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Data mining and text mining technologies for collaborative learning in an ILMS “*Samurai*”

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Abstract

*Recently, “collaborative learning” using internet has become popular in educational technology societies. One of unique advantages of the collaborative learning using internet is that much amount of learning process data concerned with their discussions can be stored. However, there are few studies about how to analyze the data and how to efficiently utilize it. It is an urgent task to consider how to utilize efficiently this much data concerned with collaborative learning. This paper introduces some new Data mining technologies and text mining technologies for collaborative learning through a ILMS (Intelligent Learning Management System) “*Samurai*” which the author has developed.*

1. Introduction

Recently, distance education using e-Learning has become popular in actual educational situations. One of the advantages of the e-learning is that it is easy to get huge learning histories data which has been saved as log data in the e-Learning. In this case, it is important how we store this data or how we utilize this data [1]. Nevertheless it is one of the most important tasks for e-learning researches, there are still few studies in the area.

The unique functions of data or text mining in e-learning are summarized as follows:

- Summarization of learners’ knowledge states
- Summarization of learners’ learning processes
- Summarization of learners’ discussion processes
- Prediction of Learner’s knowledge states in future
- Detection of the learners who need teacher’s help
- Analyses of e-learning contents
- Analysis of each learner’s characteristics in discussion

Above these functions are expected to provide the following advantages in learning:

[1]Teacher can know the students’ learning processes and their knowledge states in order to give some effective educational introductions to the learners.

[2]Teachers can analyze their contents in order to improve the contents.

[3]Teachers can grasp the content of learners discussion overall.

[3]Learners can assess their own knowledge states by themselves to reflect their learning ways.

[4]Learners can assess their own learning process by themselves.

[5]Learners can assess their own characteristics of discussion to reflect their discussion.

[6]Learners can assess the degree of support for their own opinions in the discussion board and they can be motivated to participate in the discussion.

The author has developed new data-mining methods for huge e-learning historical log data and an Intelligent Learning Management System (ILMS) “*Samurai*” with the data-mining functions for e-learning log-data (see, for example, [1] and so on). This paper focus on the mining technologies for collaborative learning and introduces the ILMS and demonstrates the functions and the performances of the system.

2. ILMS “*Samurai*”

The author has developed an ILMS, which is called “*Samurai*”, as shown in Figure 1. Here, I will introduce some data mining technologies and some text mining technologies for collaborative learning in the ILMS “*Samurai*”. The mining functions in “*Samurai*” are summarized as the following.

1. Detection of learners who have irregular learning processes in e-learning [2]
2. On-line contents analysis for e-learning [3]

- Analyses of learners' historical learning log data using Decision Tree [4]
- Analyses of learners' historical learning log data using Belief networks [5],[6]
- Some Markov analyses of learners' discussion process data in discussion board [4]
- Entropy based analyses in discussion board [4]
- Text mining for discussion board using an expanded Correspondence Analysis [4]

3. Data/text mining technologies for collaborative learning

This paper focuses on data/text mining technologies for collaborative learning. The learners have to select the relevant category which represents his or her comment in the discussion board shown in Figure 1.

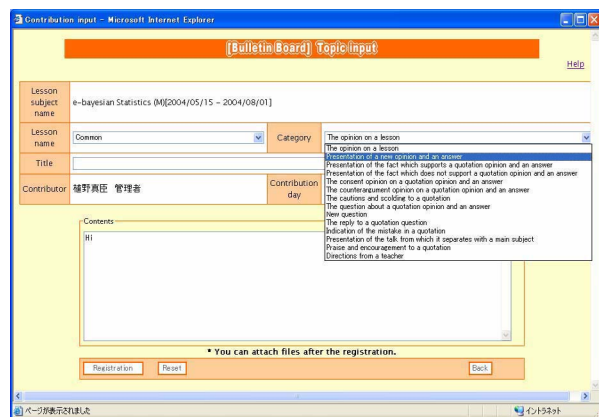


Figure 1. Categories list in the discussion board



Figure 2. Discussion board with evaluations between peers

Furthermore, “Samurai” provides evaluations for learners' comments between peers shown in Figure 2. And it also provides the following three indexes about influence which the learner's comment in the discussion board has.

- Influence : The total number of the comments which receive influence by the target comment.
- Topic Power : The maximum length of chain of the replies to the target comment.
- Progress Power : The total number of comments which provides the target comment.

The data obtained from this discussion board can be applied to the following mining techniques.

- Markov analyses
- Association rules analysis
- Belief network analysis
- Entropy based analyses
- expanded Correspondence Analysis

The applications will be demonstrated in the day.

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