Building Intelligent E-Learning Systems by Activity Monitoring and Analysis

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Abstract. E-Learning area has been intensively developed in recent years. One of the important research areas is related to improving e-Learning activity by giving the intelligent character to this activity besides core functionalities that is implemented in all e-Learning platforms.

This paper presents a method of providing intelligent character to an e-Learning platform by running a platform-side software module. The main goal of the module is to characterize learners according with performed activities and to offer advice regarding the resources that need to be accessed in order to increase the knowledge level of studied discipline. Acquiring this goal is accomplished by employing machine learning algorithms within platform-side software module. After learners are clustered based on performed activities, based on learner’s activity parameters and parameters of target cluster there are obtained the resources which need more study. This approach is feasible due to the fact that the discipline is divided into chapters and each chapter has an associated concept map.

Keywords: E-Learning, activity monitoring and analysis, intelligent systems.

1 Introduction

There was designed and developed an e-Learning platform called Tesys (Burdescu, Mihăescu, 2006). This platform has implemented facilities for following type of users: system administrators, secretaries, professors and students. Some activities implemented for students, like downloading course materials or taking tests or exams are sometimes very heavy regarding the computational load of the server and the data traffic transfer to and from the user.

This paper presents the structure and functionality of an Expertise Module (EM) represented by a platform-side software module that runs along the Tesys e-Learning platform. The main purpose the EM is to provide the intelligent character for the educational network implemented by Tesys. The functionality of the EM module is presented in Figure 1.

As presented in Figure 1 the input of EM is represented by data traffic data. The data are obtained by a custom implemented logging mechanism embedded within the platform’s business logic. The platform is represented by the setup put in place in order to perform all necessary activities within the e-Learning process. The setup...
Fig. 1. General structure of intelligent e-Learning System

consists of course materials, test and exam quizzes that are set up by course managers and the overall setup performed by secretaries.

The Tesys e-Learning platform represents a collaborative environment in which all involved parties (e.g. secretaries, professors, students and administrators) accomplish their duties. The administrator, with the help of secretaries and professors are responsible for managing the environment in which the students will be throughout the e-Learning process. The platform has built in capability of monitoring and recording user’s activity. The activity represents valuable data since it is the raw data for the machine learning and modeling process. The activity of each learner is seen as a sequence of sessions. A session starts when the student logs in and finishes when the student logs out. Under these circumstances, a sequence of actions makes up a session.

User’s activity is monitored and recoded through a dedicated module implemented within the business logic of the platform. This facility was taken into consideration since the design phase of the platform. It was one of the requirements that the platform to be able to record user’s performed actions with fine granularity.

The paper presents a platform-side software module that selects the resource(s) that need further attention of learner. Guiding the learning may have important benefits regarding the improvement of self-assessment effectiveness. The scope of the recommender system is making the learner obtain the maximum knowledge from the self-assessment activity. This is accomplished by the classifier according with all previous learners’ performed activity. The activity is represented by the number of answers to questions regarding that concept, the average result of answered questions and the final result at the discipline. Each filtered resource is to be recommended or not. There will be defined the values each feature may have.

Following the structure of the discipline (chapters, concepts, and concepts maps) the professor creates a set of quizzes that may be accessed by the learner. Self-assessment activity is represented by taking a certain number of on-line quizzes. The scope of the recommender system is to guide the student to the resource he/she needs to access in order to make learning progress to be an effective one. The objective measure of accumulated knowledge is obtained from self-assessment activity. We think that this activity must be coordinated along with other learning activities. This coordination represents the means by which the recommender system makes the self-assessment as effective as possible.

The whole process is represented by an analysis procedure that has as input data representing the performed activities by learners. As learning algorithm it was employed Naive Bayes classifier (Mitchell, 1997). The classifier will predict the resources that the learner needs to access and study for improving his proficiency regarding the studied subject.