

# Automated Usability Evaluation of Adaptive User Interfaces for Smart Home Environments during Design Time

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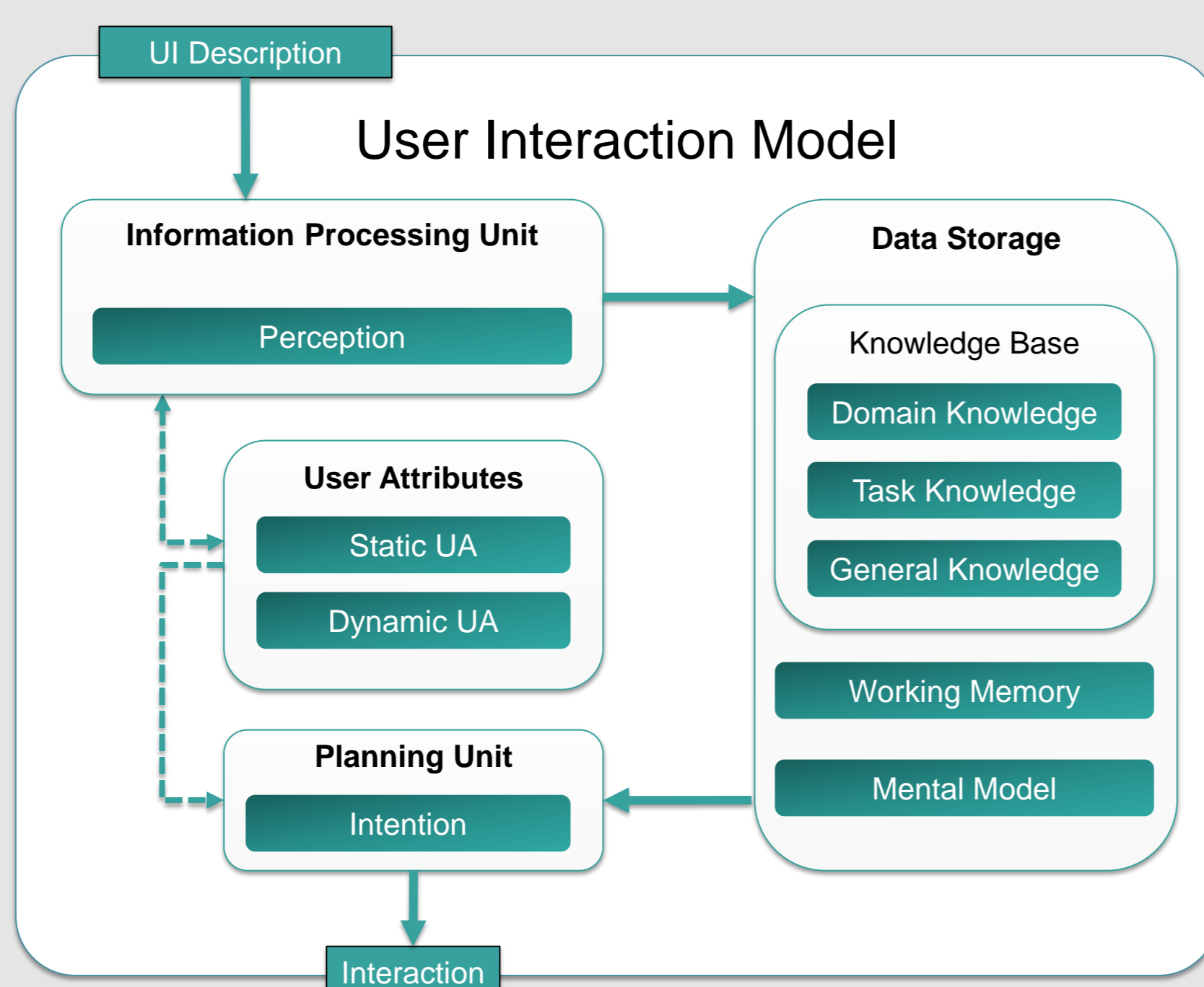
## Motivation

Within home environments, more and more electronic devices become networked which offers the user potentially benefits ranging from PC networks and media sharing to interconnected kitchen appliances. Additionally, research projects

in this area range from controlling home automation via TV sets and prototypical applications to improve everyday life to ambient assisted living projects, supporting the independent living of elderly. Within different situations users require different functionalities whereas the user interactions are becoming an interaction with a complex

system called smart home including the usage of special software services as well. To provide optimal interaction capabilities under changing situations, the user interfaces (UI) are also subject to change which leads to new challenges for UI evaluations done by the designer as well as usability experts.

## User Model



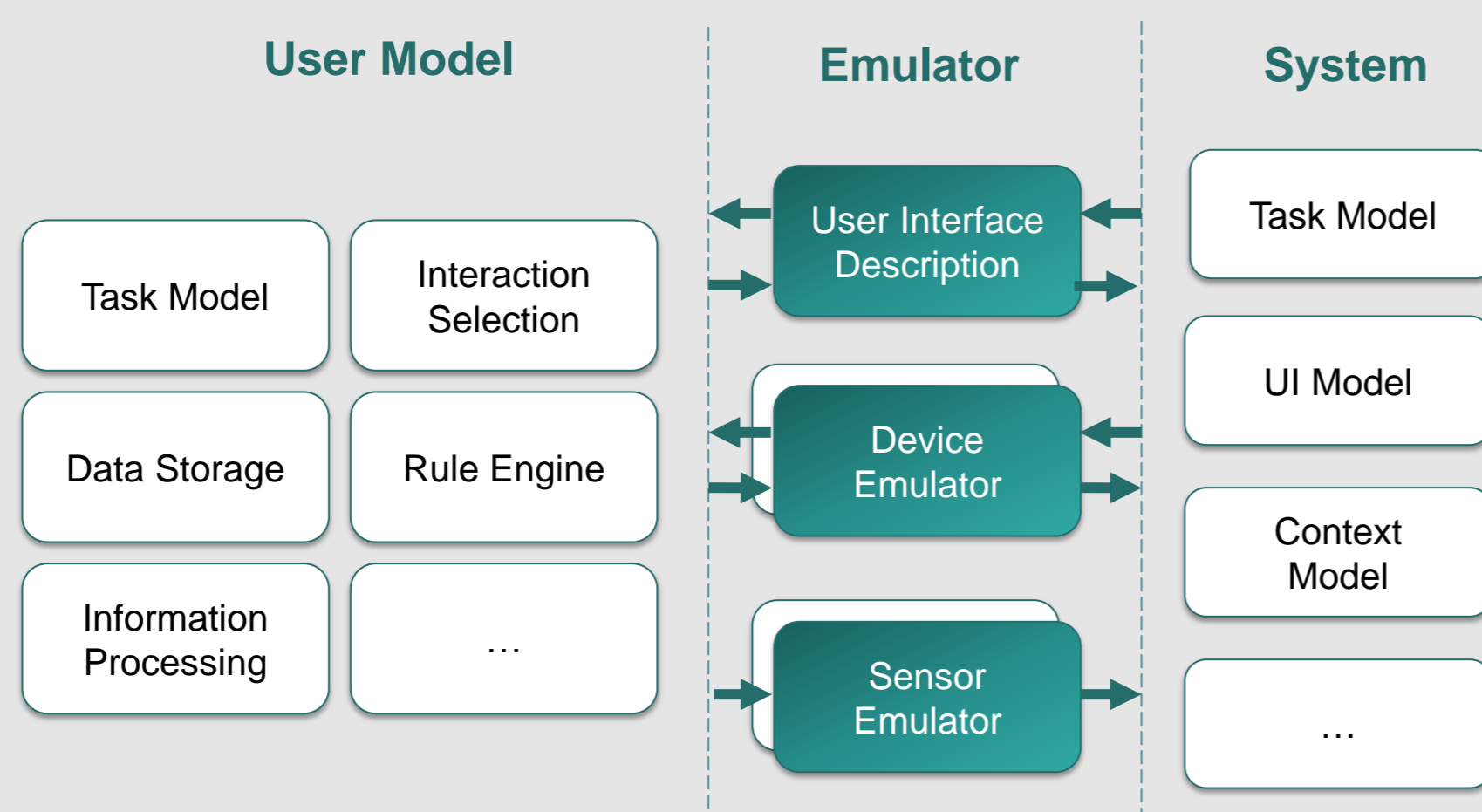
The user model analyzes the incoming description of the current UI and processes all given information according to its underlying attributes. All extracted information will be stored within the Data Storage. A Planning Unit computes the next interaction performed by the system afterwards. Finally the resulting UI Description will be generated and presented to the user model until the task is finished or the user model ends its interaction with the system.

## Approach

The work proposes an approach of model-based interaction simulation during design time to predict several usability problems of adaptive user interfaces for smart environments. These adaptations are focused on the user's needs, (dis-)abilities as well as the underlying system states. Shifting the usability evaluation to an earlier point within the development process could prevent enormous costs and efforts. On the other side, all variants of adaptive UIs have to be taken into account, a problem that only might be decreased by special tool support.

The availability of a system model at early design time can be supported by special development tools for accessibility, consistency or efficiency checks. The main approach of this work addresses the simulation of several user characteristics like (dis-)abilities, intentions, mood or age, covered by a user model (User Interaction Model). Furthermore, these characteristics have low or strong influence on how the user interacts with the system. Finally the abstract simulation of user interactions with the system model is essential for usability evaluations. The problem addresses a range from simple information in- and outputs to complex multi-modal interactions distributed over multiple devices.

## Emulator



The user model is embedded within an emulator which simulates the complete smart home environment (sensors, devices, etc.). The generated UIs of the system will be transferred into a UI description and presented to the user model which in turn selects a possible interaction that will be performed on the system.

## Links

**SmartSenior**  
<http://www.smart-senior.de>

**MASP**  
<http://masp.dai-labor.de>