World Seer : A Realtime Geo-Tweet Photo Mapping System

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ABSTRACT

Twitter is a unique microblog which is different from conventional social media in terms of its quickness. Many Twitter's users send messages to Twitter on the spot with mobile phones or smart phones, and some of them send tweets with photos and geotags, which can be regarded as being geotagged photos. Geotagged tweet photos are very useful to understand what happens currently over the world. In the demo, we introduce "World Seer" which is a real-time geo-tweet photo mapping system. Users can see the latest geo-tweet photos related to given keywords and areas on the online maps. The system shows geo-tweet photos not only on the map, but also on the street-view. In addition, for some parts of the geo-tweet photos, the system can show representative photos for the given locations and the given times employing the GeoVisualRank method which takes into account both visual features of photos and proximity of geotags.

Categories and Subject Descriptors

H.4 [**Information Systems Applications**]: Miscellaneous

General Terms

Algorithms, Design, Experimentation

Keywords

geotagged photo, geotag, Twitter, geo-tweet

1. INTRODUCTION

Twitter is a unique microblog, which is different from conventional social media in terms of its quickness. Many Twitter's users send messages, which is commonly called "tweets", to Twitter on the spot with mobile phones or smart phones, and some of them send photos and geotags as well as tweets. Then, we can regard Twitter as a data source of geotagged photos. In fact, we collected about 75 thousand geotagged photos a day on average in December 2012 via Twitter Streaming API. We think that Twitter is a promising data source of geotagged of photos, while Flickr has been the most popular data source of geotagged photos in the research community of multimedia so far. Since the characteristic of Twitter is quickness and on-the-spot-ness, the photos on Twitter are different from the photos on Flickr. Flickr has many travel photos, while Twitter has many photos related to everyday life such as food, weather and street scene. Therefore, we think that geo-tweet photos are more useful to understand what happens currently over the world than Flickr geo-photos.

We have been collecting geo-photo tweets continuously since February 2011. Currently, our geo-photo tweet database has more than 20 million geo-photo tweets, which includes ones related to some special events such as the huge earthquake hit in Japan on March 11th, 2011.

To make collection of geo-photo tweets successful, we implemented not only geo-tweet collecting system but also a system showing geo-tweet photos on the online map in the real-time way in order to monitor the status of the geo-tweet collection. Although the original objective of the geo-tweet mapping system is just monitoring, currently the system has been extended a lot so that we can get to know what happens over the world with geo-tweet photos, and then we named the system "World Seer".

In the demo, we introduce "World Seer" which is a real-time geo-tweet photo mapping system as shown in Fig.1. This figure shows the latest geo-tweet photos selected by the search keyword, "noodle", from which you can get to know what kinds of "noodle" people are eating over the world now. Users can see the latest geo-tweet photos related to given keywords and areas on the online maps, and can search more than 20 million geo-photo tweets stored in our geo-photo tweet database.

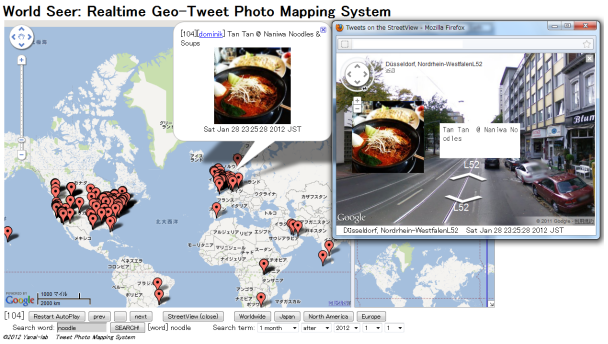

Figure 1: World Seer: a realtime geo-tweet photo mapping system. This figure shows the latest geo-tweet photos related to "noodle". You can get to know what kinds of "noodle" people is eating over the world now from the geo-tweet photos. In addition, from the street-view, you can get to know what the places where "noodles" are eaten are like, too.

ICMR '12, June 5-8, Hong Kong, China

The system shows geo-tweet photos not only on the map, but also on the street-view. Seeing photos over the street-view photos corresponding to the geotag place is also quite helpful to know what the place is like. The geo-tweet photo shown in the system window and its geo-location on the map are switched one after another every five seconds automatically.

In addition, for some parts of the geo-tweet photos, the system can show representative photos for the given locations and the give dates employing the GeoVisualRank method [1] which takes into account both visual features of photos and proximity of geotags. To do that, the backend part of the system downloads photo JPEG files and extracts visual features in advance. Due to computation loads, currently we restrict photos from which we extract visual features to the geo-tweet photos tweeted in Japan. An example is shown in Fig.3.

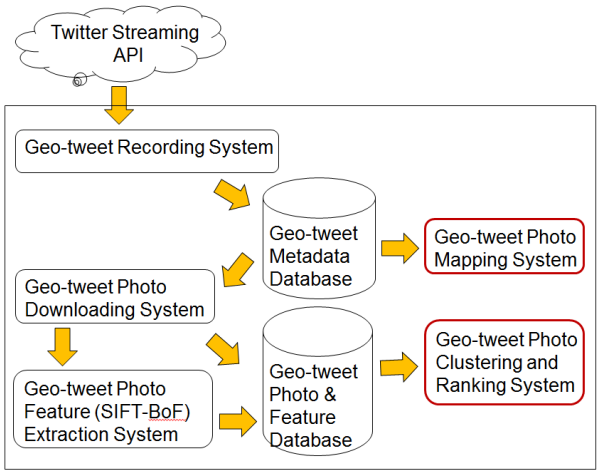

Figure 2: Overview of the system architecture.

2. OVERVIEW OF THE SYSTEM

As shown in Fig.2, the system consists of the following five sub-systems and two databases:

Geo-tweet recording system receives tweet stream flowing through Twitter Streaming API, picks up geo-tweets having photos, and stores them on the metadata database in a real-time way. It handles only textual data. We are collecting geo-tweets from whole the world.

Geo-tweet photo downloading system extracts image URLs from each tweet stored in the metadata database, downloads image files from Twitter photo affiliate sites such as Twitpic.com, Instagr.am and yfrog.com., and store image files into the photo and feature database. Currently, photos to be downloaded is limited to the photos taken in Japan.

Geo-tweet photo feature extraction system extracts SIFT features, convert them into bag-of-features (BoF) representation based on the pre-computed codebook, and store BoF vectors into the photo and feature database.

Geo-tweet photo mapping system (Fig.1) shows geo-tweet photos on the Google Maps and the Google StreetViews. It fetches the latest geotag tweets from the metadata database, or search the database for the tweets corresponding to the given search keywords and/or the given term. This sub-system is available on the Web [1].

Geo-tweet photo clustering and ranking system (Fig.3) shows geo-photo tweet clusters on the map, and representative photos corresponding to each cluster. Image clusters are constructed by applying the mean-shift clustering method to a set of 2D geotag vectors (latitude and longitude), and representative images corresponding to each cluster are selected by the GeoVisualRank method [1] which is a PageRank-based ranking method of geotagged images considering both visual similarity and geo-location proximity.

Geo-tweet metadata database stores metadata on extracted geo-tweets which contain URLs of images.

Geo-tweet photo and visual feature database stores image JPEG files and corresponding BoF vectors.

To obtain tweets from Twitter, we can use two kinds of Twitter Web API, Twitter API and Twitter Streaming API. Since we can obtain tweets only for recent ten days at most via Twitter API, we are collecting geo-tweets via Twitter Streaming API. Through Twitter Streaming API, a huge amount of tweets are broadcasted continuously. In the system, the recording system selects only the tweets which have geotags and photo URLs from the tweet stream. We have been collecting geo-photo tweets continuously since February 2011. Currently, our geo-photo tweet database has more than 20 million geo-photo tweets. We collected 2.3 million geo-tweet photos a month last December, which is equivalent to one geo-tweet with a photo per second. The number of geo-tweet photos a month is increasing gradually.

Figure 3: Geo-tweet photo clustering system. The geo-tweet photos in this figure are recorded at the day of the huge earthquake hit in Japan on March 11th, 2011.

3. REFERENCES

[1] H. Kawakubo and K. Yanai. Geovisualrank: A ranking method of geotagged images considering visual similarity and geo-location proximity. In *Proc. of the ACM International World Wide Web Conference*, 2011.

[1] http://mm.cs.uec.ac.jp/geotwphoto/