Location-Based Interaction With Children For Edutainment

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Abstract. Our mixed-reality installation features two cooperating characters that integrate multiple users by location-based tracking into the interaction, allowing for dynamic storylines.

1 Motivation

A typical situation for an edutainment scenario is an exhibition or museum event where a group of users can acquire knowledge in a playful way. In most cases, this experience is limited to the traditional on-screen edutainment game with a maximum of two players. We present an edutainment installation that combines robustness and simplicity with creativity and fun allowing a group experience for a large number of users without confronting them explicitely with computer equipment or restraining them to the seat in front of a computer screen.

Interacting with multiple users at the same time is a challenge at the level of the interface. Speech or gesture recognition techniques work fairly robust with a single user in a limited domain and under controlled conditions (e.g., [Hill et al., 2003]; [Latoschik, 2005]; [Nakano et al., 2003]). Multithreaded conversations with different users at the same time are beyond the scope of the current recognition systems. Thus, interactions with multiple users have to restrain themselves either to well-focused, strictly turn-based interactions (e.g., [Rehm and André, 2005]) or they have to come up with new ideas of interactions. In this paper, we present an application that renounces visible input devices but nevertheless allows a group of users to interact with two collaborating agents in an immersive and dynamic experience.

The second challenge is introduced by focusing on a still atypical user group. Generally, a computer user is an adult, in most user studies, e.g., a student. There are only some preliminary investigations on how children as a user group differ from adults in their interests and interaction habits. In the Victec project which features an interactive narrative approach against bullying behavior, [Hall et al., 2004] show that there are significant differences between adults and children in regard to their interests in the presented characters and the storyline. To capture the interaction habits of children with a hand-free interactive system, [Höysniemi and Hämäläinen, 2004] conducted a Wizard-of-Oz experiment

interested in different ways to depict the action of swimming. Contrary to the expectations, children exhibited surprising creativity in this task and came up with 17 different ways to indicate the action. [Paiva et al., 2003] specifically targeted children as a user group and developed a tangible interface in the form of a sensor-equipped puppet. Manipulating the puppet allows for influencing the emotional state of the characters on screen and thus their behavior.

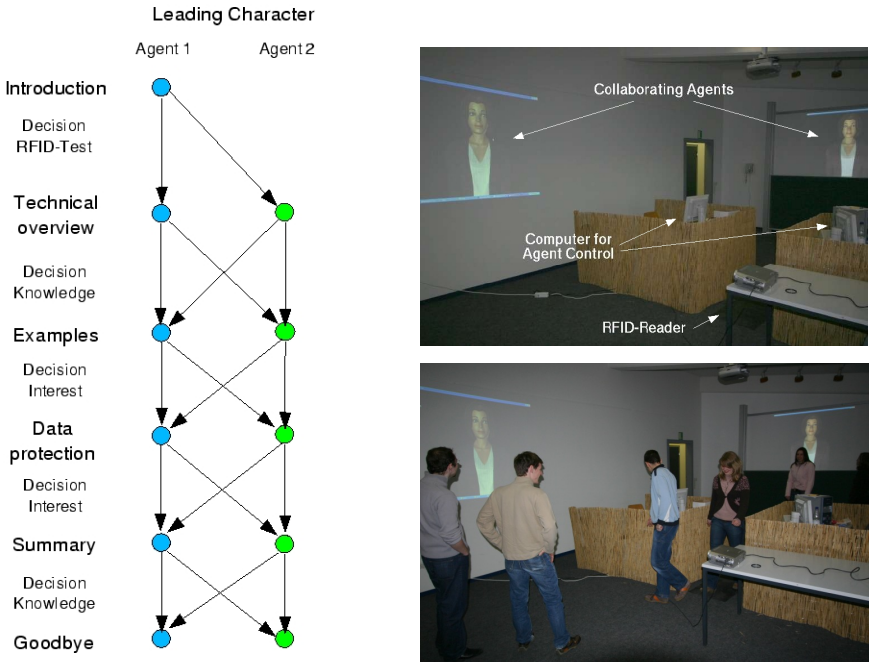

Fig. 1. Left: An overview of the dynamic eventflow between two agents which is based on user decisions. Right: The upper image shows the installation with the areas for the two agents. In the lower image the voting process at one decision point is shown.

2 System Features

In our installation, two agents collaborate in explaining the Radio Frequency IDentification (RFID) technology to a group of users. The two agents have different personalities with different interest. One agent, e.g., is more interested in the possibilities presented by the technology whereas the other one considers problems concerning data protection as crucial. During the performance, the

users influence the storyline by a majority voting process making use of the same technique that is explained to them.

2.1 Invisible Input

Targeting groups of children as users, we searched for a possibility to abandon visible and explicit input devices as well as a direct confrontation with computer equipment. The metaphor used is that of taking the side of others and thus giving support to them. At each decision point, the users can support one of the agents. Consequently, the agent which gets the most support by the children will get the floor and carries on with the presentation. The users movements are tracked by using RFID. RFID allows for reading the information on a chip from a distance. Users are equipped with passive RFID-tags which have a unique identification number. The reading devices are placed between the two locations of the Greta agents (Fig. 1 (right)). Thus, when a user changes place and decides to support the other agent, her RFID-tag is registered while crossing over to the other agent's area.

2.2 Dynamic Eventflow

To ensure the users interest even if she visits the installation more than once, the order of events is not fixed but established by a mix of user reactions, temporal constraints as well as randomization. Thus, a dynamic storyline enfolds during the demonstration. The story line is represented by finite state machines which are defined in XML similar to SceneMaker [Gebhard and Klesen, 2005]. The XML-file is parsed at the beginning to build the corresponding finite-state machine, allowing for unlimited revisions and re-designs of the application. A typical storyline consists of a greeting, followed by a short general introduction of the technique, elaborations on user specified topics interspersed with small knowledge tests. Figure 1 (left) gives an overview of the event flow (not the actual finite state machines).

2.3 Cooperative Characters

The two characters are spatially distributed and occupy different areas of a room. By positioning the two agents in different areas, users can actively support an agent by moving towards it. Creating two agents with different personalities makes the decision process of the users crucial to the unfolding storyline. The topics discussed as well as the focus on these topics depends on the agents personalities. Thus, the group members influence their experience by their decision for supporting one or the other agent. Figure 1 (left) shows that for each topic the role of the leading character is defined. The leading character is the one which is supported by the users. This character dwells on the current topic from its perspective. The other character is not rendered speechless during this time but comments on the other agent's performance bringing its own perspective on the topic into play.

The agents choose their turns from a library containing around 200 different dialogue acts. In one of the dialogues, e.g., agent one gives an account of a party where an RFID-transponder was injected subcutaniously for registering orders. The second agent claims the floor by listing the drinks the other agent had during the last two weeks, thus directing attention to the sensitive topic of data protection.

3 Concluding Remarks

By employing RFID as input device for group interactions we created a location-based edutainment installation that is targeted at children as a user group. By moving towards the agents, users can support their preferred character in the application which makes the group interaction both simple and robust. A formal evaluation of the system is pending and will be conducted in April with around 120 schoolgirls during the German "GirlsDay 2006" event.[1]

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[1] http://www.girls-day.de