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ArtSight

An Artistic Data Exploration Engine

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ABSTRACT

This technical demo presents ArtSight, a comprehensive query-by-color explorative interface built on top of the large scale artistic dataset OmniArt. Color is of paramount importance in the artistic realm and querying such large data collections by colors that appear in their palette allows for intuitive exploration. This demo allows users to browse the 3 million artwork items in the OmniArt collection by color, and hierarchically filter each result-set by multiple attributes existing in the collection itself. Colors are extracted from the digital photographic reproductions in an unsupervised fashion in palettes of twelve and matched with their meta-data seamlessly to exploit both modalities in our filtering module. The user interaction quality is moderated by a responsive framework with touch capability and an unfoldable interactive 3D sphere visualization offering two exploration options - CompactExplore or GridExplore.

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1 INTRODUCTION

Do you remember that abstract painting with blue, yellow and pale green parallel blocks at the MoMA? - It is a well known work by Ad Reinhardt and Mark Rothko from the MoMA¹ collection called No. 10 painted in 1950 (see Figure 1). A description such as the above is an extreme example of the paramount role color plays in the human perception of the visual arts. People mainly remember visual clues [1], but some non visual descriptive attributes as well, e.g. the collection on display, the period of creation or the genre [3]. This combination of descriptive metadata and a visual clue (color) allows for powerful and intuitive searching through art collections. In ArtSight we exploit a symbiosis of color and metadata for searching

¹Museum of Modern Art, New York, USA - <https://www.moma.org/>

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through large artistic data collections, while providing easy access to query specific insights and a pleasant user experience.

Figure 1: Illustration of the ArtSight pipeline from the moment an image enters OmniArt [4] until the moment ArtSight queries the dataset and retrieves the results.

ArtSight allows users to query an artistic collection by a combination of colors and an array of descriptive (textual) metadata attributes. There are many reasons for multi-attribute query result filtering in the case of art, one of them being the variation of the usage of color through time. Querying a dark red color in the early 1300s retrieves different results compared to the same color query for the period of the 1600s. The creation period is a refining attribute in this result set. These results also vary by genre, style, collections of origin, artistic types and media as well. Filtering through the query results based on specific attributes makes it possible to pinpoint a specific artwork by remembering partial information and the colors present.

Filtering can be performed in two levels of details with the two operating regimes - Compact-Explore and Grid-Explore. As computational resources are limited in a web browser environment, Compact-Explore offers a *lightweight* query interface, while Grid-Explore performs more expensive computations on a pixel level.

Figure 2: Illustration of the individual functional ArtSight interface components. A - the initial Compact Explore sphere, B - Compact Explore with genre and color palette filtering, C - Grid Explore interface, D - Selected image detail snip, E - Color ratios in the current result set, F - Similar saturation level images in the dataset, G - Active filters in Grid Explore, H - Active color palette, I - most frequent colors in current result set, J - creation period selection filter, K - collection selection.

2 ARTSIGHT

In the ArtSight demo, the users are presented with a query interface that promotes the usage of color with metadata to search through a collection. As there is a substantial amount of data in the dataset, we offer *rough* filtering options including collection, genre and period filters. After the initial filter is applied, all subsequent user queries are concatenated. Unless the user chooses to discard the previous result set, it will get more refined with every interaction.

Both Compact-Explore and Grid-Explore operate with the same interactions, but address different target groups of users. In Compact-Explore (similar to [2]) we offer the users a quick search and explore interface where the goal is for a user to retrieve the desired image as fast as possible. For this we guide the users' attention towards the center of the screen and reduce the visual distractions non relevant to the query. This mode can also be used to get familiar with the range of data available in an image collection or just retrieve groups of relevant data samples.

In Grid-Explore, every result-set is combined with insights specific to the subset of data that is currently in focus. The central sphere is moved to the left screen section and query specific insights are shown on the right screen pane with a series of thumbnail charts, stacked and regular bar-charts displayed in Figure 2. Grid-Explore offers pixel level color information on the result set using the OmniArt color information. Here we calculate ratios of digital color usage per result set from the user defined query (see Figure 2). This operation regime can offer valuable dataset insights for pixel level tasks like segmentation or in-painting.

2.1 User Interactions

ArtSight features multiple interactive elements that perform result filtering and querying. In that way, user interactions take place with an intent to filter or explore. For exploration we define omnidirectional swipe gestures (or mouse drags) to rotate the sphere element and pinching gestures (middle mouse clicks) to expand and contract the resulting display grid. Filtering interactions mainly include selections from the multiple filtering attributes (color picker wheel, saturation and luminescence sliders, genre blocks, time-line slider). These interactions are initiated by a touch or click event.

2.2 Querying by Color

Every artwork has an extracted color palette and the number of pixels representing each color in the artwork from the OmniArt dataset. This allows for fast querying and data manipulation on the

backend side as all information processing and color extraction is performed off-line. As some artworks are complex in their composition, querying by one color is simply not enough to provide a relevant result-set. ArtSight has an option of querying by multiple colors, so every subsequently picked color appends to the previous one, refining the previously retrieved results.

2.3 Query Specific Insights

In the Grid-Explore mode we offer query specific insights. In the side panel of ArtSight there is information about the relations of the different shades of the dominant colors and artworks that feature a similar dominant color. We show the ratio of the dominant colors in the query set display information to indicate how much influence a specific artwork has for a specific hue. For this operation mode, all visual elements are linked by the result set, so the query specific insight elements act as additional intelligent filters which can help and refine.

3 CONCLUSION

ArtSight presents a new way of interacting with and exploring visual artistic data collections and their metadata. It exploits the relation between a visual clue (color) and the describing metadata entities to provide users with a fast and intuitive approach to pinpointing and understanding an exact artwork. In addition to this, it provides related information based on the users' query and offers links to even more detailed external information. The complete system is wrapped in a responsive touch friendly interface that promotes interaction, reduces clutter and intelligently guides the users attention.

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