Leverage Facial Expression and Click Model for Trip Recommendation

Chun-Hsiung Tseng, Yung-Hui Chen, and Jia-Rou Lin

***Abstract*--Nowadays, there are quite a few travel agencies who aim at providing trip suggestions. However, current trip recommendation mechanisms do not fit the expectations of their users. In this research, the goal is not to replace existing trip recommendation mechanisms but to augment them. We propose to mix the information obtained from facial expression recognition and click model for trip recommendation.**

I. INTRODUCTION

Recreation is a must-have for modern people. Among leisure activities, taking a trip is a very popular one and can be a very mind-refreshing choice. Image how taking a short trip can help you after hard work! However, the issue is, as a busy modern people, do you really have sufficient time to choose a suitable trip? The answer is probably no.

Nowadays, there are quite a few travel agencies who aim at providing such suggestions. Most of them have Web sites. Some of them offer automatic trip recommendation based on user preferences. Ideally, users simply log into travel agencies Web sites, use them for a while, and then enjoy the convenience offered through automatic recommendation. However, the practicalness and effectiveness of the design of existing trip recommendation systems may not be perfect. According to a survey made by the Tourism Bureau of Taiwan, in 2014, the total expenses of traveling reached more than 10 billion US dollars, and the value kept rising in 2015[1]. The survey also reveals that over 90% of people in Taiwan prefer to plan trips by themselves rather than rely on travel agencies. The results of the survey partially proved that the current trip recommendation mechanisms do not fit the expectations of their users.

The methods used by travel agencies today highly rely on usage logs. As a result, existing methods tend to offer similar (to trips the user participated before) trips rather than preferred trips. The nature of desktop browsers poses high limitations on the information Web sites can obtain so they can only "guess" user preferences by counting similar trips. This can be very problematic since people can use travel agencies' Web sites to plan non-recreational trips such as business trips. The situation will hinder the accuracy of future recommendations.

In this research, the goal is not to replace existing trip recommendation mechanisms but to augment them. Today, user's way to do Web surfing has definitely changed a lot since the adoption of mobile devices. When mobile phones or pads are used for browsing Web sites, the equipped sensors can collect information that is difficult to acquire via desktop browsers. One of the information is the facial expressions. Analyzing facial expressions is a possible way to guess how the current user feel. Therefore, in this research, we propose to use facial expressions and click model simultaneously to achieve better trip recommendation results.

II. RELATED WORKS

According to Dan Hill, people naturally demonstrate and communicate their emotions through the face and when we read people, apparently 55% of it is facial expression, 38% is voice tone and only 7% is words [1]. As a result, to assess how people feel through their facial expressions is practical. The research of Ekman revealed the links between facial muscles and emotions [2]. He developed Facial Action Coding System (FACS) which identified each and every facial muscular movement to assess human emotion. Perhaps a famous one is the application developed by Kaliouby's team. Their application successfully predicted the victory of Obama in 2012 based on the results of analyzing the facial expression of 200 people during watching the clips of the Obama-Romney debates[2].

On the other hand, click-through information is considered as a valuable source of users' implicit relevance feedback for commercial search engines [3]. The survey of Chuklin, Markov, and Rijke summarized advances in modeling user click behavior on a web search engine result page and presented simple click models as well as more complex models aimed at capturing non-trivial user behavior patterns on modern search engine result pages [4]. The work of Wang, Zhai, Dong, and Chang proposed a novel Bayesian Sequential State model for modeling the user click behaviors[5].

[1] http://admin.taiwan.net.tw/upload/statistic/20160810/5edad339-d16f-4933-982d-9c90c72f5739.pdf

[2] https://www.newyorker.com/magazine/2015/01/19/know-feel

III. THE METHOD

We utilize the implementation offered by the Google Cloud Vision API[3]. We simply convert an image to a base64 string and upload the image to their server via the library they provided. The service simply return the recognized emotions with the probabilities. The code snippets below was used to achieved the task:

```
String face = request.getParameter("face");
EmotionDetectionRequest req=new EmotionDetectionRequest();
req.setApiKey("AIzaSyDA4H1B4AyOwSxXM0vAFgd8bh_5wKqs5u0");
req.setImageBase64(face);
EmotionDetectionResponse detectionResponse=req.send();
double happiness=5;
switch(detectionResponse.getJoyLikelihood()){
    case UNKNOWN: happiness=5;break;
    case VERY_UNLIKELY: happiness=0;break;
    case UNLIKELY: happiness=2; break;
    case POSSIBLE: happiness=5; break;
    case LIKELY: happiness=7; break;
    case VERY_LIKELY: happiness=10; break;
}
response.getWriter().print(happiness);
```

Figure 1. the emotion recognition process

In this research, we simply extract the degree of "happiness" from the results.

Besides, we have to defined feature vectors to represent each trip. Two types of features have been used: the subjective features and the objective features. The set of subjective features includes: the degree of happiness and the score obtained via click-through information. The set of objective features includes: the latitude, the longitude, and the price level of trips. The features and their variable names are shown in the table below:

Table 1. the features and their variable names

Subjective Features		**Objective Features**	
the feature	**the variable name**	**the feature**	**the variable name**
the click-through score	click	the latitude	lng
		the longitude	lat
the degree of happiness	happiness	the price level	pricerange

We used the sum of click and happiness to select the users' preferred trips and then use the formula below to calculate the similarity between the preferred trips and other trips:

$$\frac{(lng_u \cdot lng_v) + (lat_u \cdot lat_v) + (pricerange_u \cdot pricerange_v)}{\sqrt{lng_u^2 + lat_u^2 + pricerange_u^2} + \sqrt{lng_v^2 + lat_v^2 + pricerange_v^2}}$$

Figure 2. the formula to calculate trip similarity

[3] https://cloud.google.com/vision

We then use the calculated similarity to acquire the list of trips to recommend. In the future, we will arrange experiments for performance evaluation.

REFERENCES

[1] Hill, D. (2010). Emotionomics: Leveraging emotions for business success. Kogan Page Publishers.

[2] Darwin, deception, and facial expression. Annals of the New York Academy of Sciences, 1000(1), 205-221

[3] Liu, Y., Xie, X., Wang, C., Nie, J. Y., Zhang, M., & Ma, S. (2017). Time-aware click model. ACM Transactions on Information Systems (TOIS), 35(3), 16.

[4] Chuklin, A., Markov, I., & Rijke, M. D. (2015). Click models for web search. Synthesis Lectures on Information Concepts, Retrieval, and Services, 7(3), 1-115.

[5] Wang, H., Zhai, C., Dong, A., & Chang, Y. (2013, May). Content-aware click modeling. In Proceedings of the 22nd international conference on World Wide Web (pp. 1365-1376). ACM.