Projected Destination Images Versus Visitor-Generated Visual Content in Brasov, Transylvania

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Abstract Visitor-generated visual content (VGVC) that is created and uploaded as travel photos allows researchers to examine tourists' behavior, as traditional tourism data collection methods (surveys, interviews and focus groups) were proved both expensive and time consuming. Tourists take photos, upload them to social networks and photo sharing platforms, leaving digital footprints on the Internet, footprints that can be subsequently used for tourism research. Photos tagged with "Brasov" between January 1st 2000 and July 1st 2018 were collected using Flickr API. A collection of 22,362 geotagged photos collected from Flickr was analyzed. Using DBSCAN algorithm, tourist attraction areas were identified, after eliminating the content created by people living permanently in the area. For detailed data analysis seasonal graphs were generated. The research method combines content analysis based on text tags and image data with structural analysis based on geospatial data. The resulting tourist attractions of the area as derived from the number of photos taken there were compared to the distribution of the attractions as resulted from Destination Management Organizations' (DMOs) promotional materials. The spatial patterns of tourist activity in Brasov revealed many similarities and differences compared to promoted attractions by the DMOs. The results indicate that geo-tagged photos in Brasov reflect the projected image of the destination as the data provided a hotspot distribution of popular tourist attractions. This paper explores the advantages of using VGVC for tourism research, but also highlights the limitations that have to be addressed. Implications for tourism marketing managers are provided thereafter.

Keywords Visitor-generated visual content · Geotagged photos · Projected destination image

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1 Introduction

Tourism and destination image has been a research subject for many scientific articles [1–4] and books [5, 6]. With the advent of new technologies, images of places have been part of research associated with image analysis via the provision of geographic information or image tags [7]; or research by Yanai [8] on web images, and image analysis to infer location in the context of Flickr or research on approaches to determine the location of photos [9]. Zheng et al. [10] also discuss georeferencing for location landmarks and locations from photos from an image point of view. User-generated content (UGC) in social media is gradually being acknowledged, as can now be seen from numerous studies published in the literature, although there is claim [11] that it is a subject that still needs to be explored in greater depth.

The aim of this paper is to examine the visualization of the geographical positions of photographs taken by tourists as one of the methods to measure tourists' activity as most photo-sharing sites on the Internet offer the geotagging service. As a low cost and accessible source of data, tools and methods for analyzing visual content will be more and more popular among tourism researchers. The destination under study was chosen to be Brasov, Transylvania on the grounds that Brasov county was the second Romanian destination for foreign tourists in 2017, as 196.000 foreign tourists were officially registered [12]. Then, synergies can be established in relation to DMOs that can use VGVC that is created and uploaded from tourists so that the projected and the perceived image of a destination are consistent.

The sections of the paper are as follows: the authors present in Sect. 2 literature work that illustrates the significance of UGC in relation to photos that may be used for the creation of destination image. Section 3 presents methodology followed for collecting VGVC uploaded in Flickr for Brasov, Romania, then, results are presented where comparison took place between projected and generated image for Brasov and the authors in the last section, the conclusion managerial suggestions for DMOs.

2 Literature Review

2.1 Destination Image

Comparing the projected destination image and the perceived destination image has not been approached by many researchers [13–16]. DMOs should take UGC into consideration when projecting destination image in the online era, social media of official sites [17].

2.2 User-Generated Content for Tourism Destinations

User-generated content (UGC) is defined as being the media content that is produced by the general public and is primarily distributed online via Web 2.0 technologies [18]. User-generated content for tourism is termed in many ways, two of them being "tourist-generated content" (TGC) or "travel-related consumer generated media" or the travel-related content created and uploaded by tourists on the Internet [19–22].

2.3 (Geotagged) Photos and Tourism

Travel photos are considered to be a good source of understanding of tourists' perceptions of a destination [13, 23, 24]. Research [25] has indicated that photos are more suited to reflect the affective images of places from tourists' perspectives. Extracting and understanding tourists' point of interest from geotagged photos has been the focus of many researchers [26].

The image-based content sharing platforms typically have higher rates of geo-tagging. For example, 80% of images in the now-defunct Google Panoramio were geotagged, and most Flickr photos are geotagged where Flickr is the second social medium mostly used where the extraction of useful content from images and videos is easier from tags from content sharing web sites [27].

3 Method

3.1 Study Settings/Place Description

Brasov is located in the central part of Romania, about 166 km north of Bucharest. It is part of historical region of Transylvania and it is surrounded by the Southern Carpathians mountains. According to the latest Romanian census (2011), Brasov has a population of 290,743 (estimated at January 1st 2016 and 253,200 at 2011 census), but its metropolitan area is home to about 400,000 residents [28]. Four hundred objects are on the "List of Historical Monuments of Romania", with the Middle Ages, the Rennaisance, the Baroque, the Classicism, and the modern period leaving their marks on the city.

3.2 Sample, Data Collection and Filtering

Data used in this study have been retrieved using photos uploaded on Flickr from January 1st 2000 to July 1st 2018 and tagged with "Brasov". The most suitable

language for data mining is Python 3.6, with countless modules that can be installed as needed pandas, folium, numpy, scikit-learn, matplotlib. Other programs like R, Java or Scala are used by the Data Scientist, but Python is the best choise because is quite simple to use and understood. Another important reason to be considered: Python 3.6 is free of charge.

Two types of API searches were used, flickr.photos.search: after the brasov tag and geographic coordinates. Exact results were obtained after looking for geo-coordinates, because the tags are later placed on the post, and the GPS coordinates come from the camera. In our case around 2% of the pictures are from other cities, which may mislead the classification if they are not filtered and eliminated. Specifically, for Flickr is that it can be downloaded pictures and information about pictures using different search options related to the period, location or tags. To operate the system, data is entered in a 4000-page bounding box on 16 pages of 250 pictures. The application considered this restriction of not exceeding 4000 pictures, using a recursive algorithm, and the data was collected at intervals of one year. The photos with geolocation were collected for the city of Brasov from 2000 until now, but for this study data from 2006 until now have been used.

As the target group of this study was the foreign tourists, from the total sample was removed the local users of Flickr and user with unspecified address. The number of geolocalised photos and tagged with Brasov, by year, is 22,362 for the period of 1st January 2000–1st July 2018. The numbers for every year are: 2000–13 photos, 2001–15, 2002–13, 2003–170, 2004–31, 2005–252, 2006–118, 2007–1657, 2008–2095, 2009–1922, 2010–2375, 2011–2017, 2012–2273, 2013–2434, 2014–1594, 2015–1886, 2016–1029, 2017–968, 2018 (until 1st July)—500 photos.

It can be established if one user is tourist or local by using additional API calls for every user with unspecified location. It can be counted the photos uploaded on Flickr in order to evaluate the attractiveness of one specific place, but it was eliminated the multiple photos that have the same GPS coordinates.

The tool like OpenStreetMap, collects geographic information, which users do actively and with awareness and this is the purpose of VGVC while other research restricts OpenSteetMap as it considers this tool as an end in itself [27].

3.3 Data Clustering

Since there are many geographic points, a classifier should be used in order to reduce the number of points. The most used classifiers are K-Means and DBSCAN. In python, these classifiers are implemented in the skleam module. The most popular classifier for geographic points is DBSCAN, which uses two parameters to give the classification: (1) the minimum number of objects in a cluster and (2) an epsilon that specifies the distance in kilometers from points which represents the maximum distance in kilometers that points can be from each other to be considered a cluster.

Table 1 Clustering algorithms [29]

Method name	Parameters	Scalability	Use case	Geometry (metric used)
K-Means	number of clusters	Very large n_samples, medium n_clusters with MiniBatch code	General-purpose, even cluster size, flat geometry, not too many clusters	Distances between points
DBSCAN	neighborhood size	Very large n_samples, medium n_clusters	Non-flat geometry, uneven cluster sizes	Distances between nearest points

The K-Means classifier has a single parameter: the number of clusters. A comparison of the clustering algorithms in scikit-learn.org is presented in the next table (Table 1).

For the classification, the Council Square and the Black Church, two important and close targets, were detected and marked separately as points of interest, and epsilon was set at 10 m and at least 5 objects in a cluster. Therefore, 64 clusters were obtained for 2973 points.

In addition, content analysis took place for DMOs promotional materials. Content analysis is a technique for gathering and analyzing the content of text. The content refers to words, meanings, pictures, symbols, ideas, themes, or nay message that can be communicated" [30] and a picture could be considered a unit of content containing several prominent features [13].

4 Results and Discussion

From the distribution of the geotagged photos for the last three years and a half, it can be observed that are very few differences on spatial distribution (see Figs. 1 and 2).

As resulting from the map generated by the application on geotagged photos posted on Flickr by the foreign tourists, the following points of interest for Brasov were extracted: Council Square, Black Church, White Tower, Tampa Belvedere, Railway Station, Rope Street, Muresenilor Street, Titulescu Park, Cable Station, Black Tower, Schei Gate, Republicii Street and First Romanian School.

Other points of interest such as Poiana Brasov, Belvedere and Cetatuia (Citadel) was identified using K-Means though not seen using DBSCAN classifier. So, in order to have an overview, both K-Means and DBSCAN classifiers should be used together.

Since research findings of previous research have shown that UGC sources have an indirect effect on tourist satisfaction since most UGC sources have an influence on tourist expectations, which will later be compared with the real tourist perception

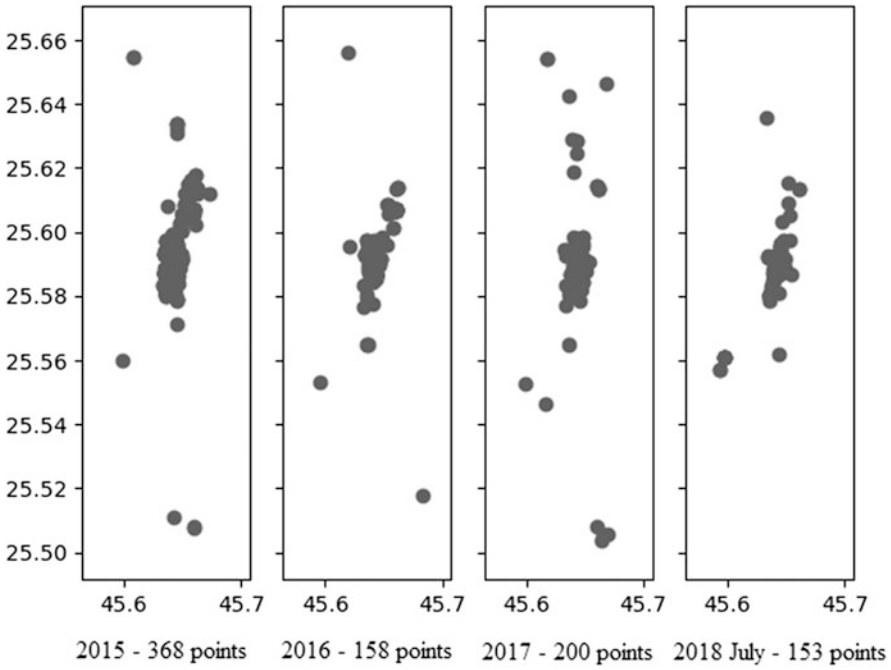

Fig. 1 Spatial distribution of the tourist hotspots as results from geotagged photos uploaded on Flickr for the years 2015, 2016, 2017 and 2018 (until 1st July 2018)

[31, 32], geotagged photos generated by tourists should be taken into consideration for the projection of a destination.

The new trends present a perfect integration between geographic information and virtual reality. In its turn, the usage of Virtual Reality in tourism is also currently increasing. Presently, the usage of geographic information tools that use Virtual Reality have become more common, more specifically one of its variations—the Augmented Reality [33].

As far as the DMOs promotional material in Brasov, the research revealed many similarities with the geotagged photos. The results indicate that geotagged photos in Brasov reflect the projected image of the destination as the data provided a hotspot distribution of popular tourist attractions. The map depicted at Fig. 3 represent an overlapping between point of interest present on promotional materials provided by Brasov Info point (marked with flags) and clusters generated by geotagged photos uploaded by foreign tourists.

Perceived destination image is considered to be significant in people's choices; literature has illustrated that people nowadays with the implementation of social media and new technologies create online communities to discuss, comment, suggest, review contribute to other like-minded people's choices [34]. Thus, projected image should aim for the creation of synergies with what is being uploaded by tourists.

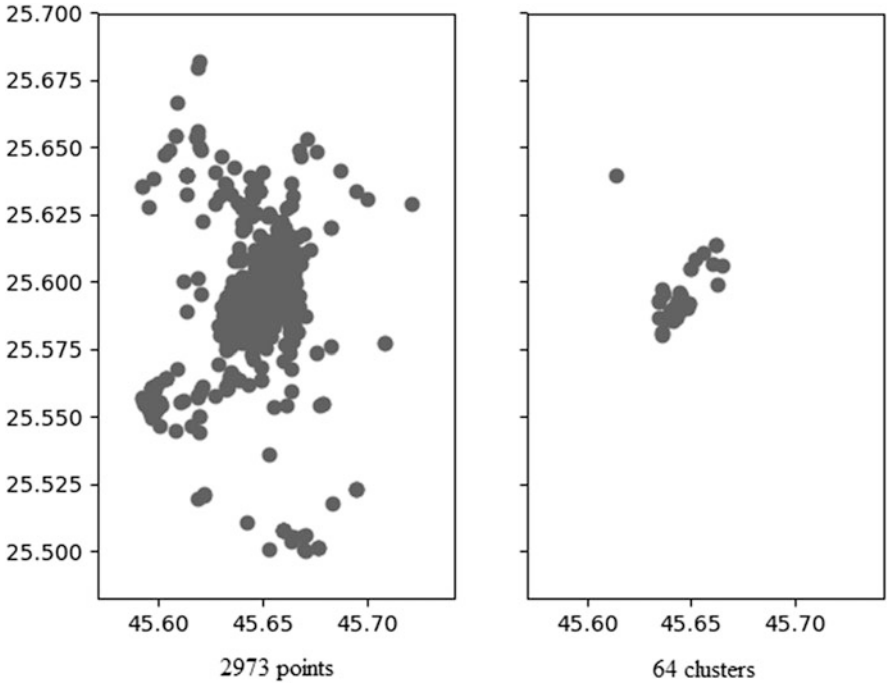

Fig. 2 Geographical points collected from geotagged photos for Brasov (left) and centers of the point of interest detected with DBSCAN for the photos uploaded between 1.01.2006 to 1.07.2018

5 Conclusion

This paper illustrated via the analysis of 22,362 geotagged photos collected from Flickr tourist attraction areas in Brasov, Transylvania and the comparison that followed with DMOs promotional materials in regard to the images of the area that geotagged photos in Brasov reflect the projected image of the destination. DMOs need to take into account the UGC that is created which in the specific case is the VGVC and incorporate this content as a database in their material lowering in that way any kind of discrepancies between the projected and the visitor generated content of a destination. Perceived destination image is considered to be significant in people's choices; literature has illustrated that people nowadays with the implementation of social media and new technologies create online communities to discuss, comment, suggest, review contribute to other like-minded people's choices as social media and photography facilitate social comparison [35–38]. Thus, projected image should aim for the creation of synergies with what is being uploaded by tourists.

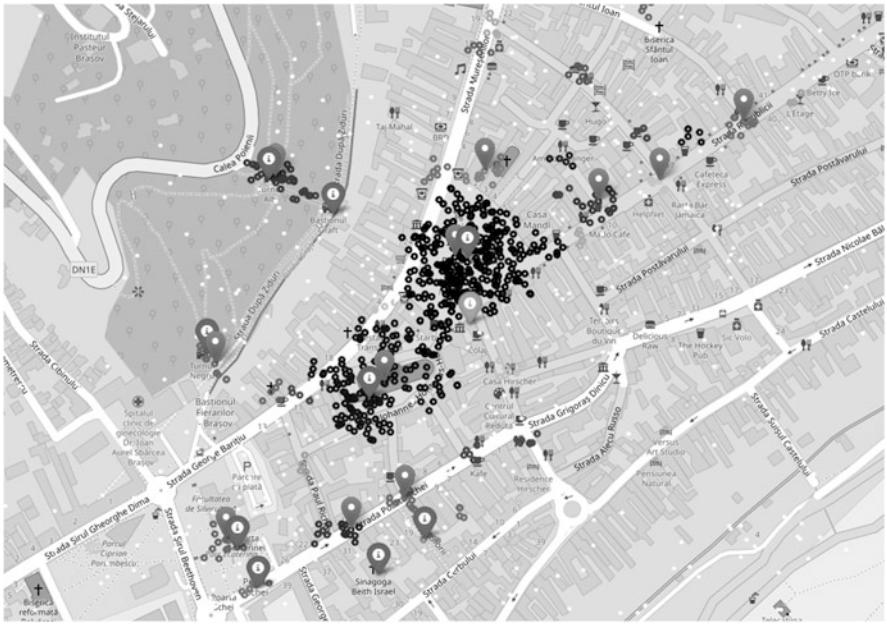

Fig. 3 Map of Brasov Old City that includes points of interest extracted from promotional materials (projected image) and clusters generated by geotagged photos uploaded by foreign tourists (perceived image)

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