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Distinguishing paintings from photographs

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Abstract

We addressed the problem of automatically differentiating photographs of real scenes from photographs of paintings. We found that photographs differ from paintings in their color, edge, and texture properties. Based on these features, we trained and tested a classifier on a database of 6000 paintings and 6000 photographs. Using single features results in ~70–80% correct discrimination performance, whereas a classifier using multiple features exceeds 90% correct discrimination.

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1. Introduction

1.1. Problem statement

The goal of the present work was the determination of the image features distinguishing photographs of real-world, three-dimensional, scenes from (photographs of) paintings and the development of a classifier system for their automatic differentiation.

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Fig. 1. Murals (left) were included in the class “paintings.” Line drawings (right) were excluded.

In the context of this paper, the class “painting” included not only conventional canvas paintings, but also frescoes and murals (see Fig. 1). Line (pencil or ink) drawings (see Fig. 1) as well as computer-generated images were excluded. No restrictions were imposed on the historical period or on the style of the painting.

The class “photograph” included exclusively color photographs of three-dimensional real-world scenes.

The problem of distinguishing paintings from photographs is non-trivial even for a human observer, as can be appreciated from the examples shown in Fig. 2. We note that the painting in the bottom right corner was classified as photograph by our algorithm.

In fact, photographs can be considered as a special subclass of the paintings class: photographs are photorealistic paintings. Thus, the problem can be posed more generally as determining the degree of perceptual photorealism of an image. Given an input image, the classifier proposed in this paper outputs a number $\in [0, 1]$ which can be interpreted as a measure of the degree of photorealism of the image.

From a theoretical standpoint, the problem of separating photographs from paintings is interesting because it constitutes a first attempt at revealing the features of real-world images that are mis-represented in hand-crafted images. From a practical standpoint, our results are useful for the automatic classification of images in large electronic-form art collections, such as those maintained by many museums. A special application is in distinguishing pornographic images from nude paintings: distinguishing paintings from photographs is important for web browser blocking software, which currently blocks not only pornography (photographs) but also artistic images of the human body (paintings).

1.2. Related work

To our knowledge, the present study is the first to address the problem of photograph-painting discrimination. This problem is related thematically to other work on

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