A Tool for Instructional Recommendation in e-Learning

An-Te Nguyen[1], Bich-Thuy Dong Thi[1], Duc-Long Le[2]
[1] Centre of Information Technology, University of Science, HCM city, Vietnam
[2] Faculty of Maths and Informatics, University of Pedagogy, HCM city, Vietnam
nate@hcmuns.edu.vn; thuy@hcmuns.edu.vn; longld@hcmup.edu.vn

Abstract: This article discusses about an approach to instructional recommendation in e-Learning based on combination of profile techniques, profile modeling and learning communities. It focuses on the introduction to the general architecture of tool named *UMeL* (User Modeling for e-Learning) that can support learner or group learning with multi-recommending forms systematically in distance training programs of Vietnam Higher Education context. Recently, Web 2.0 – one of the new technological development - is a transition from the traditional software to Internet services. By using Web 2.0 technology, UMeL can develop effectively key components of tool, such as group formation for learning communities, and one-to-many communication of student with his communities.

Related issues and some problems

Nowadays, e-Learning has being become popular to everybody all over the world. Through applications in reality, this form of training has proved its advantages in terms of learning contents, learning time and learning environment as well as its disadvantages in terms of face-to-face interactions between instructor and learner in learning activities, especially in self-paced learning[1] [2] [15].

   One of the important points which makes the main difference between e-Learning and traditional learning form is the "*virtual*" learning environment, a place where direct communicative condition and interaction between participants is somehow limited. In on-line learning process, learners do not understand why the system issues these resources or learning services, and why they should not learn the others. Thus, learners are very easy to place themselves in isolation and lose their sense of direction in the immense domain space of learning resources and on-line "*classmates*". From that, the learners can have passive learning style and motivation derived on efforts by themselves (e.g. looking for necessary materials to self-study, and seeking group to join in), and these results may not be appropriate to their individual characteristics.

   According to Lee et al. (2004) [13], a large amount of e-Learning studies have concentrated to deal with two main objectives, (1) building on-line courses (e.g. structure of lesson, instructional design) for authoring and managing learning content, (2) providing utilities for learning activities (e.g. collaborative learning, evaluation and assessment). However, in almost early e-Learning systems, learners are often provided with identical services and learning materials, in the form of "*one size fits all*". That means all learners are the same, the systems do not discriminate the learner's backgrounds, learning goals and personal interests. In addition, we should mention the lack of pedagogical methodology and basic educational principles of learning resources [23].

   Recently, personalized systems, called adaptive systems, have been developed in many fields such as e-commerce, information retrieval [17] and e-Learning [6]. In the adaptive systems, every user possesses a component of user profile. It depends on applying field that contains different information to describe him or her (e.g. personal identification, preferences, and habits). Then, the system usually provides services or information appropriately to user. For instance, user profile is being studied to apply widely in the e-Learning systems, where the adaptation focuses on how to help learner to acquire knowledge, to take interest in the learning activities effectively and to suitably fit to learning demands. There are many different approaches to instruction systems using profile such as intelligent tutoring system – abbr. *ITS* [4] [16], adaptive hypermedia system – abbr. *AHS*, and adaptive educational hypermedia system - abbr. *AEHS* [5] [9].

   However, user profile in the ITS or AHS still keeps some limitations. For example, structure of profile including information about demographics, backgrounds, knowledge in an on-line course. In this way, the updating user profile is really "*rough*", and mainly happen at the begin or the end of course. The profile's features based on analysis of learning process have not interested in their exploiting properly (e.g. learning habit, learning style). In addition, such a system only supports adaptations to each individual learner's demand, while in e-Learning, clearly learning group (i.e. community problem in learning activities) plays an important role in activities of learners and it has not

already mentioned with respectability yet. Some recent research on community problem in e-Learning has appeared (where learner is considered as a member of group learning or community), but this research only aims at applying to share learning resources based on collaborative filtering technique simply as in recommender systems [7] [10] [22], and it has not still cared about interactions in community, that means, the system does not give any help to learner in activities such as forming group learning, or helping learner to choose suitable group. On the other hand, the system has not already provided necessary supports to two actors, instructor and educational administrator, who also need to monitor and keep track of learning progress deeply of their learners.

Taking in account the above analysis, we are interesting to study a framework of e-learning services based on learner's profile and communities. Our research aims at providing a tool to support effective on-line teaching and learning. We proposed a model using profile technique for e-Learning context. Simultaneously, a tool for experimentation is also being developed, with the name *UMeL* (i.e. User Modeling for e-Learning) and it is planned to be linked, for experimentation, to the distance training site of the HCMc University of Science (www.e-learning.vn/KHTN/Pages/Home.aspx)[i]. The project focuses on two important sides for instructional recommendations, one is interaction between learner and system (private adaptation), and another one is interaction between the learner's groups (community adaptation).

UMeL: a tool for adaptive e-Learning

In our recent works, we proposed a model [11] [12] for adaptive e-Learning based on user profile and collaborative ability of learner's groups, namely

◻ Choosing and exploiting learning resources (e.g. on-line lectures, textbooks, tutors, tools) suitably with user profile of each learner; and

◻ Organizing and managing the learner's communities, which is formed by different multi-criterion based on user profile to support collaborative learning [8] [18] [19] [20] [21].

As the theoretical foundation of this work, *UMeL* is a tool that supports for e-Learning system based on profile of user and group, including three main modules (*see in Figure 1*):
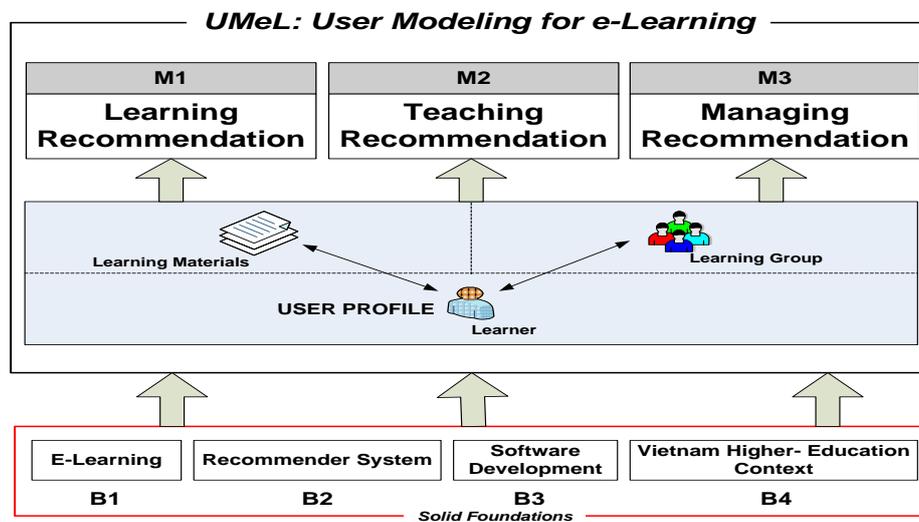

Figure 1: General Architecture of UMeL

◻ *M1.* Learning Recommendation: helping learner during all on-line learning process, for example, recommending to choose learning materials suitably, recommending learning style for a given course or an academic discipline, finding and joining learning group or discussing group;

◻ *M2.* Teaching Recommendation: supporting instructors to follow and monitor learning progress and learning situation of individual learner or group, from that instructors can improve teaching methodology, enhance quality of lectures, and specially give assistant guidance usefully to learners, for example, using the system log file that stored information of learner's activities to analysis and make recommendation; and

◻ *M3.* Managing Recommendation: helping educational managers or training bureau of faculty to monitor progress of training programs through the analysis of data based on profile of each learner or group, for example, exploiting the statistic table derived from information of log file.

Regarding data, *UMeL* uses two basic data-sources, learner's information (e.g. demographics, knowledge backgrounds, learning results), and information that is recorded the interactions between learner and system (e.g. log file) in learning process (*see in Figure 2*). At the same time, the tool will analysis and exploit to update user profile of each learner along with recommendations for learning materials, list of groups.

From the system point of view, three modules of *UMeL* are developed with key procedures: updating profile (*P1*), forming communities (*P2*), locating communities (*P3*), analyzing communities (*P4*), and choosing communities (*P5*), *see in Figure 2*. All of them are based on user profile and group profile that is considered as community's characteristics.

Regarding the organizational aspect, *UMeL* tends to an independent and flexible tool that is able to integrate with a given e-Learning system to reduce complexity in development, or build in a new e-Learning system. By meaning, the tool will be organized how to exploit through description of exchanged datum between e-Learning system and *UMeL* tool.
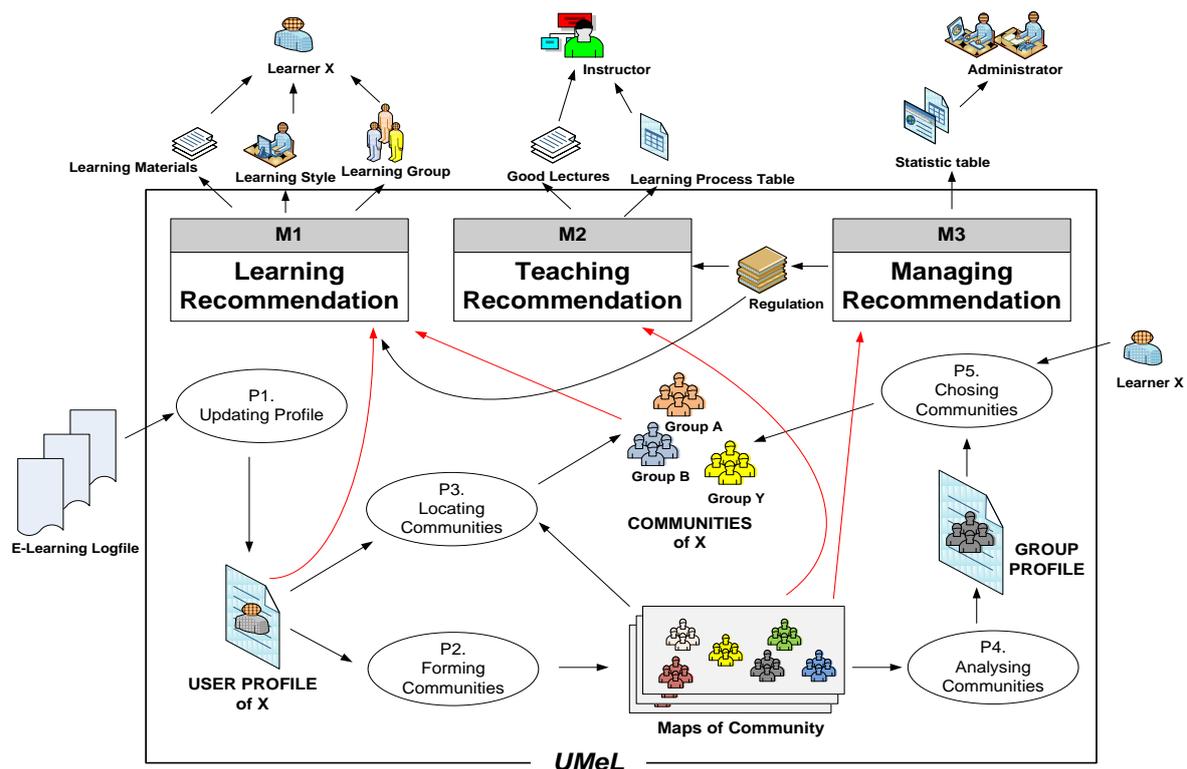

Figure 2: Main functions and related modules of UMeL

Conclusion

To sum up, the outstanding features of our work are mainly:

  ☐ Building user profile for e-Learning and applying in distance training program of Vietnam Higher Education context with the useful information, and especially basing on analysis of learning process to update user profile, and

  ☐ Focusing on two levels of adaptation in e-Learning system: (1) private adaptation (interaction between learner and system), and (2) community adaptation (collaborative activities between learners in a group learning or a community).

We are continuing to complete the proposed model of user profile and group profile, and then using both of them in *UMeL* tool with real-life datum from distance training program of HCMC University of Science.

References

[1] Allen, I. E. & Seaman, J. (2009) *Learning on Demand: Online Education in the United States*, BABSON Survey Research Group and SLOAN Consortium.

[2] Arabasz, P., Pirani, J., A., Fawcett, D. (2003) '*Supporting E-Learning in Higher Education'*. Research Study from the EDUCAUSE - Center for Applied Research, Vol.3 – http://educause.edu/ecar

[3] Bouzeghoub M., Calabretto S., Denos N., Kostadinov D., Nguyen A.-T., Peralta V. (2007) '*Accès personnalisé aux informations: Approche dirigée par la qualité*', 25e Congrès annuel de l'Informatique des Organisations et Systèmes d'Information et de Décision (INFORSID'07), Rennes, FRANCE.

[4] Brooks, C., Greer, J., Melis, E., Ullrich, C. (2006) '*Combining ITS and eLearning Technologies: Opportunities and Challeneges*', The 8th International Conference on Intelligent Tutoring Systems (ITS2006), Taiwan.

[5] Brusilovsky, P. (2007) *User Models for Adaptive Hypermedia and Adaptive Educational Systems*, Springer.

[6] Brusilovsky P., Millan E. (2007) '*User Models for Adaptive Hypermedia and Adaptive Educational Systems*', The Adaptive Web, Methods and Strategies of Web Personalization, LNCS 4321.

[7] Burke R. (2002) '*Hybrid recommender systems: Survey and experiments*', User Modeling and User Adapted Interaction, Vol. 12, 2002.

[8] Denos N., Berrut C., Gallardo-Lopez L., Nguyen A-T. (2004) '*COCoFil: Une plateforme de filtrage collaboratif orientée vers la communauté*', 1ère COnférence en Recherche d'Information et Applications (CORIA'04), Toulouse, FRANCE.

[9] Henze, N., Nejdl, W. (2003) '*Logically Characterizing Adaptive Educational Hypermedia Systems*', The International Workshop on Adaptive Hypermedia and Adaptive Web-based Systems (AH'03).

[10] Kiared S.-A., Razek M.-A., Frasson C. (2006) '*The Pyramid Collaborative Filtering Method: Toward an Efficient E-Course*', The Intelligent Tutoring Systems (IASTED'06), Puerto Vallarta, MEXICO.

[11] Le, D.-L, Nguyen, A.-T, Nguyen, D.-T, Hunger, A. (2008) *'Learner Profile supports interaction between objects in e-Learning System'*, Proceedings of the 7th European Conference on e-Learning (ECEL 2008), Ayia Napa, Cyprus.

[12] Le, D.-L, Nguyen, A.-T, Nguyen, D.-T, Hunger, A. (2009) '*Building learner profile in Adaptive e-Learning Systems*', Proceedings of the 4th International Conference on e-Learning (ICEL 2009), Torronto, Canada.

[13] Lee Y., Driscoll M.-P., Nelson D.-W. (2004), '*The Past, Present, and Future of Research in Distance Education: Results of a Content Analysis*', The American Journal of Distance Education, Vol. 18(4).

[14] Madhour H., Forte M.-W. (2006) '*Semantic learning and extended student model: Towards an AHAM-based Adaptive System*', The 5th IASTED International Conference on Web-based Education (IASTED'06), MEXICO.

[15] Morgan, G. (2003) '*Faculty use Course Management Systems*'. Research study from the EDUCAUSE - Center for Applied Research, Vol.2 – http://educause.edu/ecar

[16] Mödritscher, F., Garcia-Barrios, V.-M., Gütl, C. (2004) '*The Past, the Present and the future of adaptive E-Learning*', The International Conference Interactive Computer Aided Learning, (ICL2004).

[17] Montaner, M., López, B.,De La Rosa, J.-L. (2003) '*A Taxonomy of Recommender Agents on the Internet*', Artificial Intelligence Review Vol. 19, Kluwer Publishers.

[18] Nguyen A.-T., Denos N., Berrut C. (2007a) '*Improving New User Recommendations with Rule-based Induction on Cold User Data*', The ACM Conference on Recommender Systems 2007 (RecSys 2007), USA.

[19] Nguyen A.-T., Denos N., Berrut C. (2007b), '*Modèle des espaces de communautés orienté vers la diversité de recommandations pour les systèmes de filtrage*', Journal in Information Engineering Sciences: Information – Interaction – Intelligence (I3).

[20] Nguyen A.-T., Denos N., Berrut C., Dong Thi B.-T. (2006) '*Modèle de formation multiple de communautés dans un système de recommandations hybride*', The 4th IEEE International Conference in Computer Science (RIVF'06), HCMC, VIETNAM.

[21] Nguyen A.-T., Denos N., Berrut C. (2005) '*Cartes de communautés pour l'adaptation interactive de profils dans un système de filtrage d'information*', 23e Congrès annuel de l'Informatique des Organisations et Systèmes d'Information et de Décision (INFORSID'05), Grenoble, FRANCE.

[22] Pintwart N., Aleven V., Ashley K., Lynch C. (2006) '*Using Collaborative Filtering in an Intelligent Tutoring System for Legal Argumentation*', Workshops held at the 4th International Conference on Adaptive Hypermedia and Adaptive Web-Based Systems, IRELAND.

[23] Schroeder, U. and Spanagel, C. (2006) '*Supporting the Active Learning Process*', International JI on E-learning, Vol 5(2), pp. 245-264.

[24] Stephen W. et al. (2006) '*Observations on undergraduate education in computer science, electrical engineering, and physics at select universities in Vietnam*'. In: A Report Presented to the Vietnam Education Foundation by the Site Visit Teams of the National Academies of the United States.