Vogue through the Ages:
A Foundation for Image Analysis

David Li
Advisor: Holly Rushmeier
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Abstract
The project will consist of manipulating and analyzing a collection of digitized pages of Cond Nast's Vogue magazine, with a focus on the algorithmic extraction of both images and the relevant data contained within those images. This project will be divided into three steps: image extraction, research, and final implementation.

1 Introduction
A picture is worth a thousand words. Sometimes, powerful images and photographs can elicit stronger emotional reactions from people and can communicate messages to a wider audience than a block of text can. Today, communicating through pictures has become easier than ever before. The quality cameras on modern mobile devices, coupled with the growing popularity of social photography applications and services, have resulted in a proliferation of image sharing and image-based communication.

Even though images play such a large role in our lives, history, and culture, the difficulty of extracting useful information from images has made it difficult for researchers to analyze them in a uniform and consistent manner, much less find patterns or draw useful conclusions. Instead, those looking for information tend to rely more on textual analysis, which is simpler from a technical perspective. Developments in optical character recognition (OCR) algorithms and technologies, as well as the intuitiveness of parsing and manipulating written data, have made text analysis easy to understand and easy to use. Google's Ngram Viewer, for instance, has digitized the text contents of millions of books and provides a simple way to query the popularity of topics and key phrases within those books.

Though useful for many applications, text analysis by itself can be lacking in certain cases. Some professions and industries rely heavily on visual stimuli, and the existing collection of images for those industries paints a far more
accurate and comprehensive picture than any firsthand texts do. Fashion and advertising are two such industries for which this is true. Fashion is inherently visual. Small differences in the materials and patterns of different articles of clothing can greatly affect their visual appeal, and the text, if any, associated with instances of fashion photography often do not adequately capture those differences. Likewise, in the world of print advertising, interesting visuals usually accompany the content of the advertisement in order to grab the attention of the viewer. If we choose to extract and analyze just the words within those advertisements, then we are discarding an important piece of the puzzle we are attempting to solve.

Yale University recently gained access to a digitized collection of *Vogue* fashion magazines spanning 122 years, from 1892 to 2013. The scanned magazine pages contain a wealth of useful information on the state of the fashion world over the past century. A sizable portion of these pages contain images that fall into one of the two aforementioned categories: fashion and advertising. Thus, building a solid foundation for analyzing these images would grant insight into how fashion, lifestyle, and culture have changed in recent history.

2 Project Details

The collection of *Vogue* pages exist as a large directory of JPEG and XML files. Each XML file corresponds to an article or advertisement within the magazine, and tags within the file contain metadata about the associated content. Pieces that occupy only a portion of a page or spread over multiple pages are indicated accordingly in the relevant XML file, along with the coordinates of their bounding boxes.

Some simple analyses have already been performed on the dataset. More specifically, the text from the articles and advertisements have already been extracted from the XML files and can be used to find patterns and trends in story topic and content. Extraction of select metadata from the XML files of advertisements allows us to see which companies placed ads in each *Vogue* issue and how this number has changed for each company over the years. Finally, a basic, discrete color extraction performed on the magazine covers shows the dominant colors for each cover and gives us a way to categorize the covers by those dominant colors.

The goal of this project is to create a foundation for deeper analyses of the images, especially the advertisements, within *Vogue*. Some preliminary steps must be taken to format and structure the data. Analyses such as the discrete color extraction done for the covers cannot currently be performed for all the color images within *Vogue* because some only occupy a portion of a page and others span multiple pages. For those pictures that do not occupy an entire page, we must use the information in the XML files to extract the image, leaving other advertisements and articles on the same page behind. Similarly, for multi-page spreads, the parts of the image must be extracted and either stitched together or manipulated in some way as to indicate that they comprise a single
After these preliminary steps have been taken, then the research for the main deliverable of this project can commence. Research consists of two elements: finding a research question and learning to manipulate and extract information from this dataset. The former element will involve communicating with professors or faculty in other departments to determine the key questions that looking at this dataset can help answer, as well as researching how to best tackle answering those questions from a technical perspective. The latter element will involve performing one or more basic analyses on the restructured data and creating an intuitive user interface that allows a user to view and experiment with the data acquired from the analyses.

Finally, a research question and a method for answering that question using the dataset will be selected and implemented. Some examples of this type of question and the project that would result from those questions are as follows:

- **How has beauty changed over the last one hundred years?**
  - The racial and cultural composition of the United States has changed drastically since 1892, and our definition of beauty may have changed along with it. Answering the question may involve using a face and facial feature detection algorithm to identify the characteristics of the models in the advertisements. The data indicating the size of the various facial features and their relationship to one another may help in determining whether there has been a change in our society’s definition of beauty.

- **Is there a correlation between fashion trends and the health of the economy?**
  - In times of economic hardship, it is reasonable to think that people will buy more sensible and versatile articles of clothing that can be re-worn often and that they will avoid the flashy and the bold. A possible method of testing whether this is true is to implement a clothing classifier and look for trends in the data that correlate with the health of the economy.

- **Has the media’s representation of women changed over time?**
  - One could tackle this question in various ways. For instance, a posture detection algorithm could be used to look at the positions that women adopt when posing for pictures, or the aforementioned clothing classifier could be used in combination to the extracted text to draw conclusions about the changing role of women in the media.

### 3 Timeline and Deliverables

*By February 17, 2014:*
– Source code for the extraction of images from the existing pages
– A practical method for extracting only color images or black-and-white images

By March 7, 2014:
– Source code for one or more simple analyses of the extracted images
– A web-based UI for displaying the results of the analysis
– A plan detailing the final research question and a technical method for tackling that question

By April 14, 2014:
– All relevant code used in the process of analyzing the images

By April 21, 2014:
– Rough draft of the written report for the project
– First version of a presentation summarizing my findings

Final Due Date: April 30, 2014