

Building own's guided tour in a contemporary art guide

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ABSTRACT

In recent years the increasing availability of affordable mobile devices with touch interfaces, large display, and a large amount of storage memory has made possible the proliferation of a vast set of software to be used as city and museum guides. In this paper we discuss our experiences in using the Apple iPhone/iPod touch platform to present multimedia contents to visitors of several temporary art exhibitions that took place in Venice since 2009, culminating in the ongoing project of an interactive multimedia guide for the François Pinault contemporary art collection at *Punta della Dogana*. The guide features a novel way of presenting contents through dynamically generated tours personalized on the user answers to a set of questions about the exhibition; the personalized tour thus reflects the user background, interests and curiosity providing a richer emotional and cultural involvement.

Author Keywords

Contemporary art, interactive guides, web-based applications, mobile

ACM Classification Keywords

H.5.2 Information Interfaces and Presentation: User Interfaces; J.5 Arts and Humanities: Fine and performing arts

INTRODUCTION

In the last decade personal mobile devices have been proposed as guides in museums visited by large public, as an improvement over the simple audio guides popular in the last decades of the XX Century [8]. In 2005 the San Jose Museum of Art used an Apple iPod player to store a large quantity of audio comments and used the built-in capabilities of the device to let visitors select specific portions of content, identified by physical labels in the vicinity of the artworks [2]. The Ship Museum in Barcelona provided visitors with a Windows Mobile device: the selection of contents was still done by typing a reference number on a keypad. Each content was an audio presentation accompanied by images and short texts. Visitors could also bookmark pieces of information they find relevant and get them by email [1]. During an exhibition on Gustav Klimt's works in 2008 the Tate Liverpool Gallery provided a set of audiovisual contents on iPod touch devices, but with limited interaction capabilities. The same content has been provided as a set of downloadable files in the Tate web site [3]. The San Jose Museum of Art switched to the iPod touch device in 2008 to present an on-site art guide that goes beyond the classic

audio guide, by making information, images, and videos accessible through an intuitive graphical interface [2].

In recent years the increasing availability of affordable mobile devices with touch interface, large display, and the possibility of downloading applications online favored the proliferation of a vast set of software to be used as reference and guide while visiting a city, a museum, an exhibition. The creation by large companies of worldwide accessible software repositories, like the Apple AppStore and the Android Market, allowed institutions to develop and distribute their products in a very effective way, reaching millions of users. Among the most interesting examples we cite the MoMA iOS application that allows users to access information about all the 3200 artworks of the collection, informs users on current and future events, and let them access a series of mobile tours. Other similar applications have been developed in Europe: Versailles Gardens presents an interesting view of the castle's garden by proposing discovery paths; in England Tate Trumps allows visitors to learn about the Tate Modern Gallery artworks through games and puzzles to be carried out in groups; in Italy the Vatican Museum of Rome propose a detailed view on some of the most important masterpieces of Italian art.

Critical issues in the design of such multimedia interactive guides are the choice of the amount, detail and style of information, the design of the proper access and navigation paths and the adaptation of a potentially huge set of multimedia material to a wide spread of visitors [9, 12, 14].

In this paper we describe the *Punta della Dogana* project (hereafter referred to as *PuD*), an academic research project whose objective is the creation of an educational application, an iPhone/iPod touch guide featuring interactive multimedia guided tours of a contemporary art collection. This project aims to set up a modern critical instrument to understand contemporary art, by providing visitors with comprehensive information about the art collection of the François Pinault Foundation at Punta della Dogana in Venice. The research project is conducted by the Department of Computer Science and the Department of Art History and Conservation of Artistic Heritage of Università Ca' Foscari Venezia with the François Pinault Foundation.

The *PuD* project takes inspiration from our previous experiences in the field of multimedia installations and mobile guides on Apple iOS devices, designed for several art shows held in the Exhibition Gallery at Ca' Foscari [5, 4]. Two

of them were promoted and organized by the Department of Art History and Conservation of Artistic Heritage of Ca' Foscari: *Nigra Sum Sed Formosa: Sacred and Beauty of the Christian Ethiopia* (March 13 - May 10, 2009) featured artworks and sacred objects of the Ethiopian religious art from Italian private collections; *Russias! Memory, Deception, Imagination* (April 22- July 25, 2010) looked at a rich collection of twentieth-century Russian art also through the lens of interactive multimedia installations. Two other exhibitions were hosted at Ca' Foscari but were independently organized in the frame of the Venice *Biennale* exhibitions: *Bruce Nauman: Topological Gardens* (June 6 - October 18, 2009) hosted a section of the USA pavilion at the Venice *Biennale* of Visual Arts; *NoPlaceLike, 4 houses 4 films* (August 29 - November 21, 2010) hosted the Portugal pavilion's exhibition at the Venice *Biennale* of Architecture. For all the exhibitions we provided interactive multimedia guides as companions to visitors and supplements to the official exhibition catalog.

The *PuD* project is the culmination of our experiences. Besides experimenting rich multimedia content on mobile devices to provide a comprehensive context about a contemporary art exhibition, the project aims to give the visitor the ability to create a personalized tour through a sequence of questions that progressively builds the tour's steps based not only on the visitor's background and general interests but also on the attention and curiosity developed during the tour itself. The resulting experience is thus built upon cultural and emotional feedbacks coming from the user attitude towards the actual exhibition contents. From the designer perspective the project aims at building a development environment based on a multimedia repository on which multiple perspectives, multiple navigation paths and multiple interaction styles can be adapted and dynamically composed, fulfilling the requirements of different categories of users [7].

The paper is organized as follows: in the next section we describe the rationale of the *PuD* project. Then we discuss our approach to the guide prototype: we focus on an architecture that overcomes the limits of the traditional solutions based on hierarchical menus. The description of the development methodology follows, based on the cooperation between programmers and domain experts, along with a few words about the content management system we developed and used in the project. In the concluding section we discuss issues about future development.

THE *PuD* PROJECT

The *PuD* project takes inspiration from similar multimedia educational tools built in the last years in the area of art and museum applications. It aims to be innovative and original in a highly competitive area. The main idea is to focus our attention on interactivity, exploiting the dialogue between the visitors and the artworks. Even a well informed public may find it difficult to understand contemporary art, making this a very complex field of investigation. We believe that a way to develop knowledge in contemporary art is to improve understanding the multi-facet context of its cultural value, through a *user-friendly* multimedia interaction with a rich technolog-

ical platform.

The *PuD* project focuses on a selection of artists and artworks of the current exhibition at Punta della Dogana, *Mapping the Studio*, curated by Alison Gingeras and Francesco Bonami. The *PuD* project retraces the course of each art piece, from its conception in the studio up to its integration within the private collection, analyzing the artist's thought about art and the social and historical events occurring during his/her work.

Among the over twenty artists represented in the exhibition we selected a small but highly representative group: Jake & Dinos Chapman, Takashi Murakami, Rachel Whiteread, Huang Yong Ping and Rob Pruitt. We decided to focus on the ones who showed more enthusiasm for collaborating to the project and whose art pieces in the exhibition spaces were mostly suitable for a multimedia interpretation. For example, Jake & Dinos Chapman's *Fucking Hell*, made in 2008, and Huang Yong Ping's *Football Match*, made in 2003, are both sculptural descriptions of miniaturized worlds whose reading could be facilitated by multimedia content focusing on the relations between the whole work and its details.

Like any traditional art historical investigation, we started collecting a critical documentation of the selected artworks through traditional bibliography (reviews, articles, catalogues, artists writings) and audio-video resources (photographs, videos, music repertoires). The following step was to interview the artists either in the studio (Yong Ping), at Punta della Dogana and Palazzo Grassi exhibition sites (Pruitt, Murakami) or in other location chosen by the artist (Chapman, Whiteread). The interviews consisted in a series of questions based on a standard model touching similar subjects for all cases, to anticipate the possibility of comparing them during the exploitation of the guide:

- a presentation of the artist made by him/herself;
- reasons for deciding to be an artist and the initial art education;
- a personal view of the role of the artist in contemporary society;
- a description of the studio and the process of artistic creation (place, techniques, materials, etc);
- a commentary about the artwork at Punta della Dogana;
- historical, literary, artistic and other sources in the work in general;
- the relationship with the location: the Pinault Collection and the city of Venice.

Other specific themes and questions were addressed to each artist, considering his/her personal history and aesthetic ideas. The interview themes correspond to one of the categories designed in the structure of the multimedia guide. The interviews were also completed by a critical commentary of the two curators: a general introduction by Francesco Bonami and an audio tour by Alison Gingeras. Finally, a sample

from a lecture series on selected artworks from the Pinault collection, organized by the Venice Universities in 2010, was added as a context to the guide content.

A complementary section of the project is devoted to the history of the architecture of Punta della Dogana, since its origins in the seventeenth century until the recent work of restoration and renewal made by the Japanese architect Tadao Ando in 2009. We collected a set of multimedia contents: historical and technical documentation from recent essays and restoration reports, Ando’s drawing prints and 3D maquettes, the video-photo documentation of the restoration, professional photos of installation views and an iconographical repertoire of Punta della Dogana’s history, from ancient etchings with perspective maps and views to modern paintings. We involved three relevant experts to open a free conversation with the virtual visitor-user: the director of the Civic Museums of Venice, a prominent Architecture historian and the chief engineer of the general contractor for the building renovation.

To avoid a cognitive overload on the visitor with so much material we based the guide conceptual architecture on a collection of *tours* based on structured sets of *questions*, i.e., multiple choice criteria that allow the visitor to enjoy a dynamically configurable visit based on his/her own interaction with the system. The questions are proposed in various forms: texts, dynamic gestures, images, shapes, colors, etc. We conceive the visitor not as a passive bystander but as an active user who employs an intuitive approach to the guide contents to set up his/her own interactive tour.

THE PuD MULTIMEDIA GUIDE

The *PuD* project goal is to allow visitors to build their own perspective on the artworks through a selection of topics related to artworks, artists, and architectural points of interest. In the current prototype implementation the topics involve five different artworks and four architectural points of interest. When the visitor selects a topic, the application leads him/her through a guided tour where the visitor him/herself can shape the path of the visit by answering a set of carefully tailored questions¹.

The Guide Model

The abstract model of the guide is based on the notion of *tour* and *visit*. A tour is a set of visits where the specific visit is a sequence of coherent steps built by the visitor by answering questions proposed as the visit proceeds². Each step represents a state of the visit, q , an abstract representation of a guide section for a specific topic.

In the starting state, q_0 , a summary of the topic is presented (the artwork’s title, the author’s name, etc.). Each state is associated to a set of inputs which are atomic user interactions

¹The term *guided tour* could be questionable since the visitor chooses where to be guided. Indeed, the tour is built by the user only indirectly, answering general questions which reveal the visitor’s attitude, context and background.

²A tour is formally described by a *finite state automaton*, but formal details are not relevant here.

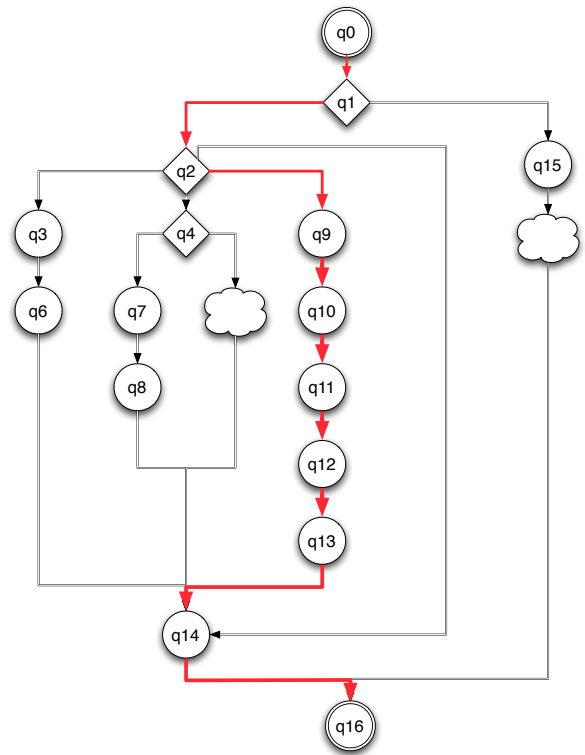


Figure 1: An abstract topic graph with an actual visit path outlined with a thick line.

like pressing a button, selecting a color, tilt the device, and so on. The set of states is partitioned in two disjoint subsets, the *contents* and the *questions*. When the guide is in a content state the visitor is presented with a node containing a multimedia piece of information. Each content state is associated with only one transition: after experiencing the content, the visitor goes to the next state without any need of interaction. Question states, instead, present the users with a node containing two or more alternatives to choose from: the visitor interaction (the answer to the questions) will be used to determine the next state, i.e., the next node shown. When the system reaches a final state the tour ends: the guide presents the visitor a summary of the experienced contents and allows him/her to select a new topic.

We call the sequence of states q_0, q_1, \dots, q_n experienced by the visitor a *visiting path*. Visiting paths are used immediately by the guide to provide the user a summary of the experienced contents, but are also stored persistently on the device: we can aggregate multiple paths to analyze how the visitors “move” inside the guide and use this information to improve future selection of contents. Our past experience with mobile guides proved that such analysis is a valuable evaluation tool for tuning the guide design [7].

Content nodes are further classified by *macro categories*, like “Atelier”, “Artwork”, “Yourself”, respectively related to the artist’s studio, to the artwork and to the artist him/herself. Each content node can belong to one or more categories.

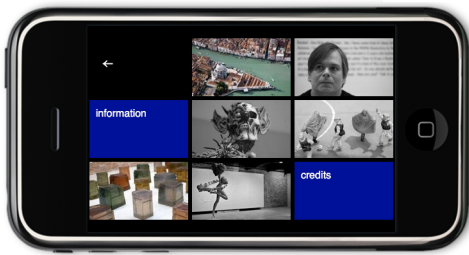


Figure 2: The guide initial screen.

Visit paths are classified by the type of macro-categories their nodes belongs to: a path touching nodes of only one category is a *mono-thematic* path, while *multi-thematic* paths traverse several categories.

In Figure 1 an example of an abstract topic is given: questions are represented by diamonds and contents are represented by circles. Arrows represent the possible transition. Clouds represent subgraphs that are not detailed here for clarity. The topology of the graph, designed by domain-experts, has a direct influence on how the visitor will experience the contents and how such contents are connected. In the figure the thick lines represent a sample visit path.

The Guide Functional Architecture

The guide initially presents to the user a grid view of topics (Figure 2). Each topic is identified by an image to help the visitor to visually identify the artists, the artworks and the architectural points of view. Then, according to the choice made, the application loads the relative topic and displays the starting node, usually containing introductory information. To make the information context clear, each topic should be experienced in a specific place: for instance, artworks topics should be viewed while in front of the physical artwork, while the description of the architecture is best appreciated if the visitor is in a proper location. In the current version of the applications we have no mean to infer the position of the visitor inside the building: hence, information is prepared to be understood in every location inside or outside the exhibition, with proper visual references in the multimedia material.

When a content node is encountered, the application displays the corresponding multimedia object. Contents are presented in a predefined set of modes. A video or audio will simply be played on the device with standard controls; a set of images is displayed as a user-controllable slideshow; textual contents is paginated to make it easily readable on a small screen. When the user is done experiencing the content the application goes to the following node; the transition event is either automatically triggered for contents like audio and video, or manually activated by a user gesture for texts and images. Since content nodes have only one outgoing arc the next node is unique. When a question node is encountered the application waits for the answer and displays the next node accordingly. This loop continues until the visitor hits a final node; the application displays a summary of the visit and returns to the initial topic selection screen.

A graphical example of a visit to the Rachel Whiteread's artwork "*Untitled*" (*One Hundred Spaces*, 1995) is shown in Figure 3; each screenshot is labeled with the corresponding state of Figure 1. In state q_0 introductory content is shown; in state q_1 the user is presented with the first visual question asking to choose between the author, touching the right image, or the artwork, touching the left image. If the visitor selects the author, another question in state q_2 asks to choose between four different point of views. The example shown in the figure leads the user to a sequence of nodes about "building an invisible city", where the artwork is put in relation with other works of the same author, shown in the sequence ($q_9, q_{10}, q_{11}, q_{12}, q_{13}$). Finally, in q_{14} a fragment of an interview where Rachel Whiteread explains her artwork is presented.

The Run-time Environment

In our early experiences with multimedia art guides we used a small number of iPod touch devices both as development and deploying devices. While the Apple support for developers and the possibilities given by the iOS SDK are great, we felt the need to be platform independent at a large extent. To achieve this goal we started developing a *web application* thanks to the excellent support given by the Safari Mobile browser integrated in the device, a solution available also on other platforms. Modern browsers can be seen as *virtual machines*: they can render text and graphics, interpret an high-level programming language, and handle complex data structures. A web application, however, has also a set of limitations, heavily dependent on the specific device we take in consideration. The iPod touch, for instance, runs web application only inside the standard Safari Mobile application, that includes features unnecessary in the context of a specific application, like bookmarks, address bar, etc. Moreover, some behaviors, like the one induced by the native audio player user interface, are not optimal for our case.

For such reasons we have developed a *web application wrapper*, a software that acts as a bridge between the web application and the mobile device. The wrapper main task is to embed the web application into a native application tailoring the browser functions to the ones needed with suitable control over the permitted interaction. With such an approach we allow the web application to be served completely in local, bypassing the need of a stable, fast wireless connection in the exhibition spaces³. Also, the application is self-contained and can be distributed like a native application.

In September 2010 a consortium of major international companies led by the German Fraunhofer Institute for Open Communication Systems, FOKUS, started a project to develop an open-source platform and software components that will allow cross-platform use of services and technologies that can be operated on multiple screens. The *Webinos* project⁴, funded by the European Union, is, at the time of writing, at

³A very common problem when working inside ancient buildings like in Venice.

⁴Secure WebOS Application Delivery Environment — <http://www.webinos.org/>



Figure 3: Screenshots of the *PuD* application. The sequence corresponds to the abstract path of Figure 1.

an early stage of development, but proves that our approach to use a virtual machine to run the same code on different mobile platforms is actual and viable. The concept of using mobile devices browsers with a wrapper native application to develop and distribute web applications is also embraced by the acclaimed *PhoneGap* project [13].

The use of a native application has also made possible a set of other improvements like a finer control on gestures, data management, complete support for multimedia playback in a local environment and, finally, the ability of logging the user actions. With the recent advancement in the HTML standard (see the HTML5 draft on multimedia elements and client-side databases [10]), some of these features, that were implemented as native iOS code in our early experiences, were rewritten in pure, portable web code. More detail on the guide's run-time architecture can be found in [6].

A COOPERATIVE APPROACH TO GUIDE DEVELOPMENT

According to [11] the goal of human computer interaction is evolving from just making systems that are easy to use to systems that are easy to develop. This is of particular importance in the field of computer science applied to cultural heritage, where different areas of expertise require different approaches, and often data is biased by some degree of subjectivity. For this reason we departed from the simple solution of developing an ad-hoc structure for our contents, but produced instead a framework where domain experts can participate in the guide development together with interface designers and multimedia producers.

To allow different actors with different roles and skills to cooperate to the development of the guide, the navigational structure of the guide is purposely kept at a simple level; this approach also permits a fast learning curve. The application is a one-page web application, a single HTML document that is loaded when the application is started and is modi-

fied dynamically by asynchronous calls, normally driven by the user input, generating a sequence of pages and menus which are the *nodes* of the graph describing a tour. A node is generated by a set of components:

- an HTML document containing the node's markup, acting as a template defining the general structure of the node;
- a document containing the node's data. Actually we use JSON as a content description language;
- a CSS document containing the styles to apply to the node markup;
- a Javascript document to be executed after the node has been loaded;
- a set of external files that can be linked by the node, like images, videos, and so on, prepared by multimedia content producers.

When any specific node is requested the application fetches the required components and combines them to create the actual content that will be presented to the user. Such an architecture allows us to extend and modify the guide from three different perspectives:

- a *programmer* can act on the application source code (the wrapper) to modify and extend the basic behavior of the guide: this perspective requires a deep knowledge of the Javascript programming language, Ajax calls and the base framework;
- a *designer* can act on the node markup, style and behavior to create new nodes for the application and new templates for nodes: this perspective requires knowledge of HTML, CSS and, optionally, some Javascript to create dynamic or complex new node types.

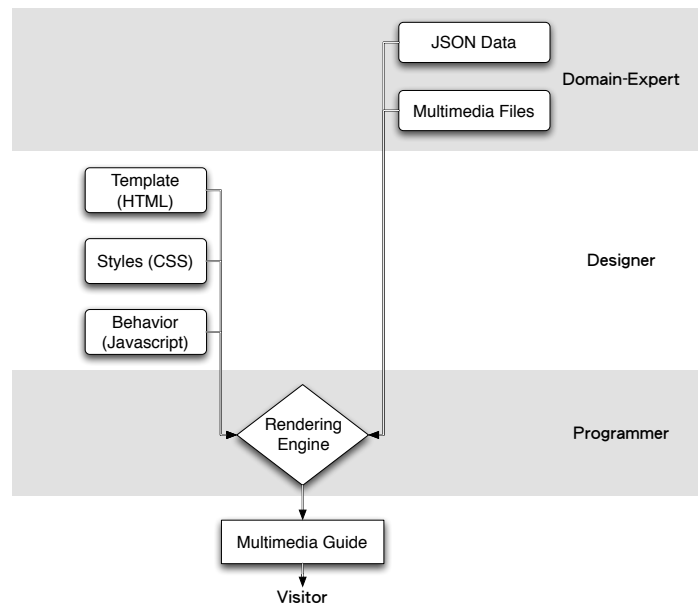


Figure 4: The guide instantiation process.

- a *domain-expert* with no prior knowledge of HTML, CSS, or Javascript can act on the node content and to the multimedia material that will be applied to pre-existing templates to generate new node instances: this perspective requires the knowledge of some simple syntactical conventions and familiarity with the available node templates, which are part of the framework's documentation.

This approach, summarized in Figure 4, allows us to control the cooperation between the different expert roles and to extend the guide framework gradually over time. We have currently implemented a set of templates to hold different kinds of questions, to present the most common multimedia file types, and a pair of starting and ending nodes to, respectively, present an artwork to the user and present a summary of the visiting path followed when the visit ends. Domain experts wrote a set of data files following the simple JSON syntax, assisted by some examples, and the results were compiled into the actual *PuD* guide.

The Content Management System

To archive, classify and manage art-related multimedia contents we developed our own content management system (*CMS*) whose main goal is to favor a more fruitful interaction between experts of different domains. In our early experiences with multimedia guides we handled multimedia data about artworks in an ad-hoc way. While ad-hoc management has the advantage of immediacy and efficiency, it might introduce ambiguities among the team components that can hinder the entire project in terms of speed of development and error management.

The *CMS* features an online storage space with the following characteristics:

- it is accessed through a web-based application, usable from

the vast majority of existing computer systems without any specific installation or configuration. A graphical interface based on common knowledge and a clear feedback of actions allow users to easily operate it;

- it introduces a set of vocabularies to organize contents among different categories. Vocabularies can be taxonomies (fixed set of terms) or folksonomies (free lists of terms), to allow CMS users to have different views of the data and of their relationships; different type of contents can have different vocabularies;
- it provides an abstract representation of data useful to domain experts to access, categorize, and discuss the contents, without entering into the details of their physical arrangement and of their versioning, a non trivial problem due to the size of multimedia data; at the same time the underlying implementation, based on a hierarchical file systems, permits fast re-processing of multimedia material such as format conversion, compression, post-editing, etc..

CONCLUSION AND FUTURE WORK

In this paper we have discussed our experience in designing and developing a multimedia art guide on the mobile platform Apple iOS for the contemporary art collection of the François Pinault Foundation at Punta della Dogana in Venice. The design benefits from past experiences in several art exhibition held at Ca' Foscari in 2009 and 2010. We have gained the evidence that articulating knowledge according to the user mood and need raises interest, curiosity and amusement, without diminishing the importance of art or trivializing its cultural value. To this purpose we have developed a framework that departs from the usual hierarchical menu based application, unfolding a personalized tour built on top of selected topics through a series of questions which elicit

the user reactions to the exhibition content. We argue that such approach, if paired with an intense work by domain-experts, leads to an interesting and new way of presenting contents to art visitors.

To deploy our guides we use the Apple iOS platform. Our approach, however, relied on portable and standard web technologies that exploit modern browsers as virtual machines that can run complex applications on multiple platforms. Our guide works on the majority of browsers and is especially tailored for Webkit-based ones. To present such web applications to visitors without the confusion given by the browser's complete environment, we developed a wrapper to store the guide locally and to override some non satisfying default behaviors.

The *PuD* project is at a late stage of development. We plan to follow with a set of internal tests to check the feasibility of the approach and the quality of the contents, categories and topic graphs. A logging system, embedded in the Webkit wrapper and successfully tested in previously developed guides, traces the user visit and logs the behavior in terms of interaction gestures, and will be used to infer information to further tailor and expand the guide. At present the different topics of the guide are independent from one another. The decisions the visitor takes during the visit of one topic do not influence the visits of other topics. An improvement of our system could make use of the inferred knowledge about a visitor (or the majority of users) to automatically and dynamically tailor the visiting graphs.

As a final remark, we note that our project is based on academic interdisciplinary work, and does not aim to build a refined tool for immediate commercial use. The *PuD* Project guide should be understood as a conceptual instrument that encourages the exploration of the art world from an inner view, particularly from the look of the artist creator. In sixteenth century Giorgio Vasari wrote “*ogni pittore dipinge sé*” (“*every painter paints himself*”). Today we are still searching for possible ways of understanding and interpreting contemporary art as a mirror of individual creativity and of the aspirations of our society.

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