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Cluster-based Photo Browsing and Tagging on the Go

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ABSTRACT

We present a technical demonstration of a novel smartphone application that enables efficient browsing and tagging of landmark and event photos. The application employs a hierarchical mode of exploration enabling zooming from the level of a city, through the level of an area/neighbourhood, down to the level of a specific spot. This navigation mechanism combined with photo clustering, and a dual map-list viewing mechanism, enables efficient browsing of hundreds of thousands of publicly available geotagged photos on a smartphone. Due to the large number of markers on the map, an adaptive clustering strategy is employed to reduce clutter on the screen. In addition to the advanced browsing capabilities, the application enables users to import their personal photos from Flickr and to easily annotate them by propagating to them metadata (location, tags) from the currently viewed object (area, landmark). The application currently supports more than 30 cities worldwide.

Categories and Subject Descriptors

H.3.1 [**Information Storage and Retrieval**]: Content Analysis and Indexing - Algorithms

General Terms

Algorithms, Experimentation

Keywords

Clustering, mobile app, content browsing, tagging

1. INTRODUCTION

Media content in the form of photos and videos undergoes rapid growth in recent years due to technological advances (decreasing prices of media capturing equipment, integration of high-quality cameras in smartphones, abundance of storage space). As a result, people tend to capture digital snapshots of real-world objects, such as landmarks and events, with the hope of maintaining a large repository of digital memories, which they can later replay in order to cherish the past. Ironically, this possibility for maintaining massive digital records of one's experiences makes it extremely hard for people to "retrace" their digital footprints in a meaningful and enjoyable way. Other than browsing media content by date or by coarse-grained grouping (e.g. "2010 summer holidays"), people are offered very few possibilities for effectively consuming media content.

To this end, the proposed demo, which is available as a smartphone application, aims to provide new means for organizing and consuming media content, creating a compelling media "retracing" experience. This goal is achieved in three steps: (a) mining large amounts of publicly available geotagged photo collections in order to extract rich "city profiles", (b) providing an intuitive browsing mechanism for navigating the extracted city profiles in different levels of granularity, (c) enabling efficient importing and linking of one's own photos to the currently viewed object, in order to create a personal collection that can be browsed with the same intuitive mechanism offered by the application.

Related work. A number of recent works have been motivated by the proliferation of social media content with geographic information. Most of these works focus on mining geographic knowledge from such collections, for instance, to detect and rank landmarks and events [4, 6, 7], or to extract travel itineraries and tourist insights [2, 5]. A few works propose new means of summarizing, presenting and browsing large tagged photo collections: the work in [1] automatically detects representative landmark views and creates popular landmark maps, while the work in [3] proposes Clusttour, a city exploration and browsing interface leveraging photo clustering and knowledge extracted from spatio-temporal mining. The demo builds upon the mobile imlementation of the aforementioned application that is available in the form of a mobile app[1].

2. DEMONSTRATION

The application is based on three components. The first runs on the server, while the other two on the smartphone.

City profile extraction. The first component is tasked with the extraction of geographic media-rich knowledge from large publicly available photo collections. Starting from a large set of geotagged photos for each city, a spatial clustering step automatically extracts areas and neighborhoods within the cities. Subsequently, the photos contained in each of the extracted areas are clustered by means of an efficient community detection algorithm on a graph encoding the visual

[1] http://www.clusttour.gr/itunes

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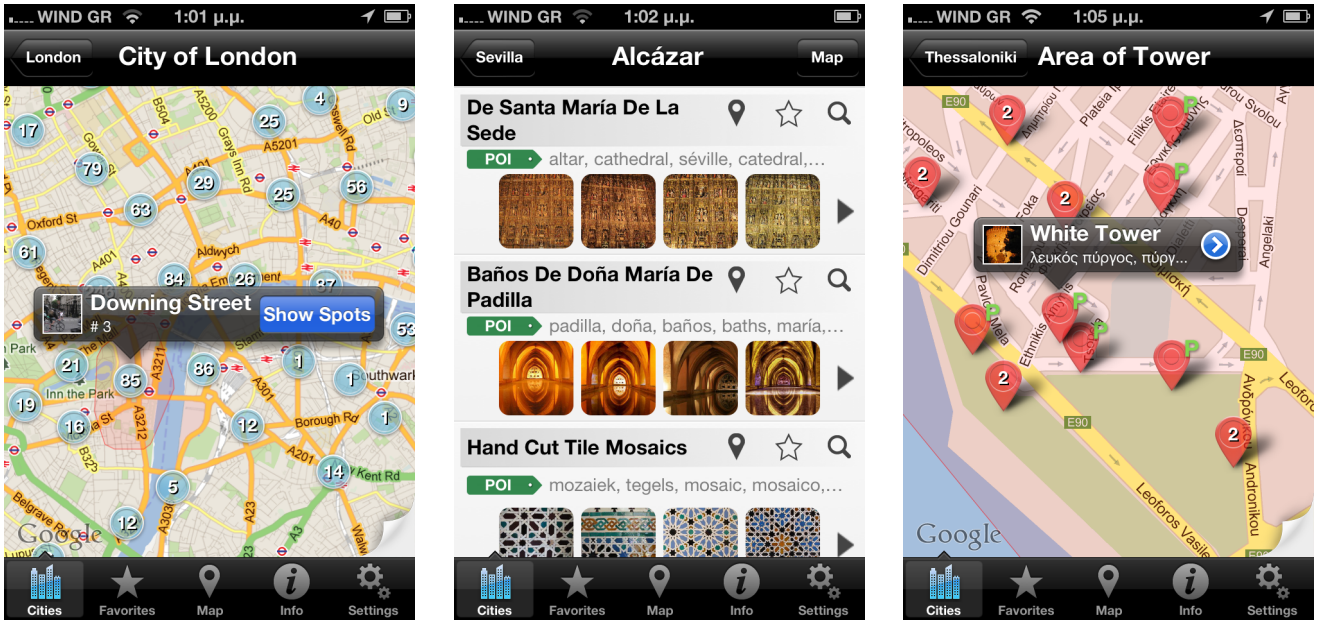

(a) City-level map view (b) Landmark list view (c) Landmark map view

Figure 1: Representative snapshots of the application interface.

and textual similarities between photos. The resulting clusters are classified as landmarks and events [4]. All extracted objects (areas, landmarks, events) are ranked by the number of unique owners of photos contained in them. The resulting city profile, i.e. a set of city areas, and for each area a set of landmarks and events, together with the associated photos and their rankings, is made available through a REST API.

Browsing interface. The smartphone application enables efficient exploration of the extracted city profiles by incorporating a hierarchical exploration mechanism that enables zooming from the level of a city (Figure 1(a)), through the level of an area/neighbourhood (Figures 1(b)-1(c)), down to the level of a specific landmark or event. At each level of granularity, a dual view is available comprising a list and a map. The cluster list view (Figure 1(b)) enables fast preview of the cluster contents by means of horizontal scrolling. The map view (Figure 1(c)) employs an adaptive marker clustering algorithm to reduce clutter on the screen. Clustered markers carry a number denoting how many landmarks and events are contained in them. Upon zoom, they "break" into their consituent objects. The smartphone application employs sophisticated caching facilities to ensure smooth user experience and reduced bandwidth requirements.

Personal photo importing and annotation. While browsing a specific object (e.g. Eiffel Tower), a user can easily import their own photos (from popular photo sharing applications) and associate them to the viewed object. The application attempts to automatically select the appropriate photos from the user's personal collection by matching their metadata (title, tags, location) to the metadata of the object of interest. A fall-back option is available that enables the user to select the appropriate photos on their own. Once a certain number of personal photos have been associated with landmarks and events, the application offers the possibility for "personal viewing" mode, enabling the user to browse their personal collection with the same browsing capabilities as described above, creating a compelling media "retracing" experience.

3. ACKNOWLEDGMENTS

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