

# Issues on using Visual Media with Modern Interaction Devices

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## Abstract

Recent advances in user interface technologies and hardware equipment have made it possible to provide new metaphors for computer human interaction. Tourism Information Systems is a domain where these advances are exploited to provide new interaction paradigms or even brand-new services for the public. The Campiello<sup>1</sup> [1] is an LTR ESPRIT project in the area of Intelligent Information Interfaces (i<sup>3</sup>) in which innovative metaphors and devices are used to provide tourism-related information to a wide range of users. In this paper we address the major problems and opportunities in this project.

## 1 Introduction

Recently, due to advances in hardware and software technologies, new media types (such as video, animation, images and audio) are widely used to convey information to the user [6]. This information is related to:

- System responses (e.g. animation to give visual feedback for the progress of copying a file)
- Visual cues for the functionality of user interface elements
- Description of real objects of actual world in a specific application
- Simulation of real world situations
- Alternative presentation of statistical and other arithmetic data

However, there are situations where heavy use of such kind of media is inadequate due to limitations to hardware, software, network bandwidth or to the very nature of the information. Such kind of problems arise immediately when innovative mobile devices are used such as hand-held PCs (or PDAs). These devices fall short in terms of hardware and system software capabilities, so the heavy use of visual media is problematic. At the same time, when these devices are used in practice frequently these media are completely inadequate. For example when using a hand-held PC to navigate inside a real museum, there is no necessity of using video as the user is located in the place that would be presented by video to a remote user. It would be practical to use alternative metaphors instead, exploiting the nature of this kind of applications and specifically the presence of the user in the real world.

These kinds of interaction environments are being considered in the context of the Campiello project [1] to provide new services to locals and tourists visiting Chania and Venezia. In section 2 a brief description of the aims of Campiello is presented. In section 3 we present the characteristics of innovative interaction devices. User interface design issues concerning these devices is presented in section 4, and a usability testing framework which focus on these interfaces is presented in section 5.

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<sup>1</sup> This work has been carried out in the framework of the project No 25572, CAMPIELLO – “Interacting in collaborative environments to promote and sustain the meeting between inhabitants and tourists”, funded by the European Union under the ESPRIT Long Term Research scheme (i<sup>3</sup> – intelligent information interfaces domain, task 4.4, the connected community schema).

## 2 The Campiello Project

People living in Historical Cities of Arts and Culture (e.g., Venezia, Florence, Chania, etc.) risk to be "foreigners" within their own cities. They must share their cultural resources (e.g., museums, libraries, etc.), their public utilities, as well as the places in which they meet and socialize (e.g., streets, squares, restaurants, bars, etc.) with visitors from other countries, and they may feel that the territory of their community is "occupied" by foreigners. Moreover, the new events organized within these cities are directed to tourists and not to the people living there; in fact, local people do not have any priority in participating in these events, and they rarely contribute to their organization. There is the risk that "folk" events with ancient tradition, such as the Carnival or the Historical Regatta in Venezia, could be more and more ignored by the local people. In some cases, the local community of historical cities also see the "strangers" as people that contaminates their culture, using and ruining their properties, like undesirable persons within their own house. On the other hand, the visitors accessing only the most visible and renowned resources (the most famous museums or known parts of the city) gain only a superficial understanding of the local culture. They have often only a "commercial" relation with the local community. We believe that this negative trend characterizing the interaction between local people and tourists could be reversed creating new "meeting places" and revitalizing social roles, developing strategies and support for the transformation of foreigners into guests.

The Campiello project [1] aims to experiment the use of innovative ICT to develop new links between the local communities and the visitors of the Historical Cities of Art and Culture. Two cities have been chosen as context of the experiment: Venezia in Italy and Chania in Crete (Greece).

Campiello will realize a heterogeneous multimedia, multi-interfaces network. The project will develop:

- A system to support the information flow and the processes between the different actors involved within a defined physical environment.
- Appropriate interaction paradigms adapted to the specific users, content and physical environment of Historical Cities of Art and Culture.



Figure 1: The actors involved

The actors involved in the process of exchange and building of knowledge in the local context are:

- The local community: people living within the territory of Historical Cities of Arts and Culture and their existing aggregates (schools, cultural associations, ...);
- The cultural managers: people organizing events exploiting the local cultural resources (e.g., museum and theatre directors, cultural managers of the municipality, managers of the various Biennale programs, ...);
- The visitors: people like tourists, external to the local community, coming from other communities, visiting the city for a brief period of time;
- The potential visitors: people living all over the world potentially interested in receiving information on the Historical Cities of Arts and Culture.

The proposed system is based on a *multimedia high band net*, connected to Internet and based on Intranet and Web technologies, integrated with the following components:

- A *shared information environment* to support the relations between the different actors, and the creation of a common knowledge base, to maintain the history of the interactions, to enhance the participation, the communication and the exchange of information among people;
- A *collaborative space* that is the virtual place for cooperation within the local community: representations and metaphors to visualize the community, the participants, the information, the patterns of relations;
- Various "*interaction devices*" (or *access terminals*) for individual or collective use, strongly integrated in physical environments, easy to use by heterogeneous users (citizens, elderly, students, visitors);

- Knowledge *base*.

In developing the system we will make use of the following technologies:

- Ubiquitous computing technologies:
- Intelligent bar-codes, multimedia knowledge bases, hypermedia-based electronic publishing;
- Social computing technologies:
- Communication and cooperative support system, information retrieval technologies, multi-lingual comprehension aids.

### 3 Use of Modern Interaction Devices

As was mentioned above one of the main targets of Campiello project is the use of modern interaction devices in order to fulfil the desired functionality. Below we give a brief description of modern interaction devices and how they fit in several application paradigms of the system

#### *Mobile devices*

The use of hand-held PCs, taking in mind the rapid development of this technology and the continuous fall of their prices, signify them as a main interaction device. User moving in real world [3] for example in a museum with a hand-held PC will be able to access information about exhibits of the museum. He can see in his hand-held PC older pictures of the exhibit that he is interested in, or even hear a narration about the exhibit that he sees. Besides he can submit information in the system describing his experiences, or request for a specific city place and see the its location on a map, along with the route he should follow in order to go there.

#### *Positioning devices*

Such devices - GPS, Active badges, devices for outdoor and indoor position tracking - have already been used [4], but now combined with hand-held PCs, new ways to exploit their functionality are presented. Having positioning devices connected to a hand-held PC the user can acquire his position on a map [2] of the place that he is moving in, and make decision about his travel.

#### *Web TV*

A new interaction device, that can replace a computer system, in some cases, for user that cannot afford to buy a computer. It offers network connection for a television, and a web browser. So users from their home or from their hotel can access the information that is available by the Campiello system, and acquire information for sites in the visiting place, cultural events, or buy things.

#### *Paper based interfaces*

Most people feel much more comfortable using paper than working with a computer. This is reasonable taking into account that people have been using paper for hundreds years, while computers have been widely used the last decades. Paper based interaction systems use a technology which add information on the paper in such a way that is invisible to the user, but can interpreted by special devices [10]. In this way a piece of paper turns out to be active and provide the user with additional information, along with what is written on it. For example in a museum beside each exhibit the user can find a piece of paper with a description about it. If the user scans this piece of paper in a device that is installed in the museum, after he filled specific fields on the paper, additional information is provided by the device, in the form of photographs, or speech.

### 4 User Interface Design Issues

In the previous section we briefly described the devices, for which we should develop interaction systems. These systems differ in many ways from the existing ones, those that most users are currently

using. A major issue that arises is how users will accept these new systems, and how these systems should be designed in order to be user-friendly and consistent with what user known [7]. Until now the user interface systems have been examined from a point of view that does not include the special features of these interaction devices. So no rules, no guidelines, no heuristic methods, no models, and no results for these systems exist, as it is the case of traditional interfaces [5][6][8][9][12]. Of course conclusions from the existing research can be considered or even applied but additional study should be carried out due to the character of the interaction devices.

For some of the interaction devices, hand-held PCs [11], Web TVs, which mainly aim to network usage, special attention should be paid on the network factor that effects in many ways the design of the user interface. For example a user interface that make extensive use of video clips or images is inadequate for such environments, because the response time will be considerable. So a methodology should be developed to define the range of functionality these user interfaces should offer along with some specific guidelines for the design of web sites, taking in mind the limited capabilities of these devices.

Another issue is that if you use a hand-held PC, user probably moves in the real world and sees everything that a video or a photograph can offer. So to develop a user interface that will offer this functionality is rather not necessary. But it is useful to develop a methodology that will combine elements of a video, voice and motion. So a methodology that we permit to the user to see in the real world what the video would have shown, and at the same time to hear the narration associated with the video. This is an alternative use of picture elements and voice.

Due to the hardware and software limitations of these devices alternative ways for presenting visual media should be examined. Thus special algorithms and methodologies should be obtained in order to extract miniatures from images, so the user could select what to see without retrieve the whole information. Of course studies have been made but without taking in mind the limitations of these devices. A similar problem but from a different point of view is how to extract miniatures for maps or even more for 3D spaces. For paper based interaction systems a major issue, is how to present visual data, or audio, on a paper. It seems strange to have video or audio on a piece of paper, but it can be achieved using special scanning devices capable of identifying the activation points on the paper for each media type, and them. The open issue here is to find out algorithms in order to achieve the most efficient placement of activation points on the paper, and realistic representations for them. The representation of maps and probably 3D spaces on a piece of paper and the efficient use of them should be considered. Thus how a piece of paper with a city map on it, will be useful for a user. An idea is to place special scanning devices to specific locations in the city capable of interpreting the data on this map. So a user scans this piece of paper in the system, on the paper activation points are printed identifying interesting sites of the city, and the system presents the corresponding information about the current location.

## **5 Usability Testing Framework**

Having in mind that these user interfaces have not been evaluated we should develop a framework that will examine them and extract useful conclusions. As was mentioned before suggestions that have made for user interfaces evaluation, probably are inadequate for these interaction systems.

A major issue is to define guidelines [12] for developing user interfaces on these interaction devices, mainly for hand-held PCs and paper based interaction devices. Additionally heuristics that should evaluate these interfaces are needed. These guidelines and heuristics should take into consideration the display capabilities of these devices, the operating system limitations, and the limited input devices. Additionally computer based evaluation tools should be developed aiming on these devices. [14]

It is evident to every user that in modern user interfaces an important interaction element is icons [13], and earcons [15]. These elements should be very descriptive about the action that is assigned to them. Many studies have been carried out about them, but fall in the restrictions we have described. In the case of earcons the same results can be used, but for icons new research should be carried out.

## 6 Conclusion

In this paper we tried to address some problems that arise due to the use of new interaction devices for innovative applications. We think that is not wise to adopt without examination the research results that have been made so far for user interface design because they don't take into consideration the special features of these devices and the applications considered. All the issues addressed are studied in the framework of the Campiello project.

## 7 References

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