

Recommender System for E-Learning

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Abstract— E-learning refers the learning process in online and describes educational technology that electronically or technologically supports learning and teaching. The aim of E-learning is to select the useful piece of material which the learner actually requires to study. With the facility to connect people and information around the world, the Internet is now having a major impact on the traditional education. To support these different learning needs, the proposed work satisfies different e-learning delivery methods and implements a way to develop and manage e-learning. Recommender system improves the learning methodologies and implements collaborative filtering approach. This paper focuses collaborative recommender system that uses distributed systems in order to continuously improve e-learning courses to test the tool with several groups of external instructors and experts in order to test the usability of the tool with external users.

Keywords— Recommender System, E-learning, Collaborative Filtering.

I. INTRODUCTION

E-learning is the online-learning system contains various types of media that deliver audio, text, image, animations, and streaming video. E-learning is suited for flexible learning in various distances. It is also implemented by face-to-face user interaction via online. The feedback is collected from the user in this method. [9]

E-learning mainly supports online-Education. E-learning creates the virtual classroom to the user. The advantage of E-learning is to improve access to education opportunities allowed students or other people who interest to share their information in online. This information may transfer to various users who need to share the information. The problem of E-learning is online content or information depthness. Sometimes information may not be useful to the students [5].

Recommender system helps to improve the quality of E-learning and the originality of the information contained in online. Recommender system gives the additional information or supportive information to the E-learning system and act as prominent tool to recommend the best suited and useful piece of learning material for the learner. This system produces individualized recommendations to the user and online information developers in a personalized way to interesting or useful objects. This System compares the user's profiles to some reference

characteristics and accepts to predict the 'rating' that a user would give to information they had not yet considered.[1].

Collaborative filtering approach is the recommender system technique that makes an automatic filtering process about in the E-learning system. The filter approach communicates author and the learner interests. This paper implements the collaborative filtering approach in rule based algorithm approach based on user's feedback about the material. The following architecture implements collaborative filtering approach.

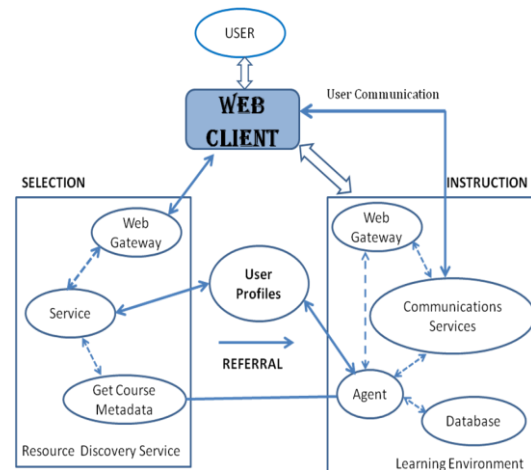


Fig .1 Web Recommender System

In Fig.1 Author updates his course material through web gateway and then user reads these materials or learn these materials. Recommender system take the comment or feedback from the user and form strong rules about the course materials and implements these rules to all the course materials.

II. RELATED WORK

The main problem of e-learning methodology is delivery of learning system and the evaluation of quality of the e-learning materials. The improvement of this process has a variety of learning methodologies and techniques. Recommender system has a variety of approaches and implements rule mining algorithms.

In the recommender system, personalized approach gives online automatic recommendations for active learners without requiring their explicit feedback. There are two modules: an off-line module that pre processes data to build learner and content models, and online module, recognize the student

needs and goals via online and predict a recommendation list [4].

The framework applies personalized learning recommender system, which helps to improve quality of learning materials and the learner easily understand that materials. Relevant methodologies in the framework is a multi-attribute evaluation method to justify a student's requirement, and another one is a fuzzy matching method to find suitable learning materials to each student need [5].

Web recommender system is also a sub part of recommender systems. This system consists of three phases: (i) data preprocessing, (ii) pattern discovering and (iii) pattern analysis. Server log files became a set of raw data where it must go through with all the web recommender system phases to produce the final results. Association rule mining and Apriori algorithm [11] optimize the content of the E-application portal.

III. PROPOSED SYSTEM

The proposed work is designed to have four main components 'getting student information', 'identifying student requirement', 'learning material matching analysis' and 'generating recommendation' respectively. The four components are connected with a user interface, a student database, a learning material tree database, and supported by a student requirement model and matching rules. The system starts getting student information and storing it into student database in component 1, student requirements across learning materials are analysed in component 2. Student requirement analysis model is used in analysing and identifying student requirements.

Information about student requirement can essentially be obtained in two ways: extensionally and intentionally expressed. By intentionally expressed information, we mean some specifications by a student of what he/she specifically desires from the type under consideration, such as a title of a learning material. By extensionally expressed information we mean some information based on the actions of the student with respect to specific learning material, such as a list of learning materials the student accessed before. Two key issues dealt with in the work are how to accurately identify a student's requirement which is handled by a student requirement analysis model, and how to accurately find out the learning materials which match the student's requirements, handled by matching rules.

Recent studies have suggested web usage mining as an enabler to reduce the need for registration-based personal preferences. E-learning data contains a wealth of detail compared to off-line learning data. One important kind of data is click-stream which indicates the path of a visitor through a web site. Click-stream in an e-learning site provides information essential to understanding learning behaviour of students, such as what materials they see and what materials they may interest.

The proposed work implemented an association rule mining algorithm applied to education, which is based on the following algorithms: 1) Predictive Apriori for association rule discovery without parameters; and 2) Interestingness Analysis System for subjective analysis and classification of unexpected rules by comparing them with a previously defined knowledge database about the field. The algorithm also includes the new Weight-based interestingness measure discussed previously to recommend to the teacher any rules that: a) other teachers with a similar profile have found useful; or b) a team of validating experts has voted for in terms of validity or interest.

The client and server application make up the recommender system based on Knowledge Based System and Collaborative Filtering System, where recommendations for improvements to the course are made on the basis of the knowledge databases created and managed in the server according to the different teacher profiles. Additionally, collaborative filtering is used as a complementary approach, which will filter and organize the priority of recommendations depending on the votes registered by experts and teachers with a similar profile. The experts explicitly vote for tuples by indicating different degrees of preference on a form in the web application; to avoid the main problems of Collaborative Filtering System, the experts or teachers vote implicitly.

IV. EXPERIMENTAL RESULTS

The proposed work has been implemented in a real time system that is a web application loaded in web server and connected to the database. Sample material for children alphabets book is preloaded and the material author uses the recommender system. The overall score is 85 (out of 100). Number of users downloaded or viewed the author's content is 10.

USING RECOMMENDER SYSTEM

This data set is trained because various number of users give their score values for each material. In the score values we can take the random 10 values for that subject and that value is given for the analysis phase. Figure 2, shows the efficiency of the students using multiple lessons in the subject. Standard Deviation has calculated using the given formula

$$\sigma = \sqrt{\frac{1}{N} \sum_{i=1}^N (x_i - \mu)^2}$$

In this equation

σ --- Standard deviation

N --- Number of users

μ --- standard mean value

x --- each user's score value deviation from the author's original score value.

From the scores Standard deviation is $\sigma = 41.12$. So the standard deviation increases from the author's score in positive range. So that efficiency level is 41.12

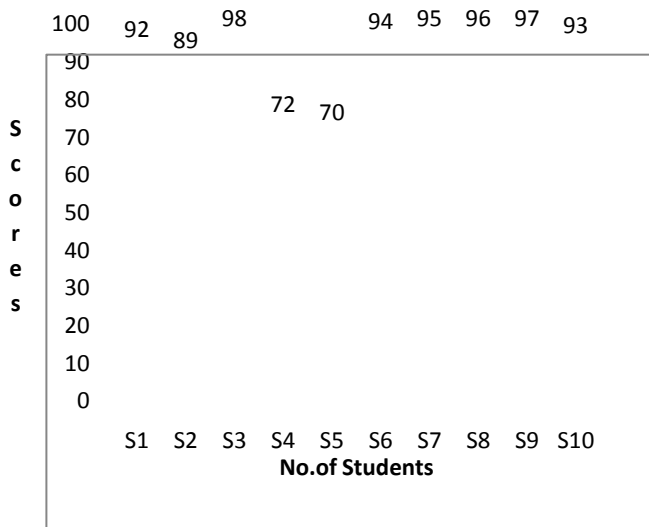


Fig. 2 Student's Efficiency Level using Recommender System

In Fig. 2, Student S3 scores the highest value 98 out of 100. This score is taken from that student score level and the rule mining algorithm implementation. The student gives the feedback in the form of questionnaires. For example, the question 'what is the difficulty level satisfies in this subject?'. It follows the answer "medium" (out of "low(25)", "medium(50)", and "high(75)"). So the system concludes the difficulty level of the subject is 50. Each level of score will be concluded from the questionnaires in this system. This is the system implementation how the student achieves that score.

WITHOUT RECOMMENDER SYSTEM

The following has the same author value without implementing the recommender system. The overall score is 82 (out of 100). Number of users downloaded or viewed the author's content is 10. The following dataset implements the score of each user. From the Scores Standard deviation is $\sigma = 12.23$. So the standard deviation increases from the author's score in positive range. So that efficiency level is 22.23.

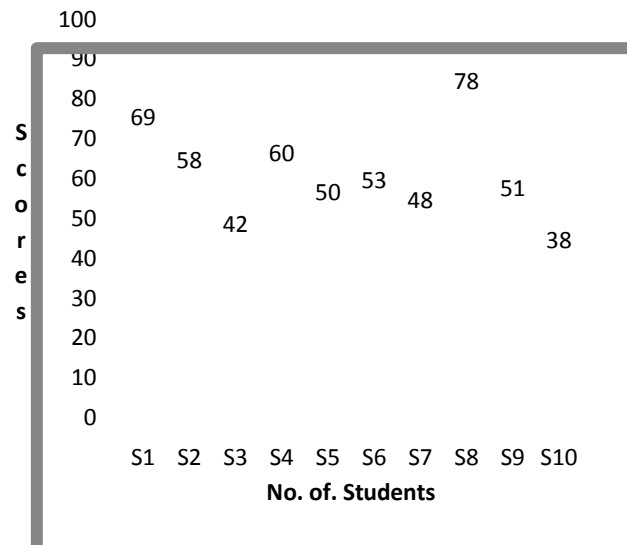


Fig 3. Student's Efficiency Level without using recommender system

In the Fig. 3, user's score is collected from simple user feedback without recommended system. For example, Student S5 gives the score 50 collected from simple feedback such as rating level feedback. It means overall subject rating is 'good', 'Excellent', 'very good', 'poor', 'average'. The student selects the category 'average'. So the system generates the score 50. This system does not generate any questionnaires level questions and the questions are not classified in the clear form.

PARTICULAR LESSON USING RECOMMENDER SYSTEM

Same observations are made in the particular lesson for the subject. The overall score is 85 (out of 100). Number of users downloaded or viewed the author's content is 10. The following data set implements the score of each user.

From the scores Standard deviation is $\sigma = 61.12$. So the standard deviation increases from the author's score in positive range. So that efficiency level is 71.12.

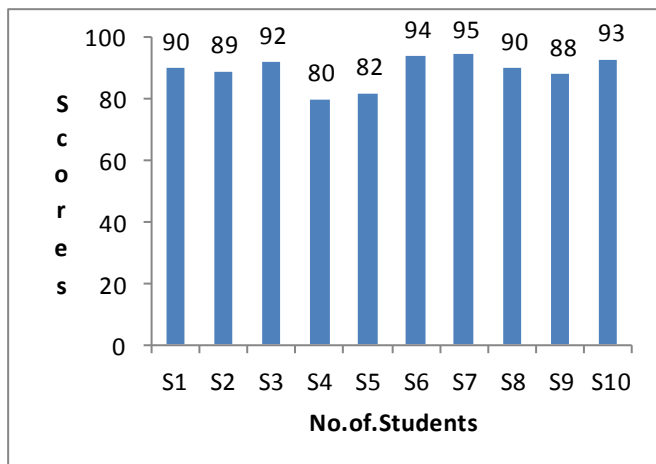


Fig. 4. Student's Efficiency level in a particular lesson

In Fig. 4, Student S7 gives the score 95. This score is collected from the rule mining algorithm. Each lesson has some information and some tests conduct for that one. Rules are generated from the author's score level from that lesson and user's feedback. Finally compares author's rule and user's rule. From the deviation of the rule this system gets the score level. This process did not conduct without recommended system.

V. CONCLUSIONS

The most important technique in E-Learning is collaborative filtering. This project focuses on collaborative recommender system that uses distributed systems in order to continuously improve e-learning courses to test the tool with several groups of external instructors and experts in order to test the usability of the tool with external users. This work has good characteristics in supporting students choosing learning materials by providing recommendations. The system will be implemented as an online system and is generally applicable to any student learning activity recommender systems. Research is also being carried out with more students and teachers in order to discover which other attributes of the data model -in addition to the final score - could be taken into account for comparison.

VI. FUTURE WORK

In future E-learning process will improve its learning methodologies and divides the learning process to learning library and virtual class room methodologies. These methods will satisfy all learning requirements and using recommended system will improve the greater results.

REFERENCES

- [1] Adomavicius, G and A. Tuzhilin, 2005, "Toward the next generation of recommender systems: a survey of the state-of-the-art and possible extensions," IEEE Transactions on Knowledge and Data Engineering, vol. 17, no. 6, pp. 734-749.
- [2] Chuanguang Huang and Jian Yin, 2010, "Effective Association Clusters Filtering to Cold-Start Recommendations", Seventh International Conference on Fuzzy Systems and Knowledge Discovery.
- [3] Geyer-Schulz, A, 2003, "An Architecture for Behavior-Based Library Recommender Systems", et al., Information Technology and Libraries.22(4), pp.165-174.
- [4] Khribi, M.K., M. Jemni, and O. Nasraoui, 2008, Automatic Recommendations for E-Learning Personalization Based on Web Usage Mining Techniques an Information Retrieval. ICALT '08.Eighth IEEE International Conference on Advanced Learning Technologies, .
- [5] Lu,J, 2004, "Personalized e-learning material recommender system," In Proceedings Of International Conferene On International Conference Information Technology for Application, pp. 374-379.
- [6] Nikos Manouselis, Hendrik Drachsler, Riina Vuorikari, Hans Hummel,Rob Koper, 2011, "Recommender Systems in Technology Enhanced Learning",Springer Recommender Systems Handbook , pp 387-415.
- [7] Romero, C., Porras, A.R., Ventura, S., Hervás, C., Zafra, A. (2006). Using sequential pattern mining for links recommendation in adaptive hipermedia educational systems. In International Conference Current Developments in Technology-Assisted Education. Sevilla, Spain (pp.1016-1020).
- [8] Shaniand.G A. Gunawardana (2011). Evaluating Recommendation Systems, In Recommender Systems Handbook.
- [9] Tavangarian D., Leybold M., Nölting K., Röser M.,(2004). Is e-learning the Solution for Individual Learning? Journal of e-learning.
- [10] Vineet Richariya, April 2013, " A Survey on Recommender Systems based on Collaborative Filtering Techniques" vol. 2, Issue 2,.
- [11] XiaoyuanSu and Taghi M. Khoshgoftaar , 2009, "A Survey of Collaborative Filtering Techniques", Hindawi Publishing Corporation, Advances in Artificial Intelligence.