博士学位論文 審査結果の要旨

芝浦工業大学大学院 理工学研究科 博士（後期）課程

博士学位論文審査委員会

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論文題目	Adaptive e-Learning Multimedia Content Personalization Approach Based on Learner's Cognitive Processes - Real-time Bioinformatics based Adaptive Educational Hypermedia System-

〔論文審査の要旨〕

This dissertation focuses on proposing e-learning conceptual model (framework) for multimedia content personalization and developing a prototype of an adaptive e-learning system platform that can assist learners in accessing and using e-learning resources which are adapted based on learner's cognitive processes including metacognitive styles (MCS), learning styles (LS) and knowledge levels. Most commonly known challenge for the adaptive learning systems is to attain the design and delivery of timely interactive learning content that suits individual learner's skills, abilities and motives. Adaptative educational hypermedia systems (AEHS) have also attempted to address this challenge by incorporating several functions that handle adaptation process at different levels including content level adaptation, sequential level adaptation and link level adaptation such as multiple levels navigation supports approaches.

Even though multiple levels navigation supports approaches give AEHS' hyperspace and page indexing ability to provide learners with interactive adaptive learning environment. However, AEHS navigation supports impose time, misconception and work overload on learners (system users) due to failure of obtaining timely and accurate information for AEHS adaptive decision-making process. Therefore, in this study bioinformatic-based approach has been introduced to enable AEHS to dynamically integrate e-learning multimedia learning objects (LOs) with learners' metacognitive styles (MCS), knowledge levels as well as learning styles (LS) on real-time basis.

The dissertation also provides empirical evaluation of the proposed approach through several case-controlled study experiments conducted across different domains including cognitive computing, Brain Computer Interfaces (BCI), multimedia-communication and educational technology at large. Several factors including study hypotheses, learners' knowledge levels profiles, age, gender and diversity were taken into consideration. The conducted research has clearly demonstrated how to make AEHS' hyperspace and page indexing more adaptive towards spontaneous changing of the learners' learning styles and cognitive processes on real-time basis. The research findings show that timely sequential integration of the learning LOs with learners' metacognitive styles (MCS) and LS does not only improve AEHS adaptive decision-making process but also result into a better learning efficacy. Also, the proposed Bioinformatics-based approach does not only improve e-learning platforms but also ignites learners' cognition, metacognitive skills and interactivity.