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Study of Personalized E-Learning System Based on Knowledge Structural Graph

Xiangli Huang[a], a*

College of Information Engineering, Tianjin University of Commerce, Tianjin, 300400, China

Abstract

It is necessary for different learners demand for personalized learning contents in e-leaning environment. In this paper, the personalized learning system was constructed based on personalized knowledge structural graph (KSG) by the artificial intelligence, the data mining and the database technology. The system can dynamically assess the learning process to come out personalized KSG based on different learners. The optimal learning path (OLP) generator was designed and implemented based on personalized KSG through the topological sort algorithm, in order to provide learners personalized learning content and teaching methods. In addition, the system can also dig for the learning history data and gain the knowledge to improve personalized service decision-making rules and student model of the system. The experiments show that it greatly increases the efficiency of e-learning.

Keywords: knowledge structural graph (KSG); optimal learning path (OLP); personalized e-learning

1. Introduction

In the online learning environment based on network and computer technology, autonomous learning for many students is main learning mode. Students' learning process in network shown alone, helpless and facing mass network learning resources has been overwhelming situation of computer, network and education etc researchers paid more attention to. And according to the students' learning goals and

*Xiangli Huang. Tel.: (022)26667577.
E-mail address: huang_xiangli@yahoo.com.cn.

knowledge level, the curriculum repository from huge extract different learning content, as the goal of building an effective learning crowd, realize the guiding model for autonomous learning mode "teachers' scientific guidance" in recent years, has become e-learning the researchers focused research topic. For above problems, the personalized learning system was constructed based on personalized KSG by the artificial intelligence, the data mining and the database technology. The system can dynamically assess the learning process to come out personalized KSG based on different learners. The OLP generator was designed and implemented based on personalized KSG through the topological sort algorithm, in order to provide learners personalized learning content and teaching methods. In addition, the system can also dig for the learning history data and gain the knowledge to improve personalized service decision-making rules and student model. The experiments show that it greatly increases the efficiency of e-learning.

2. System Structure

The design target of the system is that the students' model and the personalized decision rules should be updated at any time by the tracking students' learning status. According to the knowledge that the students have got and the personalized decision rules, the personalized teaching contents have been generated dynamically. Fig. 1 shows the system structure.

The working process of the system is that: Firstly, the students hand in the basic information by the registry services, and the static information are input in the students' information base. When the student login in, controller can get identifications of the student and his course taken. By identifications got, matching the knowledge that the student had got with KSG of the course so as to construct the student' KSG. Then it should be sent to the OLP Generator, which produces OLP by KSG of the student and choice the suitable teaching method to guide in the instructional strategy base. At the time of following the OLP, the student also can use the learning tools, exercising tools, answering tools, communicating tools and text tools to assist himself achieve the every task which are contain in the OLP. When the act is going, controller tracks, collects and stores the information of study performance. For increasing historical data in the students' information base, the data mining module can be called. And using the knowledge acquired from the excavation to improve personalized service and the student model. Such as revising and consummating teaching method and knowledge structure of course.

3. Design of Main Functional Modules

This paper focuses on designing the representation of the course knowledge structure, the establishment and modulation of personalized KSG and the generation of the OLP.

3.1. Knowledge structure of courses

We will divide the course knowledge into three levels: unit layer, conceptual layer and the physical layer. The knowledge of unit layer is defined for teaching unit(TP), gathering together knowledge of a chapter; The knowledge of conceptual layer is the abstraction of teaching knowledge, called knowledge points(KP); The knowledge of the physical layer is the description in detail of conceptual layers, called pages(P). As fig. 2 shows.

(1) Composition of knowledge points

In order to automatically increase and delete knowledge points, we use an existence degree to present an important degree of the knowledge point. In personalized learning system it is required that the knowledge point can describe the information such as the difficulty and threshold, so we expressed each knowledge point as a seven part group: (I, A, ED, LA, AA, LT, SC), where: