Tangible Interaction with Anthropomorphized Smart Objects

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Abstract: In increasingly complex environments, users often have to interact with a variety of embedded computational devices, which requires new interaction metaphors to make such environments accessible - particularly for novice users. This work examines the possibilities and limitations of an interaction pattern that we call *anthropomorphic objects*, which involves spoken language and gesture interfaces for instrumented objects. The main idea is to provide an intuitive interaction metaphor that exploits the advantages of combining verbal communication and haptic affordances of smart objects.

1 Problem Statement

We attempt to exploit the naturalness of conversational speech and the physicality of real world objects as the foundation for an interaction paradigm for smart objects. We believe that the anthropomorphic approach in combination with a gesture interface will provide an intuitive user interface for quick and casual interaction in scenarios where learning time is not given or not appropriate. The main research question of this work is, if and how we can design efficient interfaces for anthropomorphic smart objects, considering potential user groups and general design limitations. We consider elderly and children as notably interesting user groups that have the potential to profit from such an anthropomorphic interface. It is further important to identify the limitations of this approach: For instance, we do not expect to be able to handle complex and recurring tasks as efficiently as specialized user interfaces tailored for a specific application. As a result of this work, we envision guidelines for tangible, anthropomorphic interaction design for smart object interfaces, which will outline application possibilities and guide interaction designers to create appropriate interfaces for the intended tasks. Our aim is to identify rules to build interfaces that are intuitive to use, enjoyable for presumably casual and uncritical scenarios. Anticipated scenarios for such systems are households, shopping environments, museums, exhibitions and other entertainment/edutainment installations. At first we will further investigate user response to an example of such an interface within a shopping environment. We believe that this is an appropriate setting, since it involves an application that comprises spontaneous and casual interaction by a variety of user groups in an unfamiliar environment. We will investigate whether a shopping assistance through anthropomorphic products is more enjoyable, intuitive and efficient than traditional systems. From a field study, we will attempt to identify the key properties of our paradigm, in order to abstract and translate them to other application domains and validate our findings.

2 Preliminary Results

Beside working on expressing personality through speech[SKS07], we developed a framework and toolkit for efficient prototyping of sensor based applications as the foundation for the integration of different sensor networks [MSD08]. This toolkit provides a library to Java programmers to abstract from different sensor and data types, and offers customizable software modules that implement typical datastream processing tasks, such that a large variety of prototypes can be developed by merely plugging existing software components together. To demonstrate the practicability of this toolkit, we developed an interactive wine shopping assistant that provides a multi-modal (speech and gesture) interface to general product information as well as to particular attributes of a certain product, such as its current temperature. Wine bottles sense their own states via attached wireless sensors and detect user interaction by means of RFID and acceleration sensors; visitors can inquire information either through physical interaction with products or a natural language interface. The system detects whether a bottle is taken out of the shelf (RFID) and uses this bottle as the addressee of spoken questions regarding its attributes (e.g. ”What is your price?”). It is also sensed whether the customer is looking at the back side of a bottle (acceleration sensors), which is interpreted as a stronger interest in the product, triggering the bottle to provide more detailed information about its qualities. Movement and temperature sensors continously measure the current temperature and whether the bottle has been shaken, in order to react by recommending to cool the wine or let it stand still for some time before consumption.

3 Next Steps

The next steps will include enhancements on the technical side to create more tangible input modes, such as squeezing or shaking objects or holding two objects together or stapling them. We will also have to work on haptic output, i.e. vibration, and affective non-speech audio to complement the speech synthesis. Other tangible features of objects such as temperature, texture or size have to be taken into account too. This also requires modelling an adequate concept to integrate vibration, non-speech sounds and speech for consistent affective output. Such concepts certainly need to be evaluated thoroughly, our aim is to realize instantiations of our approach mainly in two scenarios: Assisted living applications and shopping assistants in retail environments.

Literatur

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[SKS07] M. Schmitz, A. Krüger und S. Schmidt. Modelling Personality in Voices of Talking Products Through Prosodic Parameters. In *Proc. of IUI'07*, Seiten 313–316, 2007.