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An Advanced User Interface for Exploring, Analysing and Browsing Digital Artwork Collections

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ABSTRACT

We present ArtVis, an advanced user interface combining state-of-the-art visualisation techniques and tangible interaction to explore the Web Gallery of Art digital artwork collection consisting of almost 28 000 European artworks. The graphical ArtVis interface contains three separate visualisation panels that allow users to temporally, semantically and geographically investigate the digital artwork collection. The goal of ArtVis is that users can gain new insights by visually analysing and exploring a large data set rather than to only provide detailed information about individual artworks. This explorative ArtVis interaction style is further fostered by a tangible user interface where physical artefacts can be used as simple handles to drive the faceted browsing of the rich digital information space.

Keywords

ArtVis; information visualisation; faceted browsing; tangible interaction; artwork explorer.

Categories and Subject Descriptors

H.5.m. [Information Interfaces and Presentation]: Miscellaneous

General Terms

Experimentation; Human Factors.

In today's world where large quantities of data are produced every day, data overload and the efficient processing of data has become an important issue. The question of how to retrieve information and extract meaning out of large quantities of data has been intensively investigated by researchers over the last decade and a number of approaches have been explored. One of these approaches relies on information visualisation (InfoVis) in order to help users in making sense out of large quantities of data [5]. InfoVis provides interaction techniques that allow users to refine, retrieve, filter and explore large data sets. Multiple techniques have been investigated to enable interactivity in information visualisation, including zooming,

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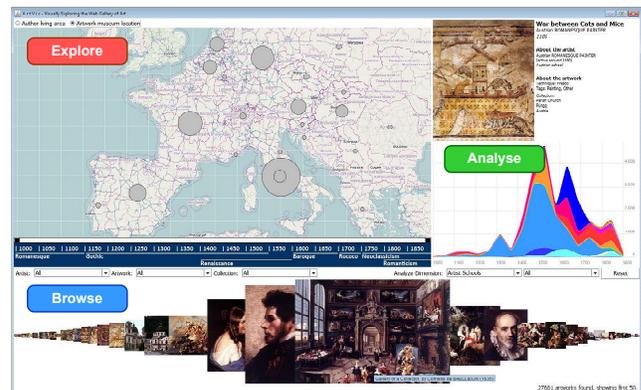


Figure 1: Graphical ArtVis user interface

highlighting or fisheye views. One of these techniques is called *linking and brushing* [4] and consists of a combination of multiple representations of the same data, which are linked in such a way that the selection of elements in one representation will highlight the same elements in the other representations. While techniques such as linking and brushing have demonstrated their strengths, they still mainly rely on graphical user interfaces and not many projects have explored interaction techniques that go beyond the well-established WIMP interaction style.

We demonstrate ArtVis [1], an advanced user interface for the exploration, analysis and browsing of European artworks created between the 11th and 19th century. ArtVis combines advanced visualisation concepts such as linking and brushing with interaction techniques from the domain of tangible user interfaces (TUI). Our ArtVis demonstrator is based on data from the Web Gallery of Art¹, a rich source of information about the artworks of European painters and sculptors. The Web Gallery of Art database consists of almost 28 000 artworks and we will first demonstrate the different graphical user interface elements to investigate this digital artwork collection. We then present the tangible user interface which allows users to interact with the ArtVis application in a natural way.

The main ArtVis application window is shown in Figure 1. The graphical user interface consists of three panels, an *Analyse* panel, an *Explore* panel and a *Browse* panel, which have been implemented based on the Prefuse toolkit [3]. The three panels are always synchronised which means that any update in the *Analyse* panel is propagated to the *Explore* and the *Browse* panel. The

¹<http://www.wga.hu>

Analyse panel consists of a stacked area chart showing how the artistic production changed over time. Thereby, three different dimensions can be selected from a pull-down menu, including the *artist schools*, the *artwork inspiration* or the *artwork form*. For example, the light blue area in the Analyse panel in Figure 1 represents the evolution of the Italian school between the 11th and the 19th century. From the visualisation in the Analyse panel, one can learn that the Italian school was at its peak around the year 1500. Similarly, if a user selects the *artwork form* dimension, they can see that the art of illumination disappeared shortly after the invention of the printing press. These two examples illustrate how the Analyse panel enables studying the evolution of artworks over time.

On the other hand, the Explore panel offers a geographical overview of two other dimensions. It shows the places where artists were living and it can also visualise the museums where the different artworks are currently located. By using panning and zooming, a user can navigate from the world level to the country level illustrated in Figure 1, or even down to city level. Note that we have used data from OpenStreetMap² for the realisation of the map. Depending on the zoom level, the circles on the map aggregate the number of artworks produced or located on a specific continent, in a country or a city. The power of the Explore panel comes from the fact that the displayed results can be filtered semantically or temporally. A user can utilise the Analyse panel to, for example, only select artworks that are related to the Italian school which means that the Explore panel will also only show artworks from the Italian school. An interactive timeline positioned below the Explore panel can further be used to select any subperiod of the 850 years of artworks which again will immediately be reflected in the Explore panel.

Finally, the Browse panel is located at the bottom of the ArtVis main view as illustrated in Figure 1. In addition to the possibility to browse the collection of artworks resulting from the filtering via the selections in the Analyse and Explore panels, the Browse panel also offers three text search fields which can be used to search the data set for a specific artist, artwork or museum.

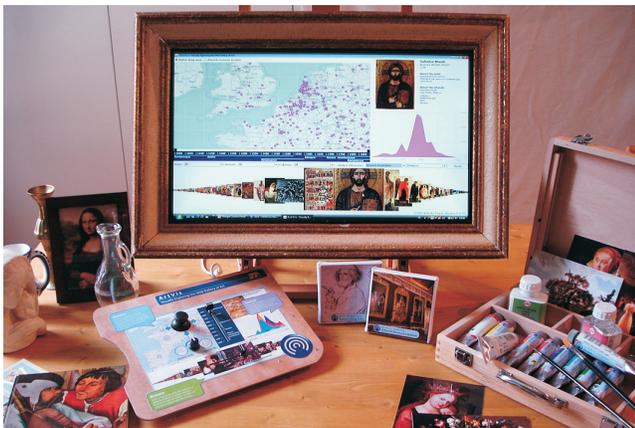


Figure 2: Tangible ArtVis user interface

In order to provide an attractive and stimulating user interface to be used in a museum setting, we further developed a tangible user interface which is shown in Figure 2 and can be used to interact with the graphical ArtVis user interface. The main components of the tangible ArtVis user interface are a picture frame on a painter's

²<http://www.openstreetmap.org>

easel, a painter's tube box and palette, some paint tubes, postcards as well as a few other artefacts including a glass jug or a small sculpture. Each of these physical objects representing a painter's working environment can be used to interact with ArtVis and the corresponding output is shown on a screen which has been embedded into the picture frame. The tangible ArtVis interface has been realised based on low-cost plug-and-play Phidgets [2]. The painter's palette combines various physical controls to interact with the Explore and Browse panels. A small joystick is used to control the panning of the map while a rotation sensor is used to control the zoom level. A physical slider component further allows for navigating through the 850 years of artworks. Another slider can be used to navigate through the thumbnails of artworks shown in the Browse panel. In order to select the different dimensions of the Analyse panel, various RFID-tagged physical objects can be used. The painter's palette has an embedded RFID reader and if an RFID-tagged object is held close to the palette, a selection will be triggered in the Analyse panel. For example, the selection of the glass jug will show the evolution of glassware whereas the statue will provide some insights about the evolution of sculpture. Last but not least, specific RFID tags for authors or museums can also be embedded in books about these subjects. An RFID-tagged book about the Louvre museum in Paris shows a selection of the Louvre's collection together with the location where the artists were living. A user experience evaluation revealed that the demonstrated ArtVis user interface indeed attracts and stimulates users to explore the digital artwork collection [1].

Conclusion

We have demonstrated the advanced ArtVis user interface which combines state-of-the-art information visualisation techniques with tangible interaction in order to explore a large collection of artworks. The presented natural user interface fosters the investigation of a data set in order to gain new insights and further offers new possibilities for multi-user interaction with the information space. Our ArtVis demonstration will hopefully result in a discussion about the presented design space and possibly identify other domains that could profit from the promising combination of advanced visualisation techniques with tangible interaction.

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