Towards Cognitive Assisted Living 3.0 (Extended Abstract)

Integration of non-smart resources into cognitive assistance systems

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Abstract: The setup and running of cognitive assistance systems like HBMS, the Human Behavior and Support-System, is accompanied by two main challenges: considerable effort is needed to set up a user's context information and activity recognition results are still too coarse-grained for the intended user support. This paper presents a semantic markup approach, which helps to overcome these challenges by simplification of the construction of inhabitant's context model and by improvement of the system's activity recognition capability. Describing non-smart resources semantically enables to facilitate their flexible handling in a cognitive assistance system. Of course, such resources start to become interoperable with enclosed context models. Moreover, we show how personalized and adaptive HBMS user clients and the power of the HBMS environmental context model can be used to bridge an existing activity recognition gap. The work summarized in this extended abstract has been published in the SmarterAAL workshop 2018 proceedings (at PERCOM 2018) by IEEE [SM18].

Keywords: Semantic Manual, Cognitive Assistance, Schema.org, User Context Model, Simulated Sensor Data, HBMS.

1 Motivation

With the cognitive assistance system HBMS (Human Behavior Monitoring and Support)[3] we aim to actively assist people e.g. in activities of daily living, using user's episodic knowledge (behavior) as well as information about user's environmental resources, social and personal situation and location [MM13][MS17]. Evaluating the HBMS-System we were faced with two problems:

(1) The user's context had to be modeled manually when setting up the HBMS-System. Particularly, considerable effort was needed to model the user's resources like domestic appliances to build up the user's environmental context model. Large parts of the user manuals have been reconstructed to enable the HBMS-System to assist the user.

(2) Existing activity recognition results were not sufficient for the intended user support especially for fine granular user interactions with environmental resources.

In [SM18] we have presented an approach to overcome these challenges and to join the HBMS-System with the semantic web to simplify the construction of user's context model and to improve its activity recognition capability.

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2 Approach

The detailed information contained in (online) manuals and the ability to semantically understand them is very valuable for active user assistance. A cognitive assistance system can support context sensitively how to use different resources and devices. The HBMS-System aims at deriving support services using integrated conceptual models of abilities, the environmental and spatial context and the episodic memory of the supported user building up the Human Cognitive Model (HCM) [MS17]. These models are described using the Domain Specific Modeling Language HCM-L.

While human readers understand the handling of a good manual mostly at a glance, an assistive system needs extra information to comprehend resources, their functionality and associated instructions semantically. Our approach shows how to represent this information in manuals semantically by reusing schema.org as far as possible and introducing some extensions, where needed. This makes them understandable for the HBMS- System (and others) and interoperable with its environmental context model.

These semantically enriched manuals can then be used to import resource domain knowledge into the HBMS-System. Semantic manual data is collected from the web, transformed and integrated into the HBMS-System data stores mapping tagged elements to HCM-L Resource Types, HCM-L Functions or Multimodal Instructions. The HCM-L Modeler enables to visualize the imported information and use it in the HBMS-support process. Additionally, an automated mapping from old to renewed devices is easily possible. Moreover, it is possible to recognize fine granular activities via personalized and adaptive user feedback. The HBMS-System simulates sensor data based on this user feedback and handles it in the related context middleware and the following components as if the data comes from a genuine sensor. This approach bridges the activity recognition gap.

References

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