Where Do Tourists Go? Visualizing and Analyzing the Spatial Distribution of Geotagged Photography

Bálint KÁDÁR, Mátyás GEDE

Department of Urban Planning and Design
Budapest University of Technology and Economics

Department of Cartography and Geoinformatics
Eötvös Loránd University, Budapest

ICC 2013 Dresden, 2012.08.25–30
Outline

- Aims
- But what makes a photo „geotagged”?
- Data collecting through photo sharing APIs
- Visualization, analysis
- Discussion
- Further possibilities
Aims:

Collecting and analyzing information from geotagged photos for...

- Providing information about tourists’ spatial distribution in cities based on geotagged photography

- Analyzing the behavior of short-term and longer staying visitors

- Verifying the impact of urban developments
But what makes a photo „geotagged”? 

Geotag = geographic positional information

Sources of position data:
- Cameras with GPS device
- Smartphones (using GPS / WiFi / GSM position info)
- Separate GPS device, geotags are merged into images using a special SW
- Geotagging while uploading photos to photo-sharing sites

Geotagging is popular: more than 25000 photos at Budapest in one year (on Flickr)
Data collecting through photo sharing APIs

Some services provide an API (Application Programming Interface)
- operating via HTTP requests
- providing attributes of photos taken within a given quadrangle (specified by boundary latitudes/longitudes)
- limited amount of data per request (e.g. max 250 photos at Flickr)

Due to the limitations it is advisable to store the data in a database for further analysis
Flickr vs. Panoramio

Panoramio

😊 no registration

😢 undocumented filtering -> contradictory results

Flickr

😢 requires registration (free of charge)

😊 downloaded data more reliable
Visualization #1: raw data

Let’s place a dot at each photo’s location!
Analyzing data

useful attributes:
- location
- date of photo
- owner ID

Example: if the date difference of a user’s first and last photo within a given area is greater than 5 days, the user can be considered as a local in that area. Otherwise, the user is a visitor there.

Results (at Budapest):

Most visitor photos are concentrated around touristic highlights (Castle Hill, Danube Bank and bridges, Parliament, St. Stephen’s Basilica, Andrássy Avenue, Heroe’s Square etc.)

Local photos also include touristic highlights, but there are several pictures scattered at residential areas and large number of photos at pubs, sport fields / stadiums, universities etc.
Visualization #2: 3D bars

Let’s place a grid to the map of the examined area and calculate the number of photos in each grid cell. The results can be visualized as 3D bars on a digital globe (e.g. in Google Earth).
Visualization #2: 3D bars

Changing tourist timespan limit

Synagogue

Liszt Ferenc square bars
68 photos

New York palace
33 photos

Hunyadi sq local markethall
19 photos

20.000 PHOTOS OF 1 TO 10 DAY TOURISTS
Visualization #2: 3D bars

Differences of local/tourist pattern and impact of new developments

PHOTOS OF TOURISTS 2009-2012

National Museum

CET

Kopaszi gát
Visualization #3: Difference map

Difference maps showing whether the local or tourist photos are in majority, or their number is similar. The grid cell size is doubled on the right-side map to demonstrate the importance of grid granularity.
Discussion

Number of days instead of total timespan:
- ~17% difference
- repeated visitors tend to act like locals

User count instead of photo count:
- correlates more to the number of visitors
- correlates less to the attractiveness of the place

Grid size: 10m*10m
- more or less equals to GPS position error
- smaller than urban features (houses, places etc.)
  → photos within a cell are at the same place
Further possibilities

- temporal analysis:
  - photo distribution before and after a specific urban development (e.g. a new pedestrian zone)
  - comparing photos taken in summer/winter, working days/weekends, morning/afternoon etc.

- movement analysis: generating typical tourist paths

- developing additional visualization methods together with the above mentioned analysis.

- defining a „touristic graph” of a city by automated spatial clustering of photos
Thank you for your attention!