ACE: Art, Color and Emotion

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ABSTRACT

We present ACE, the Art, Color and Emotion browser. ACE is a data driven web based platform for exploring the visual sentiment and emotion in artistic paintings over time. To that end, we train our own visual artistic sentiment extraction model by leveraging the artworks from the OmniArt dataset. With our model we are able to estimate the overall sentiment dominating in groups of artworks belonging to a specific time interval. To make the results interactive and explorable we designed an intuitive interface with a carefully considered shape, color and element placement enforcing a top-down interaction scheme. Moreover, we perform extensive control on resource utilization to provide the smoothest possible user experience and quality of service while using ACE.

1 INTRODUCTION

Color is everywhere, and whether we perceive it consciously or not each color we encounter provides an emotional experience. Green and blue most often evoke a feeling of calm, while yellow makes us feel upbeat [4]. In the realm of the visual arts, as in the real world, colors primarily relate to the artwork's content as shown in ArtSight [5], but also to the depicted sentiment and feelings. Studies have shown that art is a powerful mechanism for evoking an emotional response in its spectators [4], making the exploration of the Art, Color and Emotion combination ever more interesting. Moreover, as the number of available digitized artworks is increasing, so do the large scale research opportunities. Mohammad and Kiritchenko [3] for example, performed large scale experiments and have found that fear, happiness, love, and sadness were the most prominent emotions depicted in the visual arts. This finding was also confirmed by the consistency of their human annotators. In ACE, we build up on [3] by training more powerful models on a larger dataset, and completing the analysis cycle by allowing users to explore the sentiments encoded in visual artworks in the OmniArt [6] dataset with an intuitive, easy to use interface. Unlike the artwork retrieval we did in ArtSight [5], in ACE we focus on understanding the

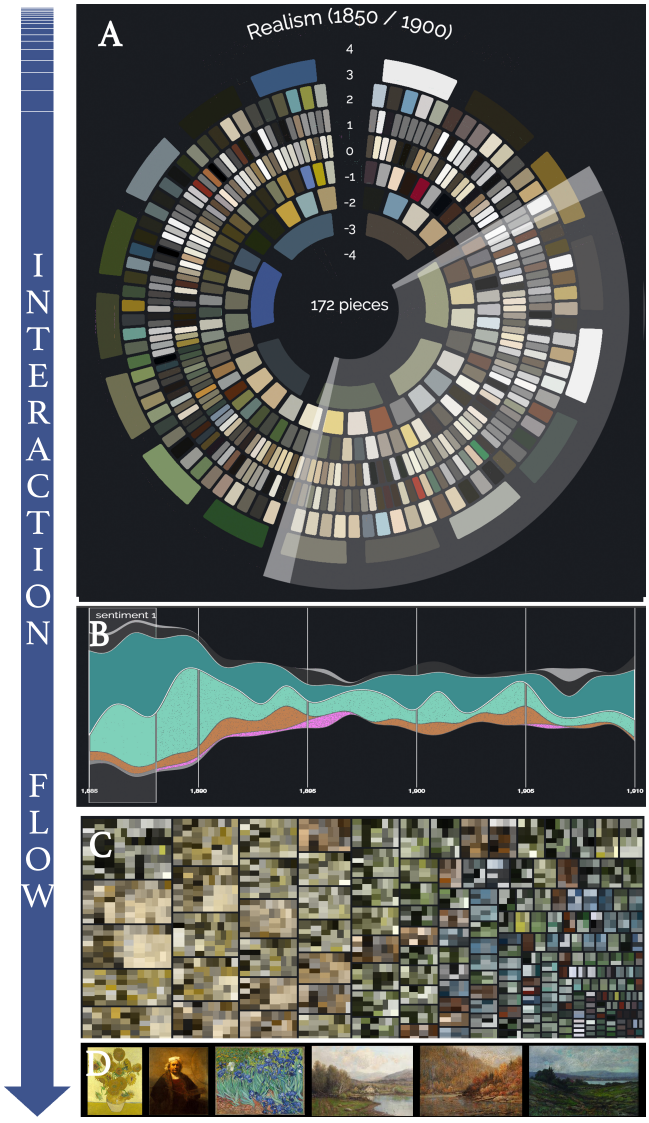

Figure 1: A: the radial sentiment chart, B: the distribution of sentiment over time for artworks, C: single sentiment ordered palette and D: live gallery.

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temporal sentiment trends in the stylistic movements from the past and today.

Understanding the psychology of color and content in artistic painting on a large scale can be a valuable asset for art enthusiasts, designers and students when researching certain artistic styles. One might relate darker hues to negative emotions and lighter ones to positive emotions, however it is not as simple as that [1]. The depiction of the world through painting has been heavily influenced by available materials and pigments in the specific age. For this reason, in ACE we offer a stylistic navigator through the ages, isolating the color ranges for a more accurate analysis. As shown in Figure 1, ACE enforces a structured interaction flow where the initial interaction always starts with section A.

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ACE[1] is designed to fit the skills of a the average Internet user regardless of his background. The general design approach rests on a vertical top-down logic in terms of storytelling. Each graph is related to the other, interaction is sequential and information from one graph complements or supplements the others. The location, size and transitions between active states enforce a logical exploration flow. Because of having multiple components, the transitions between them are also sequential and the panes they appear in are sticky for consistency and easy navigation. Keeping these factors in mind, the overall design takes the user on a journey to visually see the dominant colors across sentiments in a time period of interest. In this way, ACE is constructed of four interlinked visual components and two levels of interaction.

2.1 Data and Analysis

Despite the recent increase in on-line available artistic datasets [6], large scale research into sentiment analysis in the visual arts is yet to be thoroughly explored. In our experiments we perform sentiment extraction on the OmniArt dataset [6] targeting a pool of more than 2 million artworks. As OmniArt is not annotated with sentiment labels, we merge the WikiArt Emotions dataset [3] (as the contained artworks are a subset of OmniArt) and use them as the base training subset for sentiment extraction. With the trained model, we performed sentiment extraction to the paintings subset (330000 data samples) of OmniArt.

We trained and tested several types of established visual sentiment extraction models [2, 3, 7] in a supervised and unsupervised fashion. Based on the extracted sentiments, we utilize the sentiment rank of emotions to rank them from very negative (-4) to very positive (+4) [1]. Even though models trained on real world data apply to artistic data to a certain extent, we obtained best predictive performance with features extracted by a model trained on the WikiArt Emotions dataset [3].

2.2 Visualizations

Our visualizations are thoroughly customized D3[2] components running natively in a webkit enabled web browser. As the visualized information is extensive and user machines have limited compute capabilities on the client side, we ensure a snappy user experience with multi-threading and parallel processing algorithms for all components.

[1] ACE is on-line and live at: http://136.144.180.68:4800/
[2] Data Driven Documents (D3): https://d3js.org/

The Radial Sentiment Graph is the first visual element where users are led to understand that the visualization is about relating portrayed sentiments to dominant colors in paintings. Each ring in the radial graph represents a sentiment level and each item in the circle is a dominant color of the data sample represented by the artwork. This element provides key insight into which are the dominant colors over the complete sentiment distribution.

The Temporal Stream Graph is designed for observing the distribution of the selected data samples from the radial sentiment graph across time. The stream graph is an active filtering mechanism too, as it is equipped with a horizontal range selection brush. Changing the selected temporal range rearranges the color palettes below and samples in the live gallery to the side.

The Color Palette Sampler is a color heavy visualization with the purpose of giving the users a visual idea of all the colors used in paintings over the chosen time period in one glance. The graph is meant to invoke the idea of an artist paint box inlaid with various paints. Colors in the palette graph are divided into the hue groups. To avoid any further clutter and keep the focus on colors, the Gestalt's Law was applied to design. By this law, *humans naturally perceive objects as organized patterns and objects*. Thus, additional information about hue groups and color frequencies are conveyed via design rather than text.

A Live Gallery powered by the live links in the OmniArt dataset offers a preview of the artworks contained in the query result set. We use these links to display the photographic reproductions in a sliding lateral pane that appears on a hover event over the color palette in question. As this is the final stage of the result refinement process it only appears after the user has interacted with all previous filtering controls.

2.3 Interaction

User interactions in ACE occur on two levels, one that controls the stylistic period choice and affects all components, and a second level of component specific interactions. For choosing the stylistic period we utilize the arrow keys on the keyboard moving up and down from the stone age until today. Component specific interactions include click, drag, hover and focus events over the visualizations performing active filtering.

3 CONCLUSION

ACE offers a sleek and snappy interface for interacting with artworks, colors and the emotions they invoke or depict. It exploits the knowledge of deep sentiment analysis models to analyze and display the correlation between time, sentiment and color on a large scale in the OmniArt dataset. In addition to on-the-spot generated insight, based on the user interactions it provides a direct link to the photographic reproductions of the artworks involved in the analysis. The complete system is wrapped in a responsive client based interface designed by following state of the art information visualization principles to reduce clutter, promote key insights and guide the user's attention.

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