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Best Short Paper Award

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Automated Image Color Mapping for a Historic Photographic Collection

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Abstract
In the 1970s, the United States Environmental Protection Agency sponsored *Documerica*, a large-scale photography initiative to document environmental subjects nation-wide. While over 15,000 digitized public-domain photographs from the collection are available online, most of the images were scanned from damaged copies of the original prints. We present and evaluate a modified histogram matching technique based on the underlying chemistry of the prints for correcting the damaged images by using training data collected from a small set of undamaged prints. The entire set of color-adjusted *Documerica* images is made available in an open repository.

Keywords
computer vision, color analysis, histogram matching, documentary photography

1. Introduction

Many of the most important environmental laws and federal agencies in the United States came into existence during the large-scale political and social environmental movement that formed

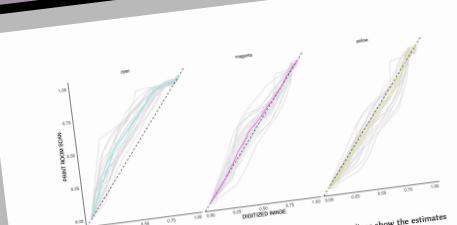


Figure 2: Learned MIM transformations of the CMY color channels. Grey lines show the estimates of individual images; the colored lines are the medians across the entire training set.

algorithm does indicate some changes for individual images, these are relatively minor when we take the median across the entire training set.

We see that there are considerable differences across training images. These differences are less pronounced than they first appear because over half of all the image intensities in the digitized images have intensities over 0.8. Looking at the upper part of each curve, we see that these are in more stable than the rest of the transformation. Additionally, the transformations on the bottom of the curves correspond to parts of the image that have a small amount of the given color dye. Often these are very bright parts of the image that are close to white, and the differences indicated on the chart have a small visual effect, as we see in the following subsection.

The differences across training images highlight two points of caution. First, the adjustments are nowhere near perfect. The final exact colors can still be quite different than the original