Designing for interaction: socially-aware museum handheld guides

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Abstract

We present ARCHIE, an interdisciplinary research project of the Expertise Centre for Digital Media (Hasselt University) and the Gallo-Roman Museum of Tongeren (Province of Limburg) which aims to discover how a handheld guide can be used to enhance the museum learning experience. Because we stress on the important role of social interaction as a prerequisite for intellectual, social, personal and cultural development, one of the main objectives of the ARCHIE project is to encourage and stimulate interaction with the museum, the PDA and fellow visitors. Designing for interaction however asks for a mental switch. At this point, we developed a first application: a collaborative trading game.

Keywords

Collaborative learning, social interaction, mobile technologies, museums, PDA

1 Introduction

ARCHIE is a project in which the educational staff of the Gallo-Roman Museum collaborates with a research team of the HCI group of the Expertise Centre for Digital Media (Hasselt University) in the context of the future expansion of the museum.
Starting point of this interdisciplinary collaboration is our strong belief that the museum handheld guide is a promising medium to enhance the visitor's learning experience.

Recently, the introduction of handheld computer guides into museums has added another dimension to the visit experience. PDA technology allows the dynamic presentation of information, without disturbing the physical space or being limited by the aesthetics of the galleries. These screen-based multimedia systems also provide the opportunity to access multimedia, visuals, photo, video, text and audio while walking through the exhibitions.

The first PDA-based applications in museums combined all these advantages, but they also revealed some important shortcomings: the device demands lots of attention, tends to displace the surrounding objects and generates the unintended side effect that it's a quite individual, isolated experience (Proctor & Tellis, 2002; Vom Lehn & Heath, 2005; Vom Lehn, Heath & Hindmarsh, 2005; Angliss, 2006a, 2006b).

These comments are quite similar to the traditional remarks on the predecessor of the PDA, the audio-tour. Angliss (2006a) suggests that "audio can also put individual visitors in a bubble, making it difficult for them to keep track of companions or family members, let alone chat about what they have seen" (p.47). This fact reminds us of the theory that explains the intrinsic development of new media (Van Driel, 2001): in a first phase, a new medium imitates familiar media (for example, first television shows took warning from radio programs, first pages of the world wide web strongly resembled a news paper, …). After this 'imitation phase' – which is quite important to break through initial aversion towards the new medium and to generate a massive acceptance – follows the 'authenticity phase', when new media try to develop their own characteristics that differ them from the old media. A good example is the mobile phone, as it first served only as a phone, we can use it now to take pictures, listen to music, play games, …

With the ARCHIE project, we want to deal with the above mentioned unintended side effects and to explore the different possibilities a museum guide can offer in the future: a greater versatility for visitors to tailor information to their needs and interests (personalization), to discover the exhibits at their own pace (localization) and to communicate and interact with family or group members (interaction).
Though the research on social interaction and collaboration using new technologies is quite recent (Hawkey, 2004), there are already some projects on museum co-visiting. The Sotto Voce project developed an electronic guidebook prototype that promotes interaction between museum visitors through content and audio sharing (Woodruff, Aoki, Hurst & Szymanski, 2001). This study resulted in an interesting set of design principles, but the collaboration between companions is maybe a little too passive (following or checking in tasks). The goal of the Cicero Project – promote social interaction between visitors through cooperative and educational games – fits in with our project (Laurillau & Paternò, 2004). Also the reported findings of the user tests of the 'Mystery in the Museum' game in the Solomos Museum are very interesting (Cabrera et al., 2005). However, we hope to take the idea of a collaborative learning activity one step further than the above mentioned edugames which are still to be played at a quite individual level with only a shared enigma.
In this paper we present the ARCHIE project and its objectives, and make clear why we want to stress on social interaction. We also present a first application: a collaborative trading game.

2 The importance of context and social interaction

As mentioned above, user studies of the first handheld guides in museums stress on the fact that the PDA tends to displace the authentic objects whilst visitors in a gallery remain oriented to the device rather than to the exhibits (Vom Lehn & Heath, 2005, p.15). The notion that the use of handheld guides can serve as a distraction bears out the idea of an ideal museum experience as one that supports unmediated communion

between the object and the visitor (Thom-Santelli, Toma, Boehner & Gay, 2005). However, a PDA-tour would not be the only so-called distraction in this narrow definition of a museum experience. The presence of other visitors, as well as the architecture and aesthetics of the museum building, can draw the attention away from the displayed objects.

Instead, we follow the idea that an ideal museum learning experience should be expanded to include these so-called distractions, as a way to make the visit richer and more interactive. More than that, we follow the contextual model of learning (Falk & Dierking, 2000), which states that there are three overlapping contexts that contribute to and influence the interactions and experiences that visitors have with objects and the consequent learning and meaning-making: the personal context, the physical context and the socio-cultural context (see figure 1).

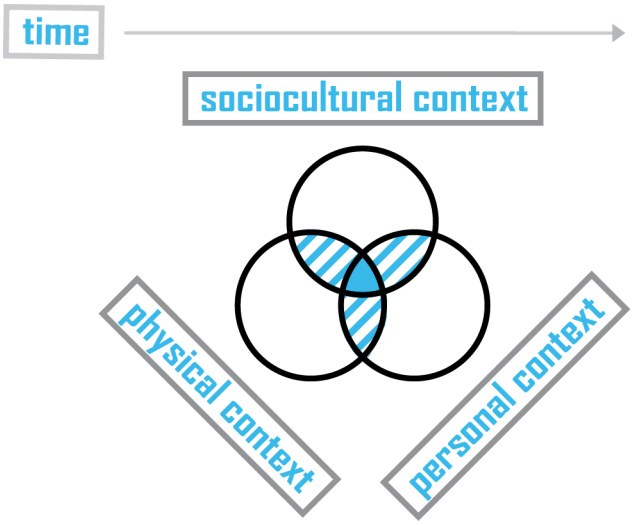

Figure 1: The contextual model of learning (Falk & Dierking, 2000)

Following this model, social interaction does not only promote, but is a prerequisite for intellectual, social, personal and cultural development (Morrissey, 2002). Recent studies with children and object-centred learning also recognize the importance of social interaction: "the potential of the learning environment and its objects largely depends on the social atmosphere generated and the support young children receive through positive, reciprocal interactions. […] The successful learning setting functions as a community of learners, where all individuals are respected, their learning is supported, and opportunities for collaboration are provided" (Piscitelli & Weier, 2002, p. 126). An extensive investigation among visitors and potential visitors of the Gallo-Roman Museum confirms these findings (Provincial Gallo-Roman Museum, 2005).

3 Project objectives and system overview

One of the main objectives of the ARCHIE project is to encourage and stimulate interaction between visitors and the museum by use of the PDA. This can be done by providing opportunities to communicate with each other directly (using Voice-over-IP) or by involving visitors in a collaborative game. Furthermore, we recognize that each visitor is different (age, level of knowledge, interests …). While traditional mobile museum guides often offer a uniform tour and presentation for all visitors, the project wants to discover opportunities and benefits of a personalized approach while exploiting the social relationships between visitors.

The ARCHIE Mobile Guide System consists of a set of three core services (personalization, localization and communication) on top of which an arbitrary interface shell can be deployed (see figure 2). The interface shell can be developed quite independently; it only has to handle events sent by the services it is subscribed on. This approach results in a flexible mobile guide system rather than one particular mobile guide: various interface shells that behave differently can be integrated and by using the communication service, which handles the interaction between visitors, it is possible to implement collaborative applications such as games.

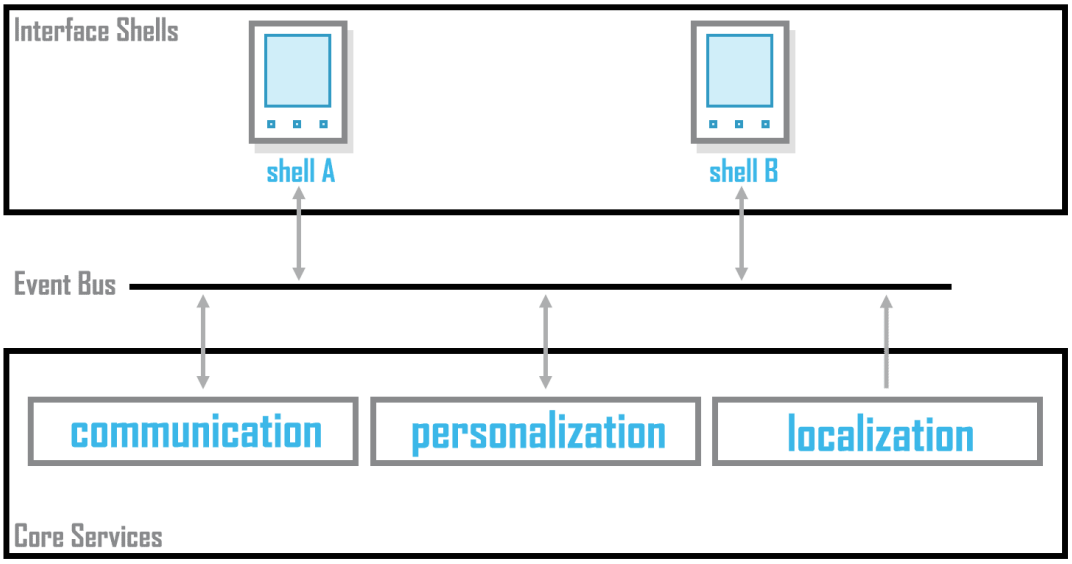

Figure 2: Framework overview

Since the focus of this paper is on interaction between visitors and the museum, we will have a deeper look at the communication service. A server application keeps track of the different groups of visitors. During the visit, the system allows visitors tot communicate with other visitors in the same group in two different ways:

- a direct communication style that is voice-based and uses Voice-over-IP (VOIP). This allows the visitor to address the other members of the same group directly.

- an indirect communication style that allows visitors to exchange other types of data related to the interface shell. Through collaborative games experiences and opinions

can be shared. The synchronization between different clients involved in a collaborative game depends on the game and should be taken care of by the developer of the shell.

Both types of communication make use of the wireless network that is deployed inside the museum and covers the complete museum surface that can be visited. The combination of both types of communication opens up several possibilities to implement collaborative applications such as games that need to be played in group.

4 Case study: a collaborative trading game

One of the possible applications for the future Gallo-Roman Museum is to develop a museum game; a collaborative learning activity for (school) groups (aged 10-14 years). To get better acquainted with their needs and expectations, we conducted a brainstorm with four boys and three girls (12 to 17 years) and invited them to think aloud about gaming in a museum. What are their main expectations towards a museum game?

- it has to be lots of fun, with enough challenges and plenty of variety
- promote unconscious learning (young people don't want to get the impression that they are learning)
- integrate objects of the museum (exhibits) within the game
- provide a personal and adaptable character/avatar
- integrate a help menu within the game
- …

Starting from this inspiring meeting, a prototype of a collaborative trading game for teams of 4 persons was developed. In collaboration with the educational staff of the museum, we decided to work on a specific chapter of the future museum narrative concerning the introduction of social differentiation in society (round 825 BC). Main message is the introduction of iron and salt in daily life, which results in new exchange networks and the emergence of a new elite class as key figure in these contacts.

Every player has an explicit role in the game: there are three farmers and one leader. Each one has his own properties and specific goals that need to be achieved. The game sets off when the three farmers try to solve a set of questions about the exhibits. With every right answer, the farmer gains exchangeable goods (local products as for example cattle, sheep, …).
The leader has an overall view on the earned exchangeable goods, and can make a trade proposal to a farmer (see figure 3). Only the leader has exclusive contacts in the exchange networks, he can travel to the south three times to exchange the local products for iron and salt. While every farmer has a specific amount of iron and salt as a goal, the leader's objective is to keep every farmer satisfied (this means, make sure that every farmer obtains his goals) and to get hold of a bronze sword (see figure 4).

Figure 3: Trade proposal from leader

Figure 4: Leader profile

We designed the game in this way that every player is dependent on the concrete actions of other players; only through social interaction and cooperation they can come to a good end. Main message is to learn in an unconscious way about unequal stratifications in society, how they came to existence, how they worked and more precisely how it must have felt to be in an unequal position.

The game is actually an interface shell that is developed on top of the ARCHIE framework and makes use of its several core services. The *localization* service is used for determining when the game has to be started, namely when all team members are nearby the physical presentation of the concerned museum narrative. This is realized by catching and interpreting the events from the localization service. *Personalization* is realized by assigning each team member a specific role – farmer or leader – and by providing each person of his own adaptable character (avatar – see figure 3 and 4). The *communication* service makes is possible for team mates to communicate directly to each other through a chatbox. They can use this Voice-over-IP-based communication channel to negotiate or comment on the trade proposals and/or to help each other solving the questions. Indirect communication is carried out by the trade actions, which are necessary to accomplish the game. By sending a trade proposal to a farmer, the leader initiates indirect communication. The farmer replies by accepting or refusing this trade proposal. The data that is exchanged between the players is obviously game related.

At this moment, we are beyond the conceptual stage of the prototype and have started with the implementation of the trading game. We expect to start this fall with the first extensive user tests with +/- 75 school children (aged 12-14 years) in three secondary schools in and around Hasselt.

5 Conclusion

Designing for interaction starts with the recognition of the importance of (social) interaction for the museum learning experience, takes notion of some design principles during implementation and ends with numerous user tests … which again give input for following iterations.
We have presented the research project ARCHIE, its objectives, framework overview and a first application prototype of a collaborative game which aim is to augment interaction with the museum (exhibits, PDA, …) and between fellow visitors. We are looking forward to the results of the user tests of the collaborative game, to examine to what extent we can bring theory into practice.

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