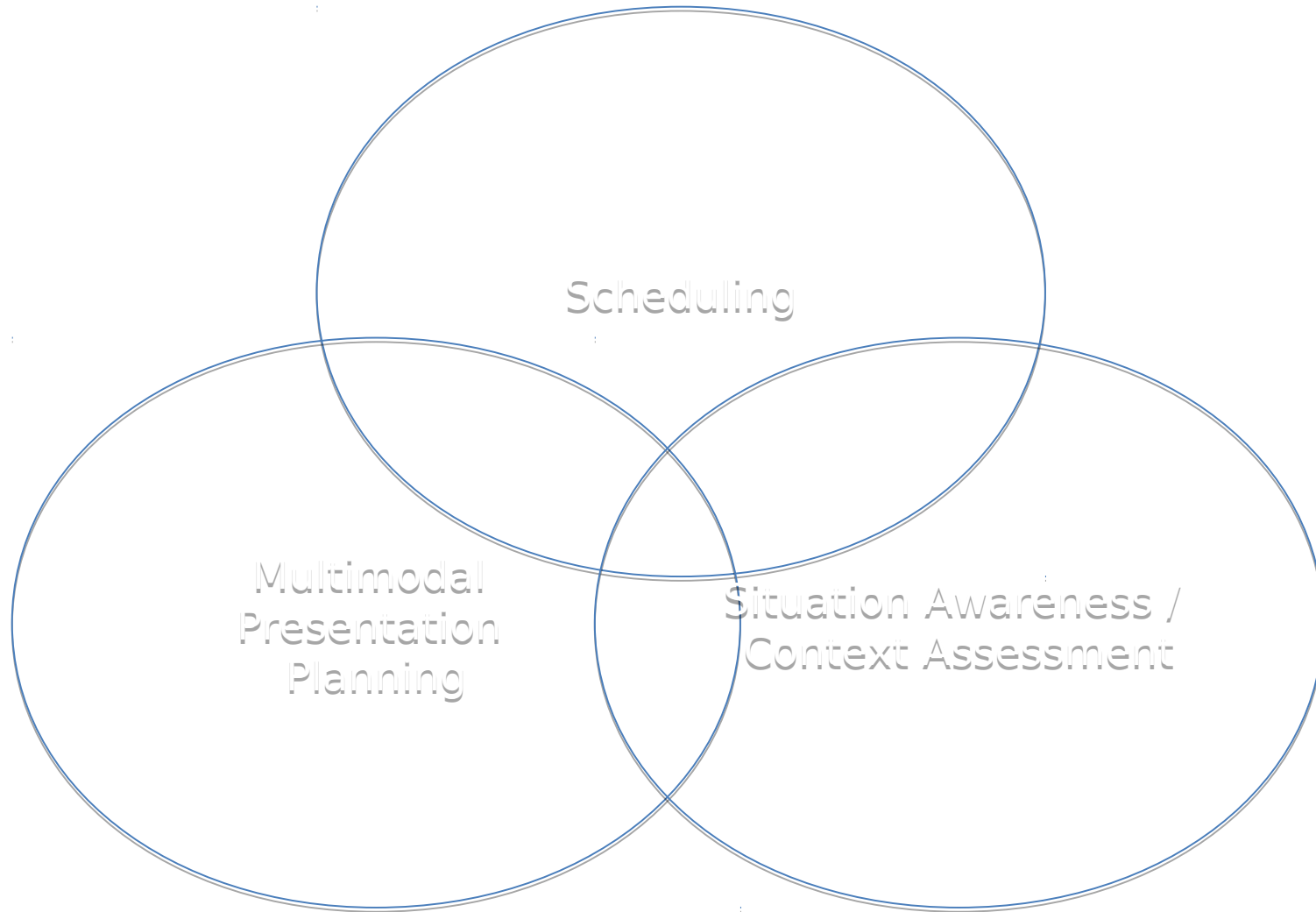
A. Mahr, Ch. **Endres**, T. Schneeberger, Ch. Müller: *Determining Human-Centered Parameters of Ergonomic Micro-Gesture Interaction for Drivers Using the Theater Approach*. 3rd International Conference on Automotive User Interfaces and Interactive Vehicular Applications (**AutomotiveUI 2011**)

# The PresTK approach

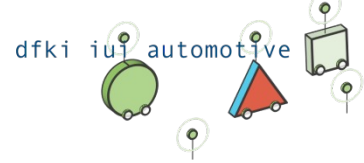
- The PresTK extends the task of scheduling presentations to three dimensions: time, available output channels, and complexity of presented information



# Classification of the approach

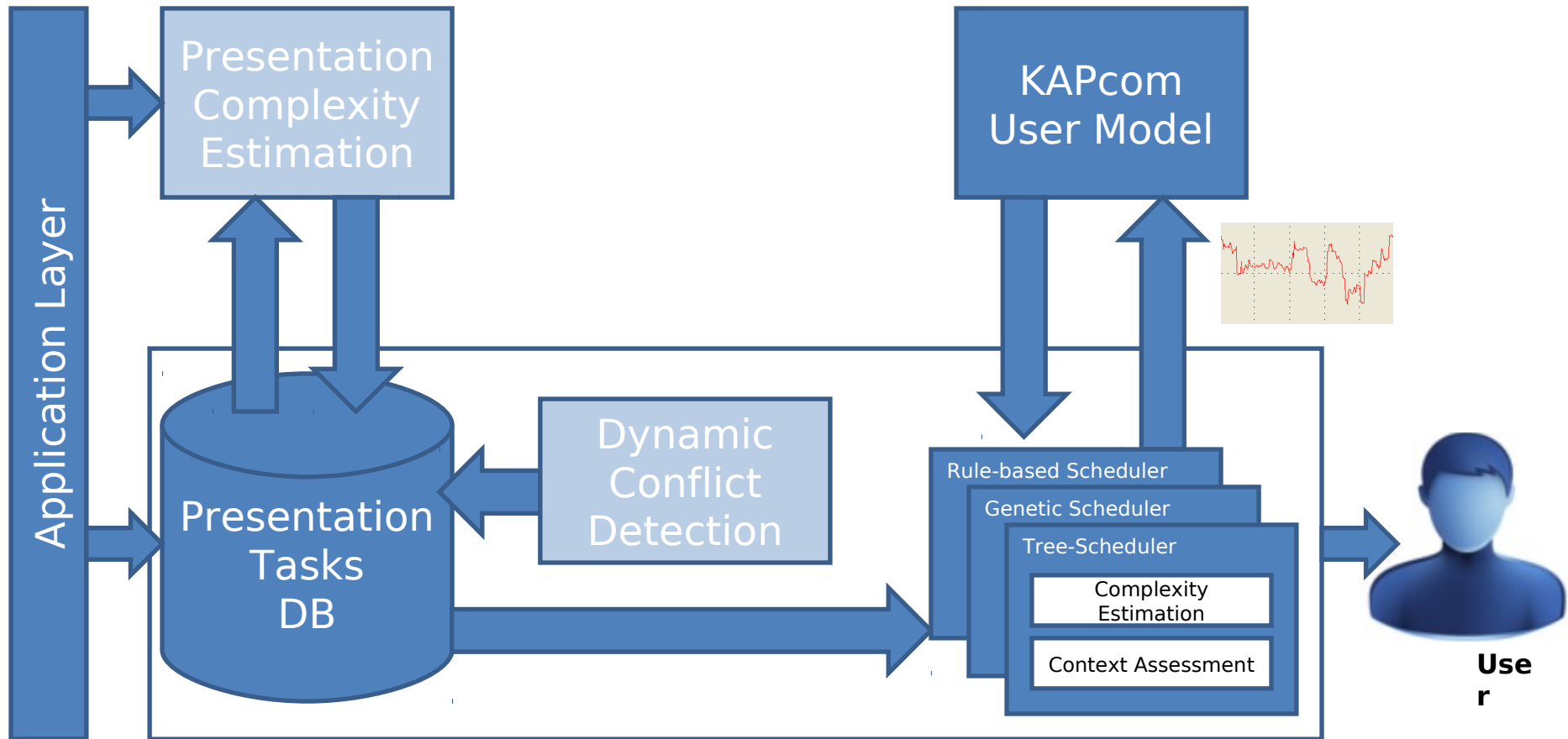


# Examples for Situation Awareness



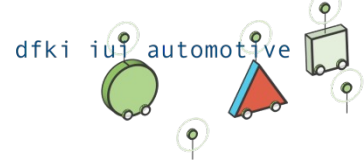
- Driver's cognitive load high and driver unfamiliar with the system: Don't show complex presentations for the first time; keep it simple.
- Driver's cognitive load low: Provide more detailed information
- Driver's cognitive load high and important (high priority) information incoming: Render message with high conspicuity (e.g. high contrast)
- Driver's cognitive load high and many incoming presentations in a short time period: Keep presentations fast-understandable and skip less important information
- Don't show obvious information, e.g. no navigation hints in familiar areas

# PresTK – Architectural perspective



PREST  
TK

# Requirements for a presentation language



- Encompasses different modalities
- Considers device-spanning presentations
- Able to manage different presentation alternatives
- Handles annotation of complexity for a presentation or presentation part

# Conclusion

- We argue that presentation planning, scheduling and situation assessment should be combined for in-car ADAS
- By using this approach, presentations can be tailored more specifically to the driver and his situation (knowledge, skills, preferences, and current cognitive load)
- Some implications for a standardized presentation markup language ensue