Product Associated Displays in a Shopping Scenario

Lübomira Spassova
Saarland University
Stuhlsatzenhausweg B. 36.1
66123 Saarbrücken, Germany
mira@cs.uni-sb.de

Rainer Wasinger, Jörg Baus
DFKI GmbH
Stuhlsatzenhausweg 3
66123 Saarbrücken, Germany
rainer.wasinger, baus@dfki.de

Antonio Krüger
University of Münster
Robert-Koch Str. 26-28
48149 Münster, Germany
antonio.krueger@uni-muenster.de

Abstract

In this paper, we introduce the concept of Product Associated Displays – PADs – *as a way of providing visual feedback to users interacting with physical objects in an instrumented environment. PADs are projected public displays created at locations that can be intuitively associated with the objects they show information about. The concept is illustrated in a shopping scenario.*

1. Introduction

The work presented here is mainly concerned with the following question: How can a system visually assist its users in solving their tasks in an instrumented environment?

Walls and floors of instrumented environments provide physical spaces that can be used for information visualisation. Since the human mind locates information and concepts spatially, such environments allow for a mapping between physical space and abstract information, where physical space is enriched by digitial information, and digitial information can be made more accessible and understandable by a mapping to physical space (see also [6]). Before introducing the concept of Product Associated Displays as a way of providing visual feedback, we will give a brief description of the application scenario.

2. Product Associated Displays

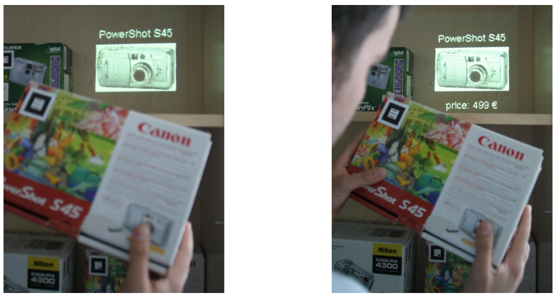
Our application scenario, an instrumented shop (see also [7]), consists amongst others of the following components: instrumented shelves, some public screens and a PDA for each user. The shelves are fitted with RFID antennas and allow for sensing implicit user interactions with RFID-labeled objects, such as picking up a product or putting it back into the shelf.

In our previous scenario [7], the visual information about the products taken out of the shelf were displayed on a public screen beside the shelf and on the user's PDA. In both cases the user's attention has to be directed away from the object that they are interacting with, to the location of the displayed content. In this context, we distinguish between the (stationary) public screens that are bound at fixed locations and the projected public displays that can be created on arbitrary surfaces within the environment. Product Associated Displays represent a special case of projected public displays and offer a more intuitive way to provide visual feedback than the stationary public screens. If the user takes a product out, we use the product's place in the shelf to project information about the product. Although in the process of taking an object out, the users focus their attention on the product itself, the former location of the object is still in their peripheral view. So if a change like the appearance of a new projected display occurs in this area, it is very likely to be recognized by the users and thus draws their attention to the projected display. Following this approach, the user's attention does not have to be directed to a new display location as the relationship between the physical object and the displayed information arises automatically. In fact, a spatial mapping between a physical space and the digital information is established, and supports the user's ability to process and interpret information about where objects are in space: *visuospatial perception*. This represents the relation between physical space around the user and what the user sees. As interaction between humans and computers moves from the computer screen to the environment, this aspect becomes fundamental, and can be exploited by mapping content and relational information to the space around the person.

3. Technical realization

In our approach, Product Associated Displays are projected using the *Fluid Beam* [4] – a steerable projector and camera unit. The steerable unit can be rotated both horizontally and vertically, and allows for the creation of distortion-free projected displays on arbitrary surfaces in the room.

The technical implementation of our approach is realized in the following way: When a product is taken out of the instrumented shelf, it is recognized by the shelf's RFID antenna and a corresponding event is generated and sent to an event heap. If the *Fluid Beam* application detects a "product removed" event, it creates a Product Associated Display at the appropriate location, showing the name and a picture of the removed product (see fig. 1 (a)). Now the user can ask for information about the chosen product (see fig. 1 (b)).



(a) (b)

Figure 1: Example of user interaction via PADs (a) Initial image of the product indicates the recognized interaction (b) Visual feedback to the user's request for the price of the product

If the user puts the product back into the shelf, the interaction sequence is finished and the PAD disappears.

4. Related Work

During our previous work, we developed a search function for physical objects (*SearchLight* [1]) using the *Fluid Beam* unit. In this application, objects fitted with optical markers can be detected with the camera of the steerable unit. In a preliminary step, the whole environment is scanned for optical markers and information about their 3D position is stored. Thereafter, it is possible to search for tagged objects and highlight them with a projected spot.

In [3], Raskar et al. propose an approach of instrumenting the physical world with RFIG tags (RFID tags with photo sensors) in order to make objects self-describing. By illuminating those tags with a special handheld locale-aware projector (LAMP) using structured light, the 3D position of the tagged objects can be detected and the objects can be augmented with projected visual information. In our work, we avoid the use of complex technology and confine ourselves to the simpler RFID tags and a steerable ceiling-mounted unit instead of a handheld projector.

In [2], the authors present an approach using two cameras to detect user interactions with predefined light widgets on arbitrary surfaces. These predefined widgets allow users to select values associated with them with their hands, but it remains unclear how the widgets are visualized.

In [5], Pinhanez et al. describe and evaluate a steerable interface system using the Everywhere Displays projector, allowing interaction with projected interfaces on arbitrary surfaces in a retail store scenario. Their paper presents three types of user interaction, one of which consists in projecting information about products on a surface right beside the products' bins. In contrast to our approach, however, the interaction is based on the user's position and is sensed using computer vision. In their evaluation, the authors elaborate on the problem of many test subjects not beeing able to associate the displayed information with the products because of the spatial distance between them. Often subjects were not even aware of any displayed feedback because their attention was drawn away by other activities. These results particularly encouraged us in our belief in the effectiveness of the Product Associated Displays.

5. Conclusion and Future Work

We believe that in using PADs as presented in this paper, user interaction in an instrumented shop can become more intuitive and hence more effective. For future work we intend to integrate projected widgets (e.g. radio buttons, menus etc.) to provide new interaction possibilities in the form of GUI elements such as buttons. Finally, we have to prove the assumed effectiveness of the PADs in several user studies and exploit the observed results to improve the application if necessary.

References

[1] A. Butz, M. Schneider, and L. Spassova. SearchLight - A Lightweight Search Function for Pervasive Environments. *International Conference on Pervasive Computing*, 2004.

[2] J. A. Fails and D. R. Olsen. Light widgets: interacting in every-day spaces. In *Proceedings of International Conference on Intelligent User Interfaces*, pages 63–69, 2002.

[3] R. Raskar, P. Beardsley, J. van Baar, Y. Wang, P. Dietz, J. Lee, D. Leigh, and T. Willwacher. RFIG Lamps: Interacting with a Self-Describing World via Photosensing Wireless Tags and Projectors. 2004.

[4] L. Spassova. Fluid Beam - A Steerable Projector and Camera Unit. *Student and Newbie Colloquium at ISWC/ISMAR*, 2004.

[5] N. Sukaviriya, M. Podlaseck, R. Kjeldsen, A. Levas, G. Pingali, and C. Pinhanez. Embedding Interactions in a Retail Store Environment: The Design and Lessons Learned. *INTERACT*, 2003.

[6] A. Valli. Notes on Natural Interaction. *http://naturalinteraction.org*, 2005.

[7] R. Wasinger, A. Krüger, and O. Jacobs. Integrating Intra and Extra Gestures into a Mobile and Multimodal shopping assistant. *International Conference on Pervasive Computing*, 2005.