

A Personal Travel Project Planning System with concept of adjustment

白宗叡、姜琇森

E-mail: 321987@mail.dyu.edu.tw

ABSTRACT

Recently, Internet has significantly influenced the tourism sector providing a great variety of services and products online. However, the number of choices has increased so dramatically that is very difficult for the consumers to find what they are looking for. Since tourists can plan their traveling schedules by themselves, the free and independent travel is increase gradually. How to plan the best traveling schedule under considering various kinds of influencing factors (as tourist attractions) simultaneously is a challenge. In order to find out solutions, recommendation systems for tourism have attracted a lot of research energy and interest. However, the personalized concept is not completely in most of travel recommendation system. They only recommended most popular travel route or project, and cannot plan the traveling schedule or transform the traveling schedule for themselves. Moreover, many recommendation systems are not considering the charging of tourists' requests and the results of recommendation are not satisfied for tourist. Therefore, the travel recommendation system plays an important role in both planning and recommending a personalized travel route. In this study, we proposed a personal travel project planning system with concept of adjustment. In the system, some methods and concepts are adopted including ontology, time framework, adjustable interface and schedule reasoning method. The dynamic drag techniques are used to reinforce the adjustable interface. An ontology is adopted to manage and represent the various travel information and tourists' requests. We also develop a schedule reasoning method for traveling schedules planning. The system consists of three modules. First, 「Interface Module」 provide both the user's travel requirement and build a time framework. The 「Travel Requirement Match Module」 is responsible for finding the concepts matched with the tourist's requirements. Then 「Schedule Planning Module」 planning a travel project base on user's travel requirement. Through adjustable interface and time framework, users can adjust their travel project. In order to provide a better accuracy rate for next traveling schedule to new users, the satisfied travel projects are feedback to the system. In this paper, we invite 32 users to use our travel project planning system and 20 users even use other travel recommendation systems. We collect the of 52 users' opinions through questionnaires. After statistic analysis, the findings that travel project planning and adjustable interface functions are necessary. The user is satisfied to our provide system moreover is willing to use our system.

Keywords : personality、traveling schedule planning、adjustable、recommendation、ontology

Table of Contents

中文摘要	iii	英文摘要	iii
iv 誌謝辭		vi 內容目錄	
vii 表目錄		ix 圖目錄	
x 第一章 緒論	1	第一節 研究背景	1
1 第二節 研究動機	3	第三節 研究目的	3
4 第四節 研究流程	5	第二章 文獻探討	5
7 第一節 本體論	7	第二節 推薦系統過濾方法介紹	7
10 第三節 旅遊推薦技術相關研究	15	第四節 旅遊推薦系統探討	15
18 第三章 旅遊行程規劃系統架構	21	第一節 系統架構介紹	21
21 第二節 系統模組介紹	23	第三節 旅遊行程規劃	23
系統運作流程	31	第四節 行程推論方法	32
範例	38	第五節 系統運作	32
環境與流程設計	47	第四章 實驗設計	47
與未來研究	60	第一節 實驗	47
未來研究	62	第二節 實驗分析	50
		第五章 結論	60
		第一節 結論	60
		第二節	64
		參考文獻	64

REFERENCES

一、中文部分 1. 王治立(2004), 旅遊語意網整體服務系統之建置, 大葉大學資訊管理研究所未出版之碩士論文。 二、英文部分 1. Ansari,

A., Essegai, S., & Kohli, R. (2000). Internet recommendation systems. *Journal of Marketing Research*, 37(3), 363-375.

2. Ardissono, L., Goy, A., Petrone, G., Signan, M., & Torasso, P. (2003). Intrigue: Personalized recommendation of tourism attractions for desktop and handset devices. *Applied Artificial Intelligence*, 17(8), 687-714.

3. Baldzer, J., Boll, S., Klante, P., Krosche, J., Meyer, J., Rump, N., Scherp, A., & Appelpath, H. (2004). In Brunswick (Ed.), Location-aware mobile multimedia applications on the Niccimon Platform. *Proceedings of the Informations Systeme fur Mobile Anwendungen (IMA-04)*, Germany: University of Oldenburg.

4. Breese, J. S., Heckerman, D., & Kadie, C. (1998). Empirical analysis of predictive algorithms for collaborative filtering. In G. F. Cooper & S. Moral (Eds.), *Proceedings of the 14th Conference on Uncertainty in Artificial Intelligence (UAI-98)* (pp. 43-52), Wisconsin: University of Wisconsin Business School.

5. Bunge, M. (1977). *Ontology I: The furniture of the world*. Boston: D. Reidel publishing.

6. Burke, R. (2000). Knowledge-based recommender systems. *Encyclopedia of Library and Information Systems*, 69(32), 175-186.

7. Burke, R. (2002). Hybrid recommender systems: survey and experiments. *User Modeling and User-Adapted Interaction*, 12(4), 331-370.

8. Buyukozkan, G. (2009). Determining the mobile commerce user requirements using an analytic approach. *Computer Standards and Interfaces*, 31(1), 144-152.

9. Cheverst, K., Davies, N., Mitchell, K., Friday, A., & Efstratiou, C. (2000). Developing a context-aware electronic tourist guide: some issues and experiences. *Proceedings of the Computer Human Interaction (CHI-00)*, (pp. 17-24), Netherlands.

10. Chin, D., & Porage, A. (2001). Acquiring user preferences for product customization. In M. Bauer, P. Gmytrasiewicz, J. Vassileva, (Eds.), *Proceedings of the 8th International Conference on User Modeling, Lecture Notes in Artificial Intelligence, (LNAI)*, (pp. 95-104), Berlin: Springer.

11. Console, L., Lombardi, I., & Gioria, S. (2003). Personalized and adaptive services on board a car: An application for tourist information. *Journal of Intelligent Information Systems*, 21(3), 249-284.

12. Corallo, A., Lorenzo, G., & Solazzo, G. (2005). In Y. Gil, E. Motta, V. R. Benjamins & M. A. Musen (Eds.), A semantic recommender engine enabling an e-tourism scenario. *Proceedings of the International Semantic Web Conference*, (pp. 1092-1101), Springer Berlin.

13. Coyle, L., & Cunningham, P. (2003). In K. D. Ashley & D. G. Bridge (Eds.), Exploiting re-ranking information in a case-based personal travel assistant. *Proceedings of the 5th International Conference on Case-based Reasoning*, (pp. 11-13), Trondheim.

14. Chandrasekaran, B., Josephson, J. R., & Benjamins, V. R. (1999). What are ontologies, and why do we need them?. *IEEE Intelligent Systems*, 14(1), 20-26.

15. Choi, C., Cho, M., Choi, J., Hwang, M., Park, J., & Kim, P. (2009). Travel Ontology for Intelligent Recommendation System. *Proceedings of the Third Asia International Conference on Modelling & Simulation 2009, (AMS '09)*, (pp. 637-642), Indonesia: Bali.

16. Cho, Y. H., Kim, J. K., & Kim, S. H. (2002). A personalized recommender system based on Web usage mining and decision tree induction. *Expert Systems with Applications*, 23(3), 329-342.

17. Fesenmaier, D. R., Werthner, H., & Wücher, K. W. (2003). *Travel Destination recommendation systems: Behavioral foundations and applications*. London: CABI publishing.

18. Fink, J., & Kobsa, A. (2002). User modeling for personalized city tours. *Artificial Intelligence Review*, 18, 33-74.

19. Garcia-Crespo, A., Chamizo, J., Rivera, I., Mencke, M., Palacios, R. C., & Berb?ulo, J. M. G. (2009). SPETA: Social pervasive e-tourism advisor. *Telematics and Informatics*, 26(3), 306-315.

20. Goldberg, D., Nichols, D., Brian, O. M., & Terry, D. (1992). Using collaborative filtering to weave an information tapestry. *Communication of ACM*, 35(12), 61-70.

21. Good, N., Schafer, J. B., Konstan, J., Borchers, A., Sarwar, B., Herlocker, J., & Riedl, J. (1999). Combining collaborative filtering with personal agents for better recommendations. *Proceedings of the 1999 Conference of the American Association of Artificial Intelligence (AAAI-99)*, (pp. 439-446), Florida.

22. Guarino, N. (1998). In N. Guarino (Ed.), *Formal ontology and information system. Proceedings of the Formal Ontology in Information Systems (FOIS-98)*, (pp. 3-15), Italy.

23. Hayes, C., & Cunningham, P. (2004). Context boosting collaborative recommendations. *Knowledge-Based Systems*, 17(2-4), 131-138.

24. Hinze, A., & Voisard, A. (2003). In C. B. Medeiros, M. Egenhofer & E. Bertino (Eds.), *Location and time-based information delivery in tourism. Proceedings of the 8th International Symposium on Advances in Spatial and Temporal Databases*. (pp. 489-507), Brazil.

25. Huang, Y., & Bian, L. (2009). A Bayesian network and analytic hierarchy process based personalized recommendations for tourist attractions over the Internet. *Expert Systems with Applications*, 36(1), 933-943.

26. Hwang, J. H., Gu, M. S., & Ryu, K. H. (2005). Context-based recommendation service in ubiquitous commerce. *Lecture Notes in Computer Science of Computational Science and Its Applications (ICCSA 2005)*, (pp. 966-976), Singapore.

27. Iwasaki, H., Mizuno, N., Hara, K., & Motomura, Y. (2007). In F. Ulrich & E. Institute (Eds.), *User-adapted car navigation system using a Bayesian network-personalized recommendation of content. Proceedings of the 7th International Conference on Intelligent Transport Systems Telecommunications*, (pp. 1-6), France.

28. Jasper, R., & Uschold, M. (1999). A framework for understanding and classifying ontology applications, In B. Gaines, R. Cremer, & M. Musen (Eds.), *Proceedings of the 12th Int. Workshop on Knowledge Acquisition, Modelling, and Management KAW '99*, (pp 4-9-1 - 4-9-20), Calgary: University of Calgary.

29. Jennings, A., & Higuchi, H. (1993). A user model neural network for a personal news service. *User Modelling and User-Adapted Interaction*, 3(1), 1-25.

30. Kabassi, K. (2010). Personalizing recommendations for tourists. *Telematics and Informatics*, 27(1), 51-66.

31. Kobsa, A., Koenemann, J., & Pohl, W. (2001). Personalized hypermedia presentation techniques for improving on-line customer relationships. *The Knowledge Engineering, Review*, 16, 111-115.

32. Kr?uche, J., Baldzer, J., & Boll, S. (2004). Mobidenk-mobile multimedia in monument conservation. *IEEE MultiMedia*, 11(2), 72-77.

33. Lawrence, R. D., Almasi, G. S., Kotlyar, V., Viveros, M. S., & Duri, S. S. (2001). Personalization of supermarket product recommendations. *Data Mining and Knowledge Discovery*, 5(1-2), 11-32.

34. Lee, C. S., Chang, Y. C., & Wang, M. H. (2009). Ontological recommendation multi-agent for Tainan City travel. *Expert Systems with Applications*, 36(3-2), 6740-6753.

35. Lee, W. P., Liu, C. H., & Lu, C. C. (2002). Intelligent agent-based systems for personalized recommendations in Internet commerce. *Expert Systems with Applications*, 22(4), 275-284.

36. Liu, Y., Huang, X., & An, A. (2007). Personalized recommendation with adaptive mixture of Markov models. *Journal of American Society for Information Science and Technology*, 58(12), 1851-1870.

37. Li, Y. -M., & Kao, C. -P. (2009). TREPPS: A trust-based recommender system for peer production services. *Expert Systems with Applications*, 36(2-2), 3263-3277.

38. Maswera, T., Edwards, J., & Dawson, R. (2009).

Recommendations of e-commerce systems in the tourism industry of sub-saharan africa. *Telematics and Informatics*, 26(1), 12-19. 39.Montaner, M., Lopez, B., & de la Rosa, J. L. (2003). A taxonomy of recommender agents on the internet. *Artificial Intelligence Re-view*, 19(4), 285-330.

40.Neches, R., Fikes R. E., Finin T., Gruber, T. R., Senator, T., & Swartout, W. R. (1991). Enabling technology for knowledge shar-ing, *AI Magazine*, 12(3), 36-56. 41.Niaraki, A. S., & Kim, K. (2009). Ontology based personalized route planning system using a multi-criteria decision making ap-proach. *Expert Systems with Applications*, 36(2), 2250-2259. 42.O ' Grady, M. J., & O ' Hare, G. M. P. (2004). Gulliver ' s genie: Agency, mobility & adaptivity. *Computers & Graphics*, 28(5), 667-689. 43.Pashtan, A., Blattler, R., Heusser, A., & Scheuermann, P. (2003). CATIS: A context-aware tourist information system. *Proceedings of the IMC 2003, 4th International Workshop of Mobile Compu-ting*, (pp. 1-8), Germany. 44.Ricci, F., & Werthner, H. (2002). Case-based querying for travel planning recommendation. *Information Technology and Tourism*, 4(3-4), 215 - 226. 45.Ricci, F., Venturini, A., Cavada, D., Mirzadeh, N., Blaas, D., & Nones M. (2003). In: Ashley, D. Kevin, Bridge, G. Derek (Eds.), *Produce recommendation with interactive query management and twofold similarity. Proceedings of the 5th International Confer-ence on Case-Based Reasoning, ICCBR 2003, LNCS*, (pp. 479-493), Springer. 46.Roh, T. H., Ohb, K. J., & Hana, I. (2003). The collaborative filter-ing recommendation based on SOM cluster-indexing CBR. *Expert Systems with Applications*, 25(3), 413-423. 47.Roth, J. (2002). Context-aware web applications using the pin-point. *Proceedings of the IADIS International Conference WWW/Internet. IADIS Press, Lissabon, Portugal*, (pp. 3-10), Por-tugal: Lisbon. 48.Sarwar, B., Karypis, G., Konstan, J., & Riedl, J. (2000). Analysis of recommendation algorithms for E-Commerce. *Proceedings of the EC ' 00 Association for Computing Machinery, (ACM)*, (pp. 158-167), United States: Minneapolis. 49.Sarwar, B., Karypis, G., Konstan, J., & Riedl, J. (2001). Item-based collaborative filtering recommendation algorithms. *Proceedings of the 10th International World Wide Web Conference*, (pp. 285-295), Hong Kong: Hong Kong Convention and Exhibition Center. 50.Sarwar, B. M., Konstan, J.A., Borchers, Al., Herlocker, J., Miller, B., & Riedl, J. (1998). In P. Steven & G. Jonathan (Eds.), *Using filtering agents to improve prediction quality in the groupLens re-search collaborative filtering system. Proceedings of the 1998 ACM conference on Computer supported cooperative work*, (pp. 345-354), United States: Washington. 51.Schafer, J. B., Konstan, A. J., & Riedl, J. (2001). E-Commerce recommendation applications. *Data mining and knowledge dis-covery*, 5(1-2), 115-153. 52.Sch?mmer, R. (2001). Rules for using multi-attribute utility theory for estimating a user ' s interests. In N. Henze (Eds.), *Proceedings of the 9th GI-Workshop: Adaptivit?und Benutzermodellierung in interaktiven Softwaresystemen, (ABIS)*, Germany: Dortmund. 53.Scherp, A., & Boll, S. (2004). Generic support for personalized mobile multimedia tourist applications. In H. Schulzrinne, N. Dimitrova, M. A. Sasse, S. B. Moon & R. Lienhart (Eds.), *Proceedings of the ACM Multimedia 2004 – Proceedings of the 12th ACM International Conference on Multimedia*, (pp. 178-179), New York City: Columbia University. 54.Schiaffino, S., & Amandi, A. (2009). Building an expert travel agent as a software agent. *Expert Systems with Applications*, 36(2-1), 1291-1299. 55.Sebastia, L., Garcia, I., Onaindia, E., & Guzman, C. (2008). e-Tourism: A tourist recommendation and planning application. *Proceedings of the 20th IEEE International Conference on Tools with Artificial Intelligence (ICTAI '08)*, (pp. 89-96), United States: Dayton. 56.Shardanand, U., & Maes, P. (1995). Social information filtering: algorithms for automating ' Word of Mouth ' . In vin R. Katz, R. L. Mack, L. Marks, M. B. Rosson & J. Nielsen (Eds.), *Proceedings of the Computer Human Interaction (CHI-95)*, (pp. 210-217), Colorado: Denver. 57.Shoval, N., & Raveh, A. (2004). Categorization of tourist attrac-tions and the modeling of tourist cities: based on the co-plot method of multivariate analysis. *Tourism Management*, 25(6), 741-750. 58.Soe, Y. M., Myo, M. N., & Ni, L. T. (2006). RPCF algorithm for multi-agent tourism system. *Proceedings of the 2006 IEEE Inter-national Symposium on Micro-Nano Mechanical and Human Sci-ence, MHS*, (pp. 1-6), Japan: Nagoya: Nagoya University. 59.Srivihok, A., & Sukonmanee, P. (2005). Intelligent agent for e-tourism: Personalization travel support agent using reinforce-ment learning. In A. Ellis & T. Hagino (Eds.), *Proceedings of the WWW 2005, Japan: Chiba*. 60.Srisuwan, P., & Srivihok, A. (2008). Personalized trip information for e-tourism recommendation system based on bayes theorem. In S. Jajodia, P. Samarati, S. Cimato (Eds.), *Proceedings of the International Federation for Information Processing, (IFIP)*, (pp. 1271-1275), Italy: Milano. 61.Swarout, B., Ramesh, P., Knight, K., & Russ, T. (1997). Toward distributed use of large-scale ontology. In A. Farquhar, M. Grun-inger, A. Gome-Perez, M. Uschool & P. ven der Vet (Eds.), *Pro-ceedings of the AAAI ' 97 Spring Symposium Series on Ontologi-cal Engineering*, (pp. 138-148), California: Stanford University. 62.Tung, H. W., & Soo, V. W. (2004). A personalized restaurant rec-ommender agent for mobile e-service. *Proceedings of the IEEE International Conference on e-Technology, e-Commerce and e-Service*, (pp. 259-262), China: Hong Kong. 63.WebGuide, A. (2001). A City Guide for the Internet. European Media Lab. Available: <http://www.eml.org/english/research/deepmap/d i.eepgis/webguide.html> [No data]. 64.World Tourism Organization(UNWTO). (2010). 世界旅遊人口成長. [Online] Available: http://www.unwto.org/facts/eng/pdf/baromet i.er/UNWTOBarom09_3_en_excerpt.pdf [2010, October]. 65.Yang, Y., & Marques, N. C. (2005). User group profile modeling based on user transactional data for personalized systems. *Lecture Notes in Computer Science, (LNCS)*, 337-347. 66.Yim, H. S., Ahn, J. H., Kim, J., & Park, S. J. (2004). Agent-based adaptive travel planning system in peak seasons. *Expert System with Applications*, 27, 211-222. 67.Zhang, J., Kawasaki, H., & Kawai, Y. (2008). A tourist route search system based on web information and the visibility of sce-nic sights. *Proceedings of the Second International Symposium on Universal Communication 2008, (ISUC '08)*, (pp. 154-161), JAPAN: Osaka International Convention Center. 68.Zhang, T., & Iyengar, V. S. (2002). Recommender systems using linear classifiers. *The Journal of Machine Learning*, 2, 313-334. 69.Zhang, X., Edwards, J., & Harding, J. 2007. Personalized online sales using web usage data mining. *Computers in Industry*, 58, 772-782. 70.Zhang, Y., & Koren, J. (2007). Efficient Bayesian hierarchical user modeling for recommendation system. In W. Kraaij, A. P. de Vries, C. L. A. Clarke, N. Fuhr & N. Kando (Eds.), *Proceedings of the 30th Annual International ACM SIGIR Conference on Research and Development in Information Retrieval, SIGIR ' 07*, (pp. 47-54), Netherlands.