

Learning about Art History by Exploratory Search, Contextual View and Social Tags

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Abstract—In order to develop a learning environment for art history, we adopted concepts from art education and information technology. In contrast to other user-interfaces for art-databases, we created the explorARTorium¹ to compare artworks along different dimensions without having to rely on textual information that excludes people without sophisticated knowledge of art history. Instead, artworks are presented in context among different categories like the oeuvre of the artist, the topic and theme of an artwork as well as the geographical region and time period the artwork was created in. Additional concepts of the explorARTorium are social tagging and tag-clouds. By evaluating the main concepts of the explorARTorium we provide proof that users follow and apply these concepts.

Keywords-learning, art history, contextual search, social tagging.

I. INTRODUCTION

Different approaches have been proposed for the education of art history. One of these concepts, described by Dewey [1], is called experiential learning. For Dewey, art functions as experience. According to his theory, art is the product of the time, place and political situation it was created in. By perceiving, contrasting and observing art, viewers are able to develop a deeper understanding for an artwork and thereby create an experience. This is consistent with Arnheim, who states that perception directly influences our way of thinking. Improving the own perception therefore changes the way we make sense of the world [2]. Since the 1970s, Abigail Housen and her team have examined the aesthetic perception and evaluated how art historical concepts are taught in classroom settings. While comparing different approaches, she has come to the conclusion that "the single most important factor predicting the level of aesthetic development appears to be the amount of time they have spent viewing and reflecting about art" [3]. The Web offers access to a huge amount of information about art as well as to digital copies of artworks. A qualitative analysis of how museums make information about their collections available on the Web is given in [4]. While it has become pretty common that museums provide access to their collection on the Web, the available information is often not satisfying the needs of the users. The problem is based on the conceptional problems of real-life museums. Museum collections consist of a limited number of artworks.

¹<http://www.explorARTorium.info>

The therefore available data describes only a portion of art history. A comparison of the complete oeuvre of an artist is therefore not possible. To give an example: The oeuvre of Baroque painter Caravaggio includes 74 paintings, which are exhibited in 26 different museums and seven churches. In order to view all artworks of Caravaggio, one would have to get information from various museum websites.

A possible solution is provided by art-databases which cover a more holistic view of art history. Examples for large art-databases are Europeana², Bildarchiv Foto Marburg³, artfinder⁴ or the Web Gallery of Art⁵. Even though art-databases combine huge amounts of information about art, they still suffer from similar problems as the web presences of art museums: they lack the involvement of the users [5]. Furthermore users often feel excluded by the systematic, artificial expert language used by art historians to describe artworks [6].

Taking these existing drawbacks into account, we propose a solution that provides a low entry level to the field of art history and actively includes the user. An important aspect of our work is the use of exploratory search. According to [7] exploratory search is better suited for learning and knowledge acquisition opposed to simple lookup and fact retrieval activities which are often used in user-interfaces of art-databases. Based on this idea we have created our system: the explorARTorium. The user-interface of the explorARTorium is designed according to the idea of compare-and-contrast, an important part of pictorial analysis according to Otto Pächt in [8].

Furthermore different concepts of User Generated Content (UGC) are adapted in order to actively include the user in the creation process of meta-data. Foremost we make use of social tagging, a concept of UGC that allows users to annotate artworks with keywords (tags). Tags are assigned according the subjective perception and knowledge of the user. Therefore tags serve as an additional layer that augments the description and categorisation of experts without replacing them [9]. Social tagging has been applied by several art-databases. The most notable examples are

²<http://www.europeana.eu>

³<http://www.fotomarburg.de>

⁴<http://www.artfinder.com>

⁵<http://www.wga.hu>

the *steve.museum* project⁶ [10] [11] and Flickr Commons⁷ [12]. Even though these systems allow users to annotate the artworks, both systems lack the concepts of pictorial analysis and compare-and-contrast. The Facebook-game *myMuseum* [13] applies the method of visual exploratory search, but does not compare artworks along art historical dimensions. Related artworks are identified using similarity measures rather than art historical categories.

The paper is organized as follows: In Section II we describe the concept of our Web platform *explorARTorium*. In Section III the concepts of compare-and-contrast social tagging are evaluated. Finally, Section IV concludes the paper.

II. EXPLORARTORIUM

The *explorARTorium* is designed as a web-platform that combines concepts of art education and information technology. Basically, the *explorARTorium* is based on three concepts.

- The art historical method compare-and-contrast which was created by Heinrich Wölfflin [14] and is commonly used in art education. Rather than providing a textual description, art history can be explored visually.
- Social tagging is used to include the users in the creation process of meta-information. By annotating artworks according to the knowledge and emotions of the users, an additional layer of description is created.
- Linking the artworks to social media sites like Facebook, Twitter and Google+ in order to share information with other (potential) users.

As data-source we are using the openly available data and pictures from the Web Gallery of Art (WGA). Currently the collection of the *explorARTorium* consists of information about 12,742 paintings by 1,542 artists from a timespan of 1100 to 1900 AD. As the WGA focuses on European, especially Italian, art we are aware that our data has a cultural bias.

A. Compare-and-Contrast

An important art historical approach to the perception of artworks, which is used for pictorial analysis in the scope of art history, is the visual contextualisation to other works of art of the same time and cultural region. In the process of creating art, artists relate to other works of the same medium and type as well as to formal and stylistic gestures. Every artwork refers, either referencing, modifying, contradicting or negating, to other works of art [15].

The *explorARTorium* follows this principle of comparing

artworks along different dimensions. By exploratively comparing the artworks, the users shall develop a sense for the context of an artwork. We use five predefined dimensions for the contextualisation and two dimensions that can be directly influenced by the users. After the user selects a certain artwork, it is prominently presented and the context for the artwork adjusts along the specific dimensions associated with the artwork. Because of the restrictions in screen resolutions, we have decided to display five artworks for each dimension.

- The first dimension of the context shows artworks of the same artist. Thereby the users develop a sense for the oeuvre of the artist as well as the position of an artwork within.
- The second contextualisation dimension describes the topic of an artwork. Since no exact information is provided in our data source, we present artworks of the same title. By comparing these artworks, the users shall create a deeper understanding for the iconographic similarities of a certain topic.
- The third dimension contrasts artworks from the same geographical region. Thereby the users shall learn about the typical tradition of a region.
- The fourth dimension addresses the theme, such as religious, historical, mythological, portrait, landscape, or genre work. The regional and chronological development of a theme is thereby visually described.
- The last predefined dimension of the context area shows artworks of the same time. Thereby users are able to compare the artworks according to the special technique, colours and use of visual perspective that was used at a certain time.
- The next dimension randomly displays other artworks from the collection. This way it is possible to completely change the context. Furthermore this dimension can be used to explore artworks that have been annotated with the same tags.
- The final dimension presents the history of viewed artworks. This can be used to return to previously selected artworks.

B. User Generated Content

An important aspect of the *explorARTorium* is that it not only presents information but that it also includes users in the process of generating meta-information. We adopt the concept social tagging, where users are able to freely annotate the artworks according to their personal knowledge,

⁶<http://steve.museum>

⁷<http://www.flickr.com/commons/>

concepts of the explorARTorium according to the principles of Section II. As described in [19] it is important in website-testing to measure the usefulness of a website as a whole, rather than testing whether the users are able to complete a number of single tasks.

A. Interaction Statistics

Between 1st May 2011 and 31 December 2011 the explorARTorium has been used by 167 different users who actually compared artworks. This does not include users who just followed a social-media-link and only viewed one artwork without comparing other artworks. All together the users examined and compared 4,181 artworks ($M=25.03$, $SD=127.06$). In order to reach potential visitors we have asked friends and colleagues, made use of social networks and discussed the idea of the explorARTorium with art historians. Therefore it can be assumed that our users come from a very diverse background with a diverse knowledge of art history. In order to provide a low entrance barrier, we do not ask for demographic information. This means we are not able to cluster our users according to age or gender. The only information we demand from our visitors is to provide a username.

B. Evaluating Compare-and-Contrast

We evaluate whether the users really compare artworks or if they instead randomly click on the thumbnails without noticing the different dimensions. In case the users would not compare the artworks, we would have a random distribution and all dimensions would have about the same percentage of selections (14.3%).

All users together have selected 4,181 artworks by clicking on thumbnails from the seven different dimensions (average clicks per dimension 597.29, $SD=229.85$). The distribution is as follows: artist 1,048 (25.1%), topic 442 (10.6%), region 618 (14.8%), theme 653 (15.6%), time 510 (12.2%), random 593 (14.2%) and history 317 (7.6%).

For each dimension, up to five artworks are displayed as thumbnails. Due to our data source many artists and topics have less than five artworks that can be used as a context. Therefore it is not possible to compare the different context-dimensions with each other. In order to overcome this problem we calculate the amount of possibly displayed thumbnails for each dimension. By considering the thumbnails as possible links to other artworks, we can create a Markov random walk. Random walks are created for similar problems with search engines in order to compare and enhance search results as shown in [20]. We thereby get the exact percentage of possible thumbnails in the context area for all dimensions as our benchmark. This benchmark is then compared to the actual clicking behaviour of our users. As shown in Figure 2 the actual user behaviour differs from the random walk. The artist and topic dimension both exceed the random walk by great amounts. One reason for

the special behaviour might be that these two dimensions provide a very narrow context that consists only of artworks that are most closely related by sharing the same topic and originating from the same artist. This indicates that the users follow our intended idea and are using the predetermined dimensions to compare the artworks.

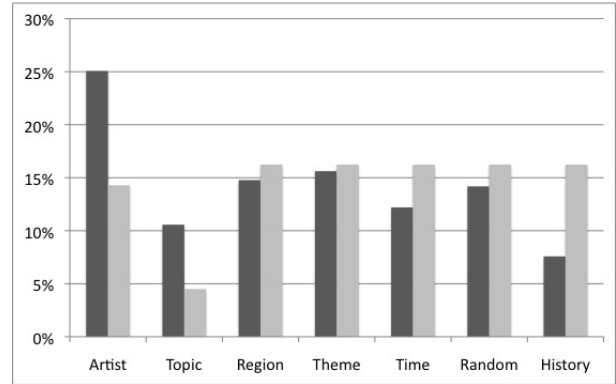


Figure 2. Clicking behaviour of the users according to the different dimensions of the explorARTorium (left bar) vs. a Markov random walk (right bar).

C. Evaluating Social Tagging

Social tagging proves as an additional layer of description to the context area. As it is hard to measure whether the users use these tags in that way, we chose to evaluate another important aspect of social tags – indexing and searching. As described in [21] tags are a very important aspect of searches. Therefore we evaluate how frequently tags are used to search for a specific content.

The explorARTorium offers a search bar that allows users to search for an artist name, title, museum and town as well as social tags. The first observation is that the number of words in a search query is very short ($M=1.20$, $SD=0.63$). This is common in web searches, as shown in [22].

So far 37 users have used the search-bar and have committed 503 searches. In order to analyse the tags, all search-strings that were inserted into the search-bar are divided into four categories. 25 (5%) searches were done for a museum or geographical location, 112 (23.3%) for artists, 113 (23.5%) for the title and 253 (50.3%) searches were done by using tags. These numbers clearly indicate that the tags are a very important aspect for searches.

IV. CONCLUSION

In the Art of Seeing [23], Csikszentmihalyi argues that people are more likely to have an aesthetic experience when the demands of a work of art closely match their viewing skills. By applying the concept of exploratory search, the explorARTorium allows users to select the artworks of their interest according to their knowledge of art history. Users are then able to compare these artworks along different

dimensions: the oeuvre of the artist, the topic and theme of an artwork and the geographical region and time period the artwork was created in. The inclusion of social tagging provides as an additional layer of information that allows users to view textual information in their own vocabulary. We described an evaluation that was done by analysing the user behaviour when interacting with the explorARTorium. Since this behaviour differs from a calculated random walk, our evaluation provides evidence that the users follow our concepts to contrast and compare artworks along different dimensions and that User Generated Content is an important layer of information to describe and search for artworks. Our findings provide an interesting aspect for the visualisation of art historical information and the design of user-interfaces and community-building that can be used by other art-databases.

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