SoCS: Studying the Computability of Emotions by Harnessing Massive Online Social Data

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Contributions

We investigated how shape features in natural images influence emotions aroused in human beings leveraging the IAPS dataset. Nonetheless, the IAPS is limited in terms of the number of images available and types of emotions they aroused. Therefore, we proposed to establish a larger human-labeled dataset. Until now, we have built a dataset that contains 3,950 color images for analyzing image aesthetics and emotions.

- We studied shapes and its characteristics, such as roundness, angularity, simplicity, and complexity, to understand the emotional responses of human beings.
- We proposed a novel approach for creating and validatung a large image dataset that combined the procedures employed in the validated work of the IAPS and the power of crowdsourcing and computational tools.
- We validated the established dataset and conducted initial statistical analyses on the collected data.

Shape and emotion

We investigated the correlation between visual shapes and emotions aroused from images, and modeled the concepts of roundness-angularity and simplicity-complexity from the perspective of shapes using a dimensional approach. We distinguished images with strong emotional content from those with weak emotional content.

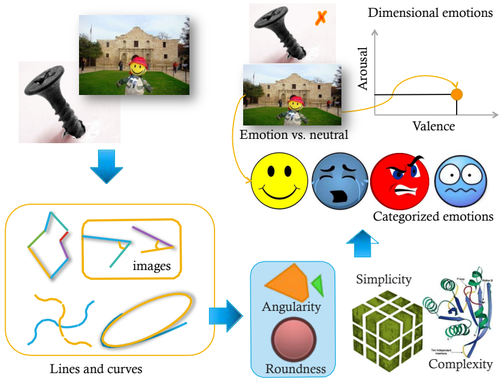


Image dataset

The International Affective Picture System (IAPS) 2008 dataset consists of about 1193 pictures which were rated by both male and female subjects on a scale of 1-9 on the Valence, Arousal, and Dominance content.

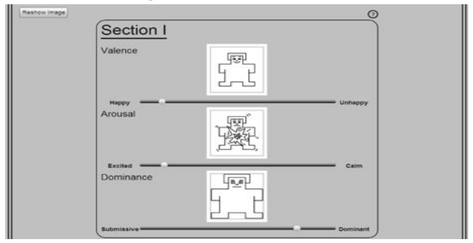
Example images from the IAPS dataset.

To conduct more generalized studies, we validated a larger image dataset. We used 558 emotional words to search for images using a search engine. Examples include happiness, proud, wary, yearning, zealous, helpless, and horrified. For each emotional word, we extracted the images with the highest rankings among all returned results to ensure the quality. The crawled images are generated by Web users and covered diverse visual scenarios. Some examples are shown below.

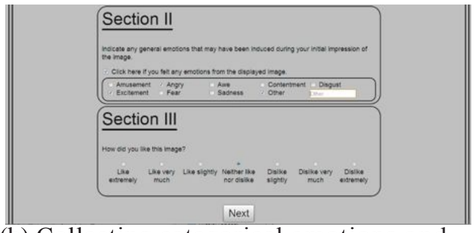
Example images from the established dataset.

Design rationales

We replicated the validation procedure used with the IAPS dataset within the design of our study. We expected participants to evaluate each image from three perspectives given a series of color images: (I) by making ratings along dimensional scales, (II) by selecting one or more categorical emotions if relevant, and (III) by including ratings of their amount of like/dislike towards every presented image. Also, in the established dataset, we collected the demographics of participants, such as age, gender, ethnic group, nationality, educational background, and income level.



(a) Collecting dimensional emotion.



(b) Collecting categorical emotions and the likeliness of an image.

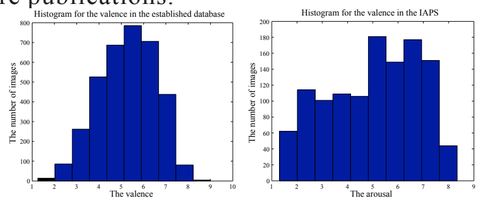
We briefly summarize the user study procedures as follows: Step 1, click the "Start" button, after 5 seconds participants will be presented with an image. Step 2, view the image that displays for 6 seconds. Step 3, a page with 3 sections will display. We allow 13−15 seconds to fill out the 3 sections. Step 4, repeat "Step 2" and "Step 3" until a button with the words "Finish" is displayed. Step 5, click the "Finish" button.

Until now, we had recruited 335 subjects, and each of them was asked to rate up to 200 images in an hour. Each image is expected to have 5 ratings. In the established dataset, we removed ratings done smaller than 2.5s and images with less than 5 ratings, which resulted in 3,950 images.

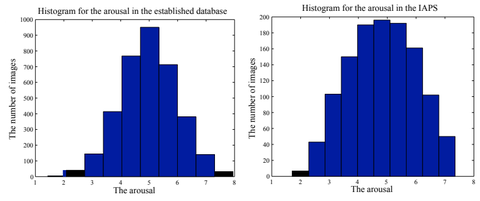
Dataset

We randomly sampled 50 images from the IAPS dataset and compared the dimensional emotions generated by our approach and the IAPS approach. We calculated the Mean Square Error for the mean value on the valence and arousal, which are 0.6913 and 0.3968 respectively. We conducted a the two-sample t-test on all 50 samples on the dimensions of valence and arousal respectively. We demonstrated that the two population means were not significantly different at the 0.05 significance level.

We plotted the distribution of valence and arousal, and compared it with the IAPS dataset. Other statistical results will be presented in our future publications.



(a) The distribution of the valence in the established dataset and the IAPS



(b) The distribution of the arousal in the established dataset and the IAPS dataset.

Future work

- We will continue our effort to generate a larger dataset for analyzing emotions evoked from images. Computational and statistical approaches will be adopted to investigate the relation- ship between visual characteristics and evoked emotions on the larger dataset.
- We will explore approaches to analyze and assist the design of Web pages. A system will be developed based on the relationship between visual stimuli and evoked emotions.