

Recommendation of preferable photo contents

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Abstract — This paper presents a recommendation module which provides preferable photo contents to the user from among the huge amount of photo contents in UMPC database. To extract the preferable photo to user, we use a hybrid approach that is combined with context and content-base approach using data mining concept.

Using two vectors concerned with the user profile and the photo metadata, we can calculate the cosine similarity between them. The higher cosine similarity indicates that relevant photo content is more preferable. The experimental results showed that our proposed algorithm has high potential to give high satisfaction to the user.

Index Terms —user profile, data mining, similarity measure, smart phone, UMPC (Ultra-Mobile Person Computers)

I. INTRODUCTION

RECENT years, it have seen a lot of recommendation photo systems in a lot of fields. Most of them could show the list of photo contents based on the context information of photos [1][2].

However, when it is growing the technology of personalizing mobile machine, it should be needed to personalize recommendation system by considering a user preference [3]. This research focuses on the method how the photo contents can be recommended to user in terms of user preference in personalize mobile interface (UMPC). Moreover, we consider not only user preference, but also photo metadata which contain a context and content information based on ontology-based photo annotation [4]. In this paper, we adopt a hybrid approach which is combined with context and content information with the user preference.

II. RECOMMENDATION SYSTEM

A. Context descriptions

A user preference is stored in the user profile which is composed of two parts, human relations and keywords. The reason why we divide two parts in the user profile is that the human relations have relative important factors. A user preference in the user profile is represented as a vector of $\langle \text{features, weight} \rangle$.

The photo metadata contains context and content information of the photo contents. Context information includes a time and location information. As we get the context information, we assign the dependent information such as light status and season information. Content information describes the background of focus of photo image. As the same manner with the user profile, we assign relative important factors to the photo metadata for the photo identification.

B. Data mining for recommendation of photo contents

When one tries to seek specific photos from the UMPC database, one usually wants a system which automatically recommends photos with considering the user preference. To implementing the automatic recommendation system, we use the data mining methodology which can extract useful information (preferable photo) from UMPC database. In details, we adopt a hybrid approach which is combined with context and content base approach in the data mining methodology. Fig.1 shows the process of photo recommendation system using data mining concept.

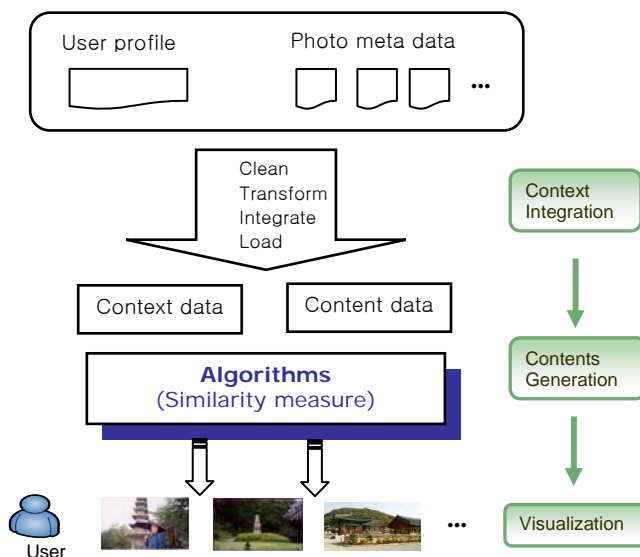


Fig.1 Process of the photo recommendation system

C. Hybrid recommendation approach

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We define a user profile as a vector $U = (u_1, \dots, u_n)$, where u_i means a user preference represented between -1 and 1. The value -1 indicates least preferred and 1 indicates most preferred. An example of user preference is as follows: User preference = {(smith, 0.5), (honeymoon, 0.9)}.

We also define a photo metadata as a vector $P = (w_1, \dots, w_n)$, where w_i is weight represented between -1 and 1. We assign this weight to photo metadata for representing the relative important factors. The value of 1 means more important factors and -1 means less important factors.

In order to find a preferable photo, the relationship between two vectors, photo metadata and user preference profile, must be investigated. As a method for investigating the relationship, we adopt cosine similarity measure as below.

$$\begin{aligned} \text{Similarity}(U, P) &= \frac{U \cdot P}{\|U\| \times \|P\|} \\ &= \frac{\sum_{i=1}^n u_i w_i}{\sqrt{\sum_{i=1}^n u_i^2 \sum_{i=1}^n w_i^2}} \end{aligned}$$

The following figure describes the process of cosine similarity calculation.

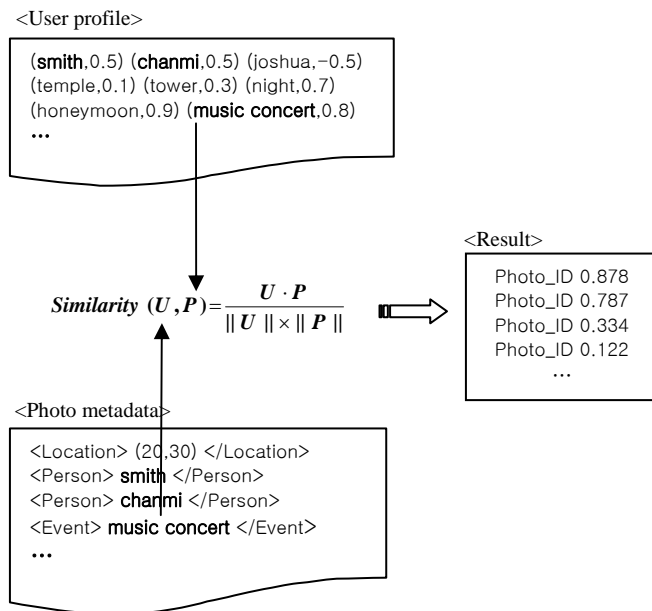


Fig.2 The process of cosine similarity calculation.

The format of output is Result = (Photo_ID , 0.878). It means the user's interest of the Photo_ID photo is 0.878.

III. CONCLUSION

The proposed recommending photo system incorporating context and content information with the user preference is preliminary crucial system in personalized Smart phone. As future work, for indicating the quality of recommending photo system, we will adopt the precision measure. As much as we

get the high score of precision value, it means that the recommending photo system has high accuracy and high user satisfaction.

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REFERENCES

- [1] Naaman, M., Harada, S., Wang, Q.Y., Garcia-Molina, and H., Paepcke, A. Context Data in Geo-Referenced Digital Photo Collections. In *Proc. ACM Multimedia (MM 2004)* (New York, NY, October 10-16, 2004). ACM Press, New York, NY, 2004, 196-203.
- [2] O'Hare, N., Jones, G., Gurrin, C., and Smeaton, A., Combination of content analysis and context features for digital photograph retrieval. in *IEEE European Workshop on the Integration of Knowledge, Semantic and Digital Media Technologies*, (2005).
- [3] Yu, Z., Zhou, X., Zhang, D., Chin, C.-Y., Wang, X., Men, J., 2006. Supporting Context-Aware Media Recommendations for Smart Phones. *IEEE Pervasive Magazine* 5 (3), 68-75.
- [4] A. T. Schreiber, B. Dubbeldam, J. Wielemaker, and B. J. Wielinga. Ontology-based photo annotation. *IEEE Intelligent Systems*, 16:66-74, May/June 2001.