User Modeling for Facilitating Learning on the Web

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Personalized text enrichment with the potential to improve access to an information is an easy way to obtain new knowledge. Text enrichment is the process covering analysis of the text, enrichment of the text based on user's knowledge and finally obtaining feedback about the appropriateness of text enrichment. Everyday web browsing is the normal routine of each of us and through experiences that users have, it can be used as an effective way to support learning, especially e-learning.

History of e-learning begins in 1800 under the name distance learning in process of teaching villagers which have no opportunity to go to school. The evolution of technologies and especially information technologies pushed the envelope of distance learning to form of e-learning and web learning as we know it now. Web learning brings a lot of new opportunities how to enhance learning, but also we have to realize that there are many problems with adaptation of learners and teachers to new trends. The main advantage is asynchronous learning that allows learner to learn anytime and anywhere and also teacher to teach in the same way. But that brings also disadvantages. For example complicated scheduling of learners life because variable learning time can replace user free time, that is so important. Also chance to cheating is higher than in a classroom teaching. According to mentioned pros and cons the web learning is suitable for working people or higher educating future professionals [1].

In many cases, web learning is supported with adaptive learning system. Adaptive learning system needs knowledge about user like skills, characteristics, preferences and so on. The best way how to store this knowledge is usage of user model. We have options like individual or stereotype user model, we can visualize model like vector, network, key-set or ontology [2]. Human brain and its ability to forget is often not considered factor in user modeling. In [3] user model is split to hierarchical structure of three models. Active model contains active knowledge about user. Archive model contains knowledge which user don't use for long time. Time decay of information moves information from higher level of hierarchical model to lower. The last level of hierarchical user model is deleted model. Knowledge in the last model is used for statistics and aggregation of user knowledge. The best way to support users in handling

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forgetting is to employ user model scrutability which allows to user control own model. It also increases user confidence to web learning mechanism.

User skills, personal characteristics or preferences can be captured from obtained feedback from user web browsing behavior. We have options how to capture user browsing behavior like web browser extension, where we can detect tab usages, search on the page, usage of bookmarks and so on. Next options are proxy-based methods, injecting JavaScript to every visited webpage. The last option is to implement method in the dedicated adaptive web system. We can diversify feedback to implicit and explicit based on user action and internal and external based on source of information. Implicit feedback consists of every user action during web browsing like clicking, scrolling, copy&paste, searching on page and especially time spent on the page. Explicit feedback is requested from user in form of questions. Explicit feedback helps to assure correctness of information gained by implicit feedback. On the other hand difference between external and internal feedback is in a source of information of feedback. Internal feedback emerges in user cognitive processes after completion of learning task. External feedback comes from another external teaching medium which evaluates user performance and progress in learning process after completion of learning task[4].

Our aim is to gain a feedback from every possible action of the web browsing, transform this feedback to the knowledge about the user, store the knowledge to user model and finally enrich a text of the user's web page according to the knowledge of user goals calculated from the user model. We try to consider the user forgetting with support of user model scrutability and we try to enhance user motivation to learn and work with facilities of our proposed method. Analysis of domains of user modeling in adaptive e-learning web systems, behavior tracking on the web and facilitating learning on the web poses many challenges to solve.

References

[1] Lisa Neal and Diane Miller. 2005. The basics of e-learning: an excerpt from handbook of human factors in web design. *eLearn* 2005, 8 (August 2005), 2-.

[2] Brusilovsky, P., Anderson, J. (1998). ACT-R electronic bookshelf: An adaptive system for learning cognitive psychology on the Web. In: Maurer, H., Olson, R.G. (eds.) Proc. of WebNet'98, World Conference of the WWW, Internet, and Intranet. AACE. pp. 92-97.

[3] Debjanee Barua, Judy Kay, Bob Kummerfeld, and Cecile Paris. 2011. Theoretical foundations for user-controlled forgetting in scrutable long term user models. In Proceedings of the 23rd Australian Computer-Human Interaction Conference (OzCHI '11). ACM, New York, NY, USA, 40-49.

[4] Narciss, S. (2008). Feedback strategies for interactive learning tasks. In J. M. Spector, M. D. Merrill, J. van Merriënboer & D. M. Driscoll (ed.), Handbook of research on educational communications and technology (pp. 125-144). Routledge.