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Design and Evaluation of a Mobile Art Guide on iPod Touch

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ABSTRACT

This paper describes the design principles and the main technical solutions of an interactive multimedia guide for an art exhibition about Ethiopian Christian art at Ca' Foscari in Venice, Italy. The guide has been implemented on an iPod touch, aiming at coupling rich multimedia content with a natural interaction style. The design is based on the Apple version of the Webkit development environment, interfaced with an application layer that intercepts the visitor gestures, offering a natural interaction style on top of standard web-oriented gestures.

1. INTRODUCTION

This paper presents the rationale, the design, the implementation and a preliminary evaluation of an interactive art guide based on the Apple iPod touch. The guide has been designed for the exhibition "Nigra Sum Sed Formosa - Sacred and Beauty in the Christian Ethiopia", that took place at Ca' Foscari in Venice from March 13 to May 10, 2009. The idea behind the guide design was conceived largely before this exhibition, in the framework of a research about new interactive systems for rich art fruition, a project involving the Department of Computer Science and the Department of History of Arts and Cultural Heritage Preservation at Ca' Foscari University. The goal of the project is to provide the visitor of an art exhibition, in the present case an exhibition about sacred objects, places and rituals in the Christian Ethiopia, with a rich experience related not only to the exhibition content but also to the cultural, historical and geographical context in which the artworks have been conceived. The ultimate goal is to give a visitor not a simple, albeit correct, comment on the exhibition content, but rather a wide scope knowledge about Christian art in Ethiopia.

A quite obvious goal but not easy to implement, because it is difficult to build a coherent set of presentations, driving the visitors according to a consistent but multifaceted information structure, balancing two opposite concepts: at one side, the simple linearity of a guided tour, at the other side a powerful interactive multimedia technology, often leaning towards impressive presentation effects that risk to overcome the meaning of the represented content.

An interactive multimedia guide should give the visitor the ability to choose information from a large catalog, including, in addition to the usual audio track associated to individual objects (possibly joined with images and video clips that supplement the personal vision), also general introduction to the exhibition sections, comments by experts and organizers, movies and images of landscapes, architecture, environments and rituals of the Ethiopian culture and music, in a coherent context searchable with a few gestures and easily identified by evocative words.

2. THE RATIONALE FOR AN INTERACTIVE ART GUIDE

The rationale behind the design of a new guide can be explained according to two perspectives: a humanistic perspective, considering the information and knowledge a guide should convey to a visitor of an exhibition, and a technological perspective, considering how the interaction and presentation technologies should be used to give the user a satisfying experience. Globally, the two perspectives converge toward the goal of augmenting the user knowledge about the exhibition themes with a comfortable interface, rich multimedia delivery and low cognitive load.

From a humanistic perspective a good guide should provide the visitor not only information, but also, and mostly, experience coming form the interaction with the artwork. The word *experience* should be interpreted in a broad sense; in the context of this exhibition it certainly includes the exploration of the details of an artwork that for preservation reasons are not accessible. Experience primarily includes understanding the geographical and historical environment in which an icon has been produced, perceiving the value of a cross through the vision of the rituals in which it is used, listening to the sound of a sacred instrument during a ceremony to sense the atmosphere its vibrations can convey.

From a technical perspective, the design of an art guide faces several challenges, the most notable being the almost unreachable ease of use of the widespread and simple, albeit limited, keypad-based audioguides. Any enrichment raises issues of ease of use and creates gaps among the users according to their skill with portable devices.

Indeed, experiments exist of using PDA devices in exhibitions accessed by a large and heterogeneous public; for example, the Ship Museum in Barcelona [2] provides the visitors with a touch screen smartphone whose functions are constrained to the selection of presentations from a keypad, matching the numbers displayed on the visit path. Each presentation is an audio comment, but simple images and short texts are also available and can be received by e-mail at the end of the visit.

The Apple iPod touch is changing the way multimedia interactive guides are perceived, due to the excellent quality of audio and video playback, to the interaction style and to a fashionable appeal of the device itself. IPod based guides are

available in several museums, among which the New York Moma, the London Tate Galleries and the Belvedere Museums in Vienna are notable examples. Indeed, in these cases the iPod is used as a mediatheque with a strong orientation to audio only contents (at Moma it is promoted as the *Moma Audioguide*), thus limiting the multimedia potential of the device [1, 4].

We tackled the problem of joining the ease of use with the richest user experience from another point of view, trying to analyze which information delivery functions should be maintained, which dropped, how each should be implemented to account for fast but robust prototyping.

The limited time and resources available played a major role in defining a design strategy, coupled with the evidence that, since most of the objects come from private collections, digital material would be available late and would be subject to last minute revisions, and that the final decision about the guide content would be taken close to the exhibition opening.

The initial requirement analysis put into evidence a number of primary issues:

1. The guide is to be used during the visit; making it available as a stand-alone guide, downloadable or online, while considered an interesting added value for the exhibition and for the guide, was not taken into account due to copyright restrictions on the exhibition artworks. Its primary function is to help the visitor to understand the value of the artworks and of the exhibition as a whole while being on site.

   To achieve this goal the guide offers support for multiple access to information and in particular to non-linear visits to the exhibitions that - according to [3, 5] - represent the behaviour of a significant part of visitors.

   An additional access modality is a *tag cloud*, borrowed from the folksonomic approach to information sharing [6]. It offers a way to reach a large part of the multimedia material by evocative words that are orthogonal to the exhibition sections.

2. The heterogeneity of the objects on display, ranging from sacred icons and crosses to drawings and to images representative of a religious style of life, demands for a mixture of a catalog approach and an essay approach. The catalog aims at identifying and documenting single objects whose value is primarily in their physical appearance. The essay aims at presenting a more general description of artwork categories, locations, practices, historical events and geographical landmarks, in a documentary style.

3. The guide must be immediately usable and the audiovisual quality of the content must be excellent, engaging, but also simple to fit the visitors' background without being trivial. This requirement is the most critical one. It overcomes the technical issues about multimedia and directly addresses the relationships between the experts, the critics and the public accessing art and culture.

4. Due to the nature of the exhibition content, related to ancient sacral art and to historical traditions, the graphic appearance of the guide has an evocative role. Realistic images should be used to identify the different contents, instead of schematically styled icons which recall a technology but do not help the visitor to perceive the exhibition atmosphere.

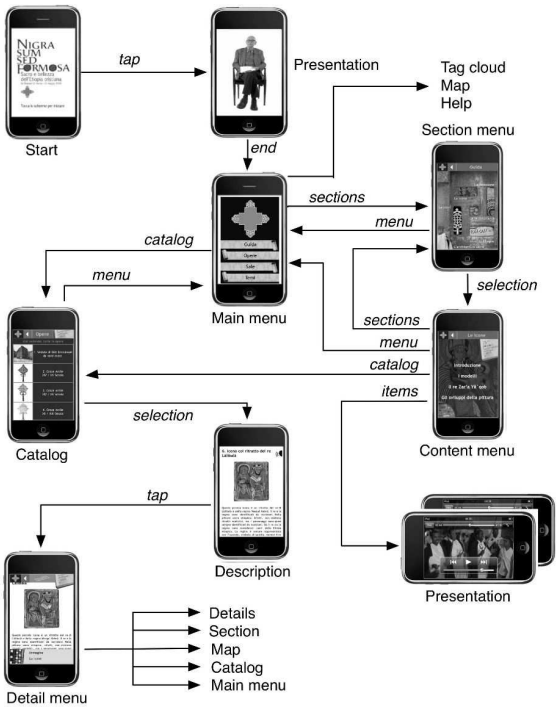

Figure 1: The guide content structure

3. THE GUIDE STRUCTURE

Figure 1 shows the overall structure of the guide content. After an initial presentation introducing the exhibition, made by an expert of Ethiopian art, a menu introduces four chapters: the guide, the catalog, the exhibition map and a tag cloud. According to item 4 of the requirement list in previous section, we have chosen to rely on graphics evocative of the exhibition itself, rather than on standardized menus. We have tried to hide the perception of a rigid navigational structure in favour of a structure closer to a printed catalog, quite conventional in art exhibitions: a collection of essays plus an index section with cards synthetically describing the works on display.

The guide has six main sections corresponding to the exhibition themes: Icons, Crosses, Devotional objects, Religious architecture, Testimonials and Drawings. The first three sections are related to themes represented by sacred objects; therefore in these sections the catalog part is preminent, as objects deserve a detailed description each. Each artwork is presented with a reference small image, a short text and an audio comment (much as in a conventional audioguide), and is accompanied by one or more high resolution images that can be enlarged and explored to discover details; in some cases a longer and more detailed audiovisual presentation shows more details through animations. The other three sections include heterogeneous objects. The guide exploits here its potential, collecting multimedia files such as movie fragments, audio recordings, slide shows, interviews,

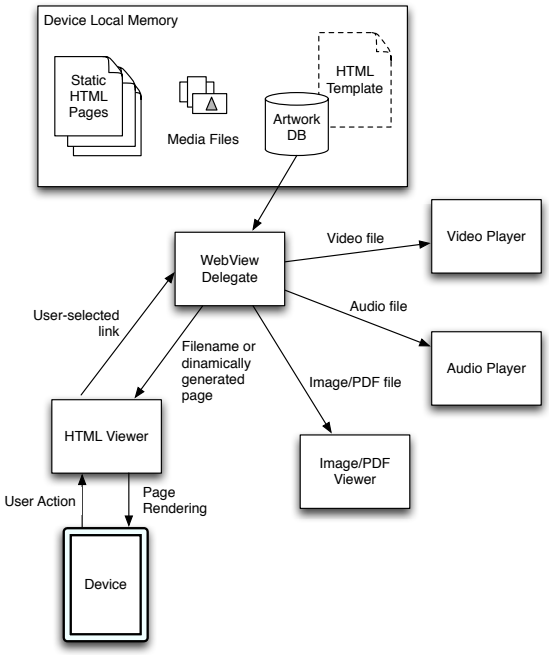

Figure 2: The application architecture

traditional religious songs, and so on.

The interaction is based on a limited number of gestures: in the menu pages, tapping on an illustration or on a title displays an index page or a multimedia content that can be controlled with the iPod standard virtual controls. Tapping on an index page element displays the artwork card; a popup menu contains additional links to high resolution images and to audiovisual content.

Browsing through objects is accomplished by the standard iPod gesture of flicking the pages, and is limited only to collections. In a first version we had no "back" button, since all actions are represented by words or by consistent symbolic icons in the screen that give the visitor the idea to *advance* into the visit rather than to *go back* or *go up* in the information structure. In a later version we introduced a "back" button, that was appreciated mainly by visitors used to web navigation.

4. THE APPLICATION ARCHITECTURE

The application has been developed using the capabilities of the iPhone/iPod touch operating system for the playback of images, audio and video, and for displaying HTML pages using iPod specific CSS constructs for visual transition effects. The application drives the HTML viewer based on Webkit, taking control to play multimedia files and to build dynamically generated pages with the catalog contents. Figure 2 shows the functional architecture of the application.

The contents are stored in the iPod as three different sets of data: (1) static pages, which are HTML files with external style sheets and JavaScript code; (2) files with images, video and audio content in an iPod compatible format, stored in an ad hoc folder structure; (3) a SQLite database containing information on the artworks: names, texts, associated multimedia files, location and classification according the exhibition themes.

The application behaviour is conceptually simple but far from trivial: the initial page (a normal XHTML page) is loaded by the Webkit engine, using the whole screen area and hiding the navigation bars to improve the screen appearance and gain full control over the user actions. User gestures are interpreted as usual, but some of them have no effect; for example, device rotation is ignored to avoid graphic misalignments.

When an interaction generates the request to load a new page, such as after a menu choice menu, the request, in form of a link, is trapped by the "WebView Delegate" module. This module, based on the name of the referenced link and on the information stored in the database, might signal to the viewer to load and display a normal XHTML page. The module itself takes care of the action in the following cases:

1. if the link is a reference to play a video file, it is shown as a standalone presentation by the "Video Player" module; at the end the application takes control and signals the XHTML viewer module to load the appropriate next page;
2. if the link is a reference to an image not embedded in an XHTML page or to a PDF document, the image or the document is displayed with an overlaid *done* button allowing the user to return to the previous screen;
3. if the link is the name of an audio file, such as a comment to an artwork, the file is played synchronously; at the end the execution returns to the XHTML page embedding the audio link
4. if the link is to a page containing a list of artworks the list is recorded into an internal structure to allow the user to browse the relevant items. Such lists are called catalogs; a general catalog collects all the artworks, accessible from the main menu; specialized catalogs collect the artworks of a section, or of a room, or associated to a word of the tag cloud.
5. relative and absolute references to artworks (i.e., references such as *next*, *previous* and by artwork number) are handled by merging information from the database with the artwork template, dynamically generating XHTML pages that are sent to the HTML viewer.

5. EVALUATION

Due to the experimental nature of the guide only ten iPod touch devices were available at the exhibition, sufficient to test the guide in a real context. The iPods are charged and synchronized by an iMac through two intermediate USB hubs, each supporting five devices. We left the iPod in the native operational environment, without protecting the program and the system from possible user misuse; we registered only one case where the application had to be reinstalled because (accidentally?) deleted.

We released three different versions of the guide. The second version was improved mainly in the available content and with a more evident identification of the four main guide chapters: by sections, by catalog, by map and by tags. The third version of the guide included a context-dependent audio-visual help accessible from any page and further improvements in the navigation structure.

In order to evaluate the effectiveness of the guide we provided two different tools: a questionnaire and an automatic

Table 1: Preliminary questionnaire evaluation

(a) Guide chapters

	Catalog	Rooms	Sections	Keywords
Used by	85%	81%	69%	66%
Score (1–5)	4.1	4.1	4.0	4.1
Norm. score	3.5	3.3	2.8	2.7

Note: The normalized score assigns 0 to void responses, taking a function not used as a function not well designed.

(b) Interface functions

	Touch	Scroll	Flick	Enlarge
Used by	86%	85%	80%	53%
Score (1–5)	4.2	4.4	4.2	4.1
Norm. score	3.6	3.7	3.3	2.2

(c) Content type

	Audio comments	Audio-video	Artwork pages
Evaluated by	81%	78%	82%
Score (1–5)	3.9	4.1	4.1
Norm. score	3.2	3.2	3.4

tracking system. All the data collected are related to the second and to the third version of the guide.

User tracking is based on the recording of every page visited. At visit end a synchronization operation resets the application to the initial state and uploads to the iMac a record of the information accessed and of the gestures done. We have collected more 50.000 records, each corresponding to a user gesture on the screen, or to a file access[1], counting for more than 600 different visits in a time span of about six weeks. We plan to use data mining techniques to reveal user patterns, that will be available in a next stage of our research.

The questionnaire was submitted to most of the visitors except in hours of great affluence. Their content will be compared with the results of the analysis on the user traces. We have first results on a sample of 176 questionnaires, synthesized in Table 1, where a general appreciation of the guide emerges. However, it is perceivable from Table 1(a) how the habit of using sequential audio guides influences the visitors that, even in presence of a more articulated device, privilege direct catalog access to introductions and theme explanations. It is also evident from Table 1(b) that the more advanced user functions, such as multitouch gestures to enlarge images and reveal detail, present some difficulties, and a consistent part of the users didn't even realize that such function was supported. The results seem to suggest that multitouch gestures, that are associated to power and ease of use in promoting new devices, is still not perceived as a natural interaction and may require a learning phase hard to be satisfied in the short time of an exhibition visit.

We may expect that, with the rapid spreading of touch-based devices and the standardization of gesture-based interaction, users will be aware of these functions without an explicit halp. The lesson learned for the immediate time is that we need to support the users with explicit information about the functions available.

Table 1(c) shows a satisfactory appreciation level for the different types of content provided by the guide, with a slight preference for content exploting the multimedia capabilities of the device.

[1]Many files need to be accessed for a single artwork, so the number of records is quite greater than the number of artworks consulted.

6. CONCLUSION

The design of an interactive multimedia guide for an art exhibition requires to consider the relationship between the visitor and the artwork in deciding what content must be delivered and what freedom the user has in accessing it. The multimedia technology is necessary but not sufficient to overcome the limits of the traditional audioguides. Novel interaction between visitors and artworks can be achieved if the information provided is rich, engaging, covering audio *and* visual content, and is targeted to provide emotions and understandings rather than knowledge of facts.

The technical harness on which the guide has been designed and implemented is independent from the application context as long as a detailed explanation of artworks lives together with the delivery of context information about lifestyles, events, historical backgrounds, reducing the gap between the art book model and the catalog model of art fruition. The guide has been evaluated positively by the responsibles of other cultural institutions in Venice, mainly in the area of contemporary art, whose language and expression style is well supported by multimedia interactive technology, and new applications for exhibitions planned in the near future are under consideration.

7. ACKNOWLEDGMENTS

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