Adaptive Caching and Presentation Mechanism to Enhance M-Learning Market

Jason C. Hung, Kuo-Feng Hwang, and Neil Y. Yen*

Department of Information Management
Overseas Chinese University
No:100, Chiao Kwang Rd., Taichung 407, Taiwan, R.O.C.
{jhung, kfhwang}@ocit.edu.tw

Department of Computer Science and Information Engineering
Tamkang University
Tamsui, Taipei Hsien, Taiwan 251, R.O.C.
nei1219@gmail.com

Received 30 May 2009; Revised 30 June 2009; Accepted 8 July 2009

Abstract. Many innovative learning systems and activities have also been proposed to promote e-learning, as well as exploited the ways of e-learning. Although the variety of mobile platforms provide more flexible and extendable learning experience, the various hardware conditions and restrictions consequently becomes the challenges and barriers we need to overcome. To enhance the mobility in e-learning market, we propose an adaptive caching and presentation mechanism to meet the need. In our mechanism, we utilize the benefits from the use of SCORM (Sharable Content Object Reference Model) to deal with the problem could happen in content extraction. Besides, we also take the multimedia resources into consideration and utilize the non-synchronous caching algorithm to solve the streaming problems. The mechanism we proposed will promote the application of ubiquitous devices in e-learning market.

Keywords: M-Learning, caching, adaptive presentation, content prefetch, SCORM

References

- [1] O. Buyukkokten, H. Garcia-Molina, A. Paepcke, "Accordion Summarization for End-game Browsing on PDAs and Cellular Phones," *The SIGCHI Conference on Human Factors in Computing Systems*, pp. 213–220, 2001.
- [2] H. P. Chang, C. C. Wang, K. H. Jan, T. K. Shih, "SCORM Sequencing Testing for Sequencing Control Mode," in *Proceedings of the 20th Advanced Information Networking and Applications Conference (AINA)*, pp. 164-169, 2006.
- [3] H. P. Chang, W. C. Chang, Y. L. Sie, N. H. Lin, C. H. Huang, T. K. Shih, Q. Jin, "Ubiquitous Learning on Pocket SCORM," *The Second International Symposium on Ubiquitous Intelligence and Smart Worlds(UISW)*, pp. 85-89, 2005.
- [4] Y. Chen, W. Y. Ma, H.J. Zhang, "Detecting Web Page Structure for Adaptive Viewing on Small form Factor Devices," in *Proceedings of the 12th International Conference on World Wide Web*, pp. 225-233, 2003.
- [5] G. Buchanan, S. Farrant, M. Jones, H. Thimbleby, G. Marsden, and M. J. Pazzani, "Improving Mobile Internet Usability," in *Proceedings of the 10th International Conference on World Wide Web*, pp. 673-680, 2001.
- [6] R. Han, P. Bhagwat, R. LaMaire, T. Mummert, V. Perret, J. Rubas, "Dynamic Adaptation in An Image Transcoding Proxy for Mobile Web Browsing," in *Proceedings of the IEEE Personal Communications*, pp. 8-17, 1998.
- [7] L. Kärkkäinen and J. Laarni, "Designing for Small Display Screens," in *Proceedings of the 2rd Nordic Conference on Human-computer Interaction*, pp. 227-230, 2002.

.

^{*} Correspondence Author

- [8] E. Kaasinen (2000), "Two Approaches to Bringing Internet Services to WAP Devices," in *Proceedings of the 9th International Conference on World Wide Web*, pp. 231-246, 2000.
- [9] S. A. Kazi, "A Conceptual Framework for Web-based Intelligent Learning Environments Using SCORM-2004," in *Proceedings of the IEEE International Conference on Advanced Learning Technologies*, pp. 12-15, 2004.
- [10] R. H. Katz, "Adaptation and Mobility in Wireless Information Systems," in *Proceedings of the IEEE Personal Communications*, pp. 6–17, 1994.
- [11] T. Kindberg and A. Fox, "System Software for Ubiquitous Computing," The IEEE Pervasive Computing, 2002.
- [12] L. Ramaswamy, A. Iyengar, L. Liu, F. Douglis, "Automatic Detection of Fragments in Dynamically Generated Web Pages," in *Proceedings of the 13th International Conference on World Wide Web*, pp. 443–454, 2004.
- [13] S. T. Li and C. H. Lin, "On the Distributed Management of SCORM –Compliant Course Contents," in *Proceedings of the 19th International Conference on Advanced Information Networking and Applications*, pp. 221-226, 2005.
- [14] N. H. Lin, T. K. Shih, H. H. Hsu, H. P. Chang, H. B. Chang, W. C. Ko, L. J. Lin, "Pocket SCORM," in *Proceedings of the 24th International Conference on Distributed Computing Systems*, pp. 274-279, 2004.
- [15] I. Mohomed, J. C. Cai, S. Chavoshi, E. de. Lara, "Applications: Context-Aware Interactive Content Adaptation," *International Conference on Mobile Systems, Applications and Services MobiSys*, pp. 42 55, 2006.
- [16] J. Malek, M. Laroussi, A. Derycke, "A Multi-Layer Ubiquitous Middleware for Bijective Adaptation between Context and Activity in a Mobile and Collaborative learning," in *Proceedings of the International Conference on Systems and Networks Communication*, pp. 36 39, 2006.
- [17] D. Narayanan, J. Flinn, M. Satyanarayanan, "Using History to Improve Mobile Application Adaptation," in *Proceedings of the 3th IEEE Workshop on Mobile Computing Systems and Applications*, 2000.
- [18] B. Orkut, K. Oliver, G. M. Hector, P. Andreas W. Terry, "Efficient Web Browsing on Handheld Devices Using Page and Form Summarization," *Journal of ACM Transactions on Information Systems*, 20(1), pp. 82-115, 2002.
- [19] D. Su and K. Seong, "Usability Guidelines for Designing Mobile Learning Portals," in *Proceedings of the 3rd International Conference on Mobile Technology*, *Applications & Systems*, 2006
- [20] A. Syvanen, R. Beale, M. Sharples, M. Ahonen, P. Lonsdale, "Supporting Pervasive Learning Environments: Adaptability and Context Awareness in Mobile Learning," in *Proceedings of the IEEE International Workshop on Wireless and Mobile Technologies in Education*, pp. 28-30, 2005.
- [21] J. Su, S. Tseng, J. Weng, K. Chen, Y. Liu, Y. Tsai, "An Object Based Authoring Tool for Creating SCORM Compliant Course," *The 19th International Conference on Advanced Information Networking and Applications*, pp. 209-214, 2005.
- [22] T. K.Shih, W. C. Chang, N. H. Lin, L. H. Lin, H. H. Hsu, C. T. Hsieh, "Using SOAP and .NET Web Service to build SCORM RTE and LMS," in *Proceedings of the 7th International Conference on Advanced Information Networking and Applications*, pp.408-413, 2003.
- [23] Y. Hwang, J. Kim, E. Seo, "Structure-Aware Web Transcoding for Mobile Devices," in *Proceedings of the IEEE Inter*net computing, pp. 14 – 21, 2003
- [24] T. H. Tan and T. Y. Liu, "The Mobile-based Interactive Learning Environment (MOBILE) and A Case Study for Assisting Elementary School English Learning," in *Proceedings of IEEE International Conference on Advanced Learning Technologies*, 530-534, 2004.
- [25] Y. K. Wang, "Context Awareness and Adaptation in Mobile Learning," in *Proceedings of the 2nd IEEE International Workshop on Wireless and Mobile Technologies in Education*, pp. 154-158, 2004.

- [26] J.T. D. Yang, C. H.Chiu, C. Y. Tsai, T. H. Wu, "Visualized Online Simple Sequencing Authoring Tool for SCORM-Compliant Content Package," in *Proceedings of the IEEE international Conference on Advanced Learning Technologies*, pp. 609-613, 2004.
- [27] G.Zhao and Z. Yang, "Learning Resource Adaptation and Delivery Framework for Mobile Learning," in *Proceedings of the 35th Annual Conference on Frontiers in Education*, F1H-18 F1H-24, 2005.
- [28] Y. Zhou, J. Tang, J. Wang, "An Improved TFIDF Feature Selection Algorithm Based On Information Entropy," in *Proceedings of the Control Conference*, pp. 312-315, 2007.