

# TRAVEL SCRAPBOOKS: CREATING RICH VISUAL TRAVEL NARRATIVES

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## ABSTRACT

The convergence of the Internet and ubiquitous technologies offers an unprecedented level of convenience for information collection, accessing, and sharing through mobile devices and web services. Mobile devices have become increasingly context aware and connected to the Internet, which lowers the barriers for capturing and sharing contextual information (e.g. location and time). Web applications are increasingly taking advantage of the so-called ‘long tail’, offering specialized services to a small number of users and allowing them to annotate, produce and consume relevant information. This paper presents *Travel Scrapbooks*, an online service that automatically stitches information together from various online sources based on geotagged photos from social networks, and visually presents the information to the user in the form of a scrapbook metaphor.

**Index Terms**— travel scrapbooks, geotagged photos, social computing, photo viewing

## 1. INTRODUCTION

Digital photography has ardently become an important component of everyday life due to the ubiquitous presence and ease of use of capturing devices such as digital cameras and camera phones. The continuing growth in digital photography has resulted in a range of social practices associated with photographs. Photo hosting websites and social networks have facilitated the widespread sharing of photos with the larger community, leading to the appropriation of photos beyond just personal consumption. As these public photo collections rapidly grow in size, the creation of semantic metadata such as geotags and user annotations has also subsequently increased to help in recall and search.

These semantically rich online photo collections are often populated during or after a travel experience such as a simple hike through a trail or a vacation in Rome. To take advantage of these photo collections, there has been a significant amount of work centered around creating new services and experiences. Majority of the work however, explores viewing photos in a monolithic fashion (such as online album services like Flickr<sup>1</sup> and Picasa<sup>2</sup>), and little work is done from the stand-

point of augmenting other social, temporal and topical information. As technology facilitates the association of contextual metadata such as tagging, comments with photos, there is a greater impetus to explore new design spaces and user interfaces. The design spaces currently being explored are fairly broad, ranging from electronic tourist guides, mixed reality to merge physical and virtual space for enhancing tourist experiences, commercialized GPS for navigation needs, and finally online photo collections and social networks facilitating users to upload photos with comments, captions and tags. In the non-digital realm, scrapbooking is used as a medium for creating memorable artifacts in the form of photographs, printed media, and memorabilia.

The contribution of this paper is providing mechanisms and services for enhancing the user experience of viewing photos by leveraging related content for automatically generating interactive travel scrapbooks. In particular, this paper automatically determines implicitly unapparent correlations among data collected from different social communities and online information resources, including that of the mobile. By employing visualization and design principles in an intuitive and semantically meaningful way, the goal is to help users externalize their photo taking experiences, and facilitating serendipitous discovery.

## 2. RELATED WORK

Existing research includes the delivery of situated guide information using context-aware technologies, such as the Lancaster GUIDE system [1], and George Techs Cyberguide [2]. More recently, researchers have leveraged the sharing and collaborative aspects of traveling to explore ways of facilitating socialization. Sotto Voce is an electronic guidebook that supports synchronized sharing of descriptive audio content between companions visiting historical places together [3]. The George Square system allows street visitors to synchronously share their experiences with people both far and near through photographs, location, and voice [4]. The Lighthouse system explores mixed reality in a system that allows web, virtual and physical visitors to share a museum visit together in real time [5].

Online travel services exist as a medium for sharing experiences, reviews, and photos of places visited. Yahoo!

<sup>1</sup><http://www.flickr.com/>

<sup>2</sup><http://picasa.google.com/>

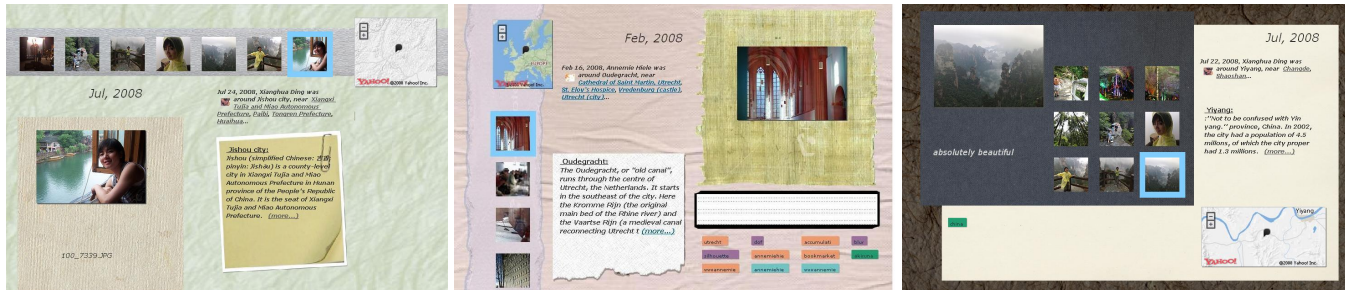


Fig. 1. Three different scrapbook compositions.

Travel<sup>3</sup> provides services including hotel rating, recommendations for things to do, and trip itineraries. Similarly, Trip Advisor<sup>4</sup> allows people to contribute and share advice about services such as ticketing and hotel booking, and car rentals. Yelp<sup>5</sup> specifically focuses on community based review creation and sharing of restaurant, store and event information. However, these web-based services do not enhance or make use of photos and their associated context.

Internet Scrapbook allows users with minimal programming skills to create personal pages by clipping only the necessary portions from multiple web pages [6]. Memento enables users to create a scrapbook website by interacting with a physical scrapbook, in which they can add not only printed photographs, and written annotations, but also digital multimedia items, audio annotations, digital pictures, and videos [7]. Pathmarker is a system that provides map-overlaid trip editing, presentation and browsing, as well as a 3D immersive environment with digital elevation maps for automatic trip flybys using travel path data [8].

On the contrary, the work of this paper relates to the automatic identification of correlations between personal travel media with other data sources, and using these correlations to automatically drive the rendering process for the final scrapbook composition.

### 3. SYSTEM OVERVIEW

The essence of this system is to automatically stitch information together from various online sources based on geotagged photos and social networks in a visually compelling way. Our system has three components, as represented in Figure 2:

- **Data Collection:** Accessing photos and albums of people from the user's social networks, along with any associated metadata.
- **Data Augmentation:** Analyzing the data collected, identifying links between the data and content from online sources, and retrieving the online information

<sup>3</sup><http://travel.yahoo.com/>

<sup>4</sup><http://www.tripadvisor.com/>

<sup>5</sup><http://www.yelp.com/>

marked as relevant. The data from online sources include Wikipedia<sup>6</sup> articles, event calendars, recommendations, ratings, books, and social networking data.

- **Scrapbook Rendering:** Visualizing these information correlations in an interactive scrapbook form that is appropriate for users to explore.

#### 3.1. Data Collection

The first source of information used by the system is the user's personal data created while traveling. This data consists of photo images, photo feeds, as well as metadata associated with the photos such as album grouping, tags, captions, and comments. The system also retrieves the same information for the user's contacts in his Flickr social network. If the photos do not belong to an album created by the user, they are grouped based on time and location information. Geotags from the group photos are aggregated and used to retrieve the most relevant location name, and all points of interests in the vicinity.

#### 3.2. Data Augmentation

Traditional physical scrapbooks metaphorically augment photographs with artifacts such as transportation tickets, receipts, postcards. In the same spirit, our system augments photo data obtained from the previous step, with several online content repositories, programmatically accessible through APIs. For instance, for a group of photos, the system retrieves, parses and ranks excerpts from the Wikipedia articles queried using the place and point of interest names associated to a group of photos. The system also searches among the user's contact data for related photos or tags. Simple text analysis methods are used to compute relevance metrics between the tags appearing in the user's data and the text collected from online resources. The system creates bag-of-words vectors representing the occurrence of words in the text, and ranks each article and section of the article by computing and sorting on the total occurrence of the tags with respect to the vectors. When there are no tags or no best ranked section, the system

<sup>6</sup><http://www.wikipedia.org/>

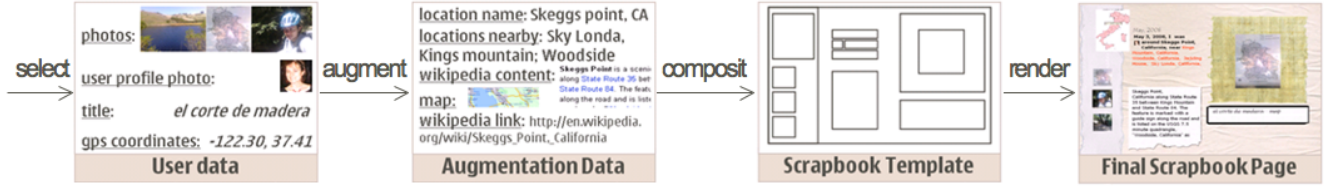


Fig. 2. System Overview

selects an excerpt from the introduction section of the article. Travel itineraries are computed based on the time stamps and geotags of the photos. Thus, the personal data together with the augmented data is composited into an interactive scrapbook page as described in the following subsection.

The performance of the data augmentation process depends on the quality of keyword disambiguation from the photo data. For example, if ‘Athens’ is a tag used for a particular photo, the tag can map to Athens, Georgia or Athens, Rome. Additional contextual information associated with the photos such as GPS coordinates helps in the disambiguation process.

### 3.3. Scrapbook Rendering

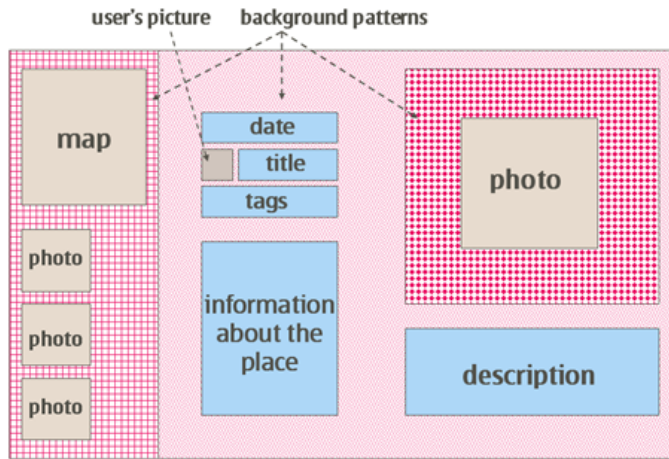


Fig. 3. Sample scrapbook template used in the system.

To present this heterogeneous data related to travel in an interface for users to explore, we use interactive visualization techniques and layouts inspired by traditional scrapbook design. An example of one such layout is shown in Figure 3. A good visual composition for conveying the right information often relies on placing important elements, *i.e.* the focal point of the design, within the visual center of a piece. Some commonly used graphics design rules [9] to achieve this goal include the rule of thirds, dominance and proportion (Figure 4). We adopt the analogous color scheme for the colors in scrapbook page. The analogous color scheme uses colors that are adjacent to each other on the color wheel. One color is

used as a dominant color in the scrapbook page, while the colors adjacent to the dominant color are used to enrich the scheme. We use *HSV* color space as it is perceptually uniform consisting of three properties, namely hue, saturation and value. The dominant color is computed based on the most dominant *HSV* color histogram of the photos in the scrapbook page [10], and is computed as the greatest perceptual difference between two *HSV* colors  $i$  and  $j$ :

$$a_{ij} = 1 - \frac{1}{\sqrt{5}}[(v_i - v_j)^2 + (s_i \cdot \cos h_i - s_j \cdot \cos h_j)^2 + (s_i \cdot \sin h_i - s_j \cdot \sin h_j)^2]^{\frac{1}{2}}$$

where  $a_{ij}$  is the perceptual difference between  $i$  and  $j$ ,  $h_i$  and  $h_j$  are the respective hues of  $i$  and  $j$ ,  $s_i$  and  $s_j$  are the respective saturations of  $i$  and  $j$ ,  $v_i$  and  $v_j$  are the respective values of  $i$  and  $j$ .

### 3.4. The Interface

The Travel Scrapbooks system works as follows: When users visit the Travel Scrapbooks website, they are invited to sign in with their Flickr account. The system retrieves recent photos from the user’s Flickr contacts and provides visual affordances to indicate which of the photos are geotagged. Then users can click on their own or their friend’s geotagged photo icons to go to the detailed scrapbook view. Further, the users can interact within each scrapbook page as illustrated in Figure 5.

## 4. PRELIMINARY EVALUATION

We conducted an informal user study to elicit qualitative feedback for the Travel Scrapbooks system. For this purpose, we recruited nine participants. Five were male and four were female. All participants used Flickr and had geotagged photos or their friends had geotagged photos. Participants were asked to review all the features of the system and answer questions.

When the contextual information depicted in the scrapbook matched what was expected, participants appreciated Travel Scrapbooks as an informative and fun tool to explore photos and travel experiences. One participant commented

that the contextual information motivated him to explore unfamiliar photos. Travel Scrapbooks however, became less informative for those participants who carefully planned the trip by themselves beforehand and knew all the information about the place.

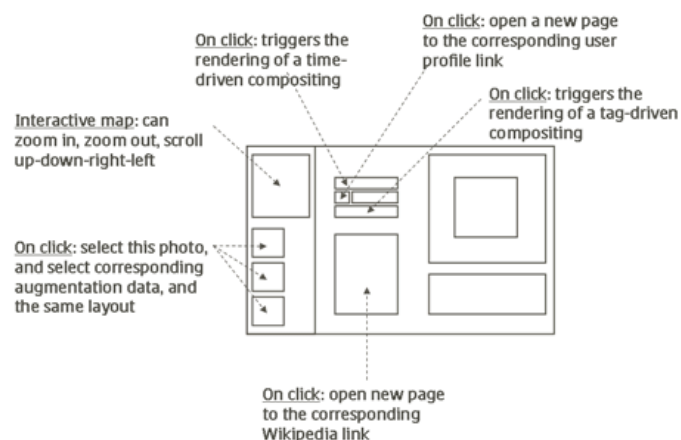


**Fig. 4.** Design principles used in compositing visual elements in the scrapbook page.

The relevance of the contextual information depends on various factors such as the data sources used, the main subject of the photo, and the popularity of the location geotagged with the photo. However, when the contextual information did not match well with what was expected by the user, it was not completely useless. In many cases, it provided opportunities for participants to serendipitously discover new correlations.

## 5. CONCLUSION

This paper presents Travel Scrapbooks, an online interactive visualization service that automatically stitches social, temporal, spatial and topical information together based on geotagged photos from Flickr to support explorative experiences. Feedback from nine participants reveal that the system is an informative and fun tool to enhance photo viewing and sharing experiences, supporting discovery of new meanings and correlations, and creating richer visual narratives.



**Fig. 5.** Scrapbook layout with interaction behavior.

## 6. REFERENCES

- [1] Keith Cheverst, Nigel Davies, Keith Mitchell, Adrian Friday, and Christos Efstratiou, "Developing a context-aware electronic tourist guide: Some issues and experiences," 2000, pp. 17–24, ACM Press.
- [2] Gregory D. Abowd, Christopher G. Atkeson, Jason Hong, Sue Long, Rob Kooper, Mike Pinkerton, and Usability Centre, "Cyberguide: a mobile context-aware tour guide," *ACM Wireless Networks*, vol. 3, pp. 421–433, 1997.
- [3] Paul M. Aoki, Rebecca E. Grinter, Amy Hurst, Margaret H. Szymanski, James D. Thornton, and Allison Woodruff, "Sotto voce: exploring the interplay of conversation and mobile audio spaces," in *CHI '02: Proceedings of the SIGCHI conference on Human factors in computing systems*, New York, NY, USA, 2002, pp. 431–438, ACM.
- [4] Barry Brown, Matthew Chalmers, Marek Bell, Malcolm Hall, Ian MacColl, and Paul Rudman, "Sharing the square: collaborative leisure in the city streets," in *ECSCW'05: Proceedings of the ninth conference on European Conference on Computer Supported Cooperative Work*, New York, NY, USA, 2005, pp. 427–447, Springer-Verlag New York, Inc.
- [5] Isabella A. da Silva, Ping H. Chen, Christopher Van der Westhuizen, Roger M. Ripley, and André van der Hoek, "Lighthouse: coordination through emerging design," in *eclipse '06: Proceedings of the 2006 OOPSLA workshop on eclipse technology eXchange*, New York, NY, USA, 2006, pp. 11–15, ACM.
- [6] Atsushi Sugiura and Yoshiyuki Koseki, "Internet scrapbook: automating web browsing tasks by demonstration," in *UIST '98: Proceedings of the 11th annual ACM symposium on User interface software and technology*, New York, NY, USA, 1998, pp. 9–18, ACM.
- [7] David West, Aaron Quigley, and Judy Kay, "Memento: a digital-physical scrapbook for memory sharing," *Personal Ubiquitous Comput.*, vol. 11, no. 4, pp. 313–328, 2007.
- [8] Ramin Samadani, Debargha Mukherjee, Ullas Gargi, Nelson Chang, Dan Tretter, and Michael Harville, "Pathmarker: systems for capturing trips," 2004.
- [9] Joseph A. Gatto, "Exploring visual design: The elements and principles," 2000.
- [10] Christopher G. Healey and James T. Enns, "A perceptual colour segmentation algorithm," 1996.