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学位の種類	博士 (情報科学)
学位記番号	シス博 第 136 号
学位授与の日付	令和 3 年 3 月 25 日
課程・論文の別	学位規則第 4 条第 1 項該当
学位論文題名	Discovery of Less-Known Tourist Attractions Based on Geo-Tagged Photographs Posted on Social Media (ソーシャルメディアに投稿されたジオタグ写真に基づき穴場的観光名所を発見する方法の研究)
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【論文の内容の要旨】

Recently, tourism has become a development emphasis for many countries because international tourism can not only bring huge revenues; it can also have positive effects on increased long-run economic growth. Several reports have described that international tourism can bring benefits by promoting foreign exchange revenues, spurring investment in new infrastructure, stimulating other economic industries indirectly, and generating employment.

An important tourist phenomenon has been observed, most tourists receive sightseeing information through travel websites. However, almost all of these websites present well-known tourist attractions. Consequently, although the attractions are crowded and congested, visitors will be guided there. Some studies have revealed that quite a few tourists dislike crowded destinations and prefer to avoid them. Moreover, our preliminary investigation revealed that most participants do not like crowded spots that make them feel uncomfortable. These conditions make

it difficult to promote the further development of tourism industries. Therefore, we propose a novel point of interest (POI) approach to discover less-known but attractive tourist attractions, which might ameliorate the difficulties described above and which might support tourism to regions other than popular regions.

A POI is a particular spot that someone might find useful or interesting. They can be landmarks, sightseeing spots or commercial institutions of all types such as restaurants, hospitals, and supermarkets. Furthermore, POIs shown on a digital map must include some information such as name, type, longitude, and latitude. Based on data types and the discovery procedure, the approaches developed for POI are divided into two types. The first type is top-down: discovery of POI from an existing POI repository or database, such as check-in data or yellow pages that are frequently used or fit for a specific theme or target. The second type is bottom-up: raw data (e.g., geo-tagged photographs, digital footprints with implicit geographic information or metadata that involved latitude and longitude) to construct a new database or dataset that includes the POI.

Considering that certain tourists might feel tired of visiting those popular tourist attractions. Thus, discovering new tourist attractions has become an important task for tourism industry. Nevertheless, most existing studies of tourist attraction recommendations and POIs have specifically emphasized analyses of popular sites, but they neglect other places. Recommending these spots encourage crowds to flock there in large numbers, making tourists feel uncomfortable. A solution to this problem is to discover less-known tourist attractions. Especially, this research specifically examines discovery of Japanese less-known tourist attractions that are attractive and which merit increased visits. Using this approach, crowds can not only be dispersed from popular tourist attractions: more diverse spots can be provided for travelers to choose.

We construct this approach in light of two ideas. First, we assume that foreign visitors have distinct familiarity levels with Japanese cities, and less-known tourist attractions might be included in unfamiliar cities. Thereby, to ascertain and compare residents and foreign visitors' familiarity with Japanese cities, Japanese prefectures and cities are grouped via X-means according to the number of geo-tagged photographs

on Flickr. Then, we invited Taiwanese and Japanese people to estimate their familiarity toward clusters.

Second, we propose a formula to find attractive spots by calculating familiarity levels with Japanese cities, image quality assessment (IQA) and sentiment of the comment for ranking tourist attractions. Cities that are familiar to participants are eliminated from the ranking results, the remnant spots are our target. Results of verification experiments demonstrate that most less-known tourist attractions obtained by our approach are known by extremely few people and they appeal to both Taiwanese and Japanese people.

This thesis is organized as follows:

Chapter 1 – introduces the background, motivation and aim.

Chapter 2 – describes the existing POI research, cluster analysis, IQA methods and image classification.

Chapter 3 – presents the first method of less-known tourist attraction discovery based on statistical grouping method and demonstrated the verification experiment.

Chapter 4 – illustrates the second method of less-known tourist attraction discovery based on the first method of discovering less-known tourist attraction via X-means and demonstrated the verification experiment.

Chapter 5 – interprets the third method of less-known tourist attraction discovery based on the second method of discovering less-known tourist attraction via IQA and demonstrated the verification experiment.

Chapter 6 – concludes this thesis and discussed the potential future work for less-known tourist attractions.