

Observers can estimate the colors of unknown paintings with high accuracy

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The color of the illumination can influence dramatically the visual impression from paintings and other artworks. It has been shown that an ideal illumination spectrum can be spectrally tuned for each painting. What chromatic composition would be obtained if instead of spectrally tuning the illumination observers tune the colors of the paintings by some global transformation? How close that composition would be to the original one produced by the artist? The aim of this work was to compare the preferred chromatic composition for unfamiliar paintings with the original composition. Ten paintings were digitalized with a hyperspectral imaging system and the spectral reflectance of each pixel was estimated with high accuracy. Stimuli for the experiments were images of the paintings generated from the spectral imaging data. They represented the paintings with the colors obtained by rotating the color volume around the L^* axis in the in CIELAB color space. The images were presented on a calibrated CRT computer screen. Four paintings were abstract from Amadeo de Souza-Cardoso (1887-1918), two had figurative elements from the same painter, two were abstract and two were figurative from other painters. Three groups of observers carried out the experiments: 50 without previous knowledge of the paintings neither any formal artistic education, 8 experts in art but unfamiliar with the paintings tested and 6 experts in the paintings of Amadeo de Souza-Cardoso. In the first experiment the observers adjusted the angle of rotation of the color volume by actuating on a joy-pad. In the beginning of each trial a painting selected at random from the set was presented with its color volume rotated by

angle selected at random in the range $+180$ deg – -180 deg. The task of the observer was to adjust the angle of the chromatic rotation such that the painting produced the best subjective impression. In the second experiment the threshold to perceive a chromatic change from the original composition was estimated. The results show that the distribution of angles selected for data pooled across paintings for the non-specialist observers could be described by a Gaussian function centered at -2 deg, i.e. very close to the original colors of the paintings, and with a FWHM of 64 deg, just about 1.5 above the threshold to detect a chromatic change. These result suggest that painters are able to predict well what compositions of colors observers prefer.

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