

An Online Recommender Agent for Boosting the Confidence of an e-learner

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www.ijcseonline.org

Received: Nov /29/2014

Revised: Dec/08/2014

Accepted: Dec/20/2014

Published: Dec/31/ 2014

Abstract— In online learning environment learners often face different types of problem due to physical absence of teacher. One of the major problems is losing the self-confidence in e-learning environment. In this paper an online recommender agent is proposed for boosting the confidence of e-learner. The designed and developed system has the ability to predict the level of confidence as well as knowledge of an e-learner through some evaluation procedure. According to the various levels of confidence and knowledge, system will provide several recommendations with the intention to enhance the confidence of the e-learner. A prototype has been developed based on the proposed system and applied on some students from eleven grade of CBSE board, India. The response obtained indicates that the system is able to raise the confidence of e-learner.

Keywords—Confidence Based Learning; Online Recommender Agent; E-Learning; Online Examination

I. INTRODUCTION

Electronic learning is a type of education where the medium of instruction is information and communication technology (ICT). Information and communication technology (ICT) has had a great impact on education and training in the current technological scenario [1][2][3][4][5]. The advent of e-learning has resulted in improved quality of learning experience for the learners in inter-networked society [6]. Traditional teacher-centric learning environment is giving way to more and more learner-centric environment [7]. Life-long learning paradigm is fast replacing the orthodox concept of a full-time student. Learning is no longer confined within a fixed classroom at scheduled time. It has become open and flexible in terms of space and time [8].

Confidence-Based Learning or CBL is a methodology used in learning and teaching that evaluates knowledge quality of a learner by measuring both the correctness of the learner's knowledge and confidence in that knowledge.[9] CBL is an innovative practice that empowers the learner to rapidly learn and retain the material with confidence. Along with this, the CBL process is intended to increase retention of online learners and minimize the effects of predicting which can skew the results of traditional, single-score assessments. This combination yields a profile of the individual's knowledge base, and identifies the difference between what the individual thinks they know and what they actually know.

People who are confidently correct will take actions that are productive [10] [11]. The reverse is also true in those individuals who are confident about their wrong knowledge

will take action very quickly which is potentially dangerous.

Bellow graph Figure1 can be drawn with confidence versus knowledge where five distinct quadrants can be shown.

- **Uninformed:** These types of learners have very low level of knowledge as well as confidence.
- **Misinformation:** These types of learners confidently believe their knowledge to be correct, but which is actually incorrect.
- **Doubt:** Such kinds of learners have the knowledge but believe of them are not high. As a result an element of doubt exists that may cause the learner not to act on that knowledge.
- **Mastery:** This category of learners confident about their knowledge and which will likely be applied correctly in practice. Learners who are in this quadrant have correct knowledge and a high degree of confidence.
- **Pre-Mastery:** This part of learner is basically a subset of the section mastery. Confidence and knowledge level of this type of learners have lower than Mastery but greater than other quadrant.

In this paper a concept is proposed which will assist the learner boosting their confidence level. It will also protect the learner from being misled by the adverse effect of overconfidence. After going through a certain learning material a relevant short test will be taken. According to the analysis of the test's outcome, the learners are fixed into a certain quadrant of the stated graph Fig. 1. Then the learners are advised according to their level of confidence and knowledge. The final target of the system is to transfer the student to the 'Mastery' quadrant or close to that. From the

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results and discussion it can be surely said that the system can successfully shift a certain learner to 'Mastery' from any other quadrant.

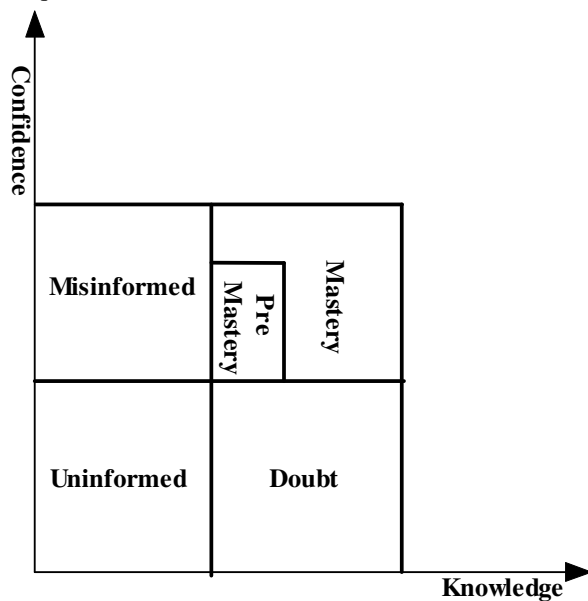


Figure 1. Confidence vs knowledge graph.

Rest of the paper is organized as follows. Section 2 provides a detailed methodology that follows to design the system. Section 3 and section 4 present the experimental design and result and discussion of system proposed respectively. Finally, Section 5 concludes the paper with a glimpse of effectiveness of the designed system.

II. METHODOLOGY

This section provides a detailed discussion on the methodology of the proposed system. Various aspects of the system, e.g., USE CASE diagram, estimation of parameters, assessment of learners' type and finally recommendation to the learner etc. are presented. The process starts with online evaluating process that involves a friendly user interface. Depending upon different types of online test parameters learners' knowledge-confidence level is determined. At the end appropriate recommendation is supplied to the learner according to this level.

A. Use Case Diagram

Fig. 2 shows the use-case diagram [12] that represents the behavioral aspects of the system. The four cases are 'online learning material', 'online test', 'generate recommendation' and 'communicate recommendation' respectively.

B. Estimation of Parameters

To assess the quadrant of learners' confidence-knowledge level an on line test is presented to the learners. This evaluation process is mainly based on MCQ (Multiple Choice Question); eventually distributed different set of

questionnaire. There are certain parameters which are estimated during assessment period. These parameters as like follows:-

- (I)Time (T), total time taken by a learner to complete the test,
- (II)Marks (M), total marks obtained by a learner after completing one test,
- (III)Attempt (A), number of attempts (including correct and incorrect),

To estimate the level of the above parameters some threshold values named α and β are introduced. Agent considers all those values which are generated lower than (α) as low. Likewise there will be a maximum point (β), beyond which the level of parameter will be considered as high. The values will be taken as medium (mid) if it is in between low and high, The values of α and β are determined by the system developer with the consultation of subject specialist. The threshold value may be changed according to the learning material. It is illustrated in Table 1.

C. Learners' Type Assessment

Depending on different levels of assessment parameters, learners are classified into five quadrant groups viz. misinformed, uninformed, doubt, pre mastery, mastery. In order to tally with real life situations, 27 combinations are squeezed in to 18 combinations which are relevant in practical situations. For an example, if a learner's level of attempt is low; his level of marks may not be high or medium. Hence for all 18 situations learners are assigned into any one learner type. Few combinations are exemplified in Table 2.

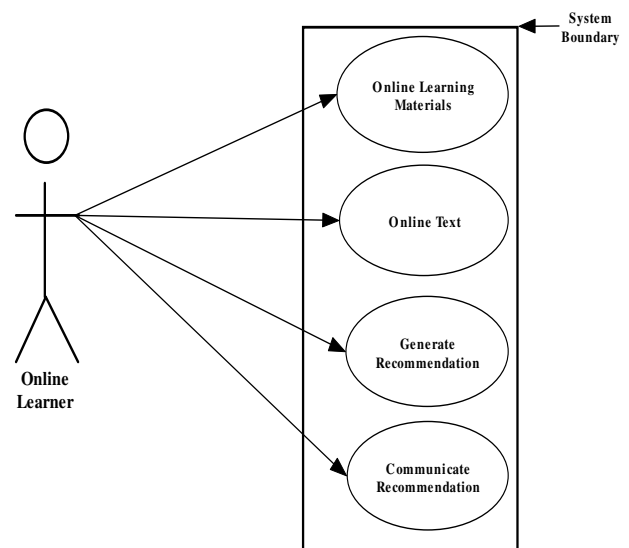


Figure 2. USE CASE diagram of the system.

Level	Online Test Parameters		
	Attempt (A)	Score (S)	Time (T)
Low	$A < \alpha_1$	$S < \alpha_2$	$T < \alpha_3$
Medium (Mid)	$\alpha_1 < A < \beta_1$	$\alpha_2 < S < \beta_2$	$\alpha_3 < T < \beta_3$
High	$\beta_1 < A$	$\beta_2 < S$	$\beta_3 < T$

Table 1. Threshold values of online test parameters.

Serial No.	Online Test Parameters			Learners' Type
	Attempt	Score	Time	
1	H	H	H	Doubt
2	H	H	L	Mastery
3	H	L	H	Uninformed
4	H	L	L	Misinformed
5	M	M	M	Pre Mastery
6	L	H	L	NA

Table 2. Assessment learners' confidence- knowledge level.

Serial No.	Confidence - knowledge level	Recommendation to the learner
1.	Uninformed	Thoroughly go through the textual parts again, comprehend the solved problems, take help from step by step demonstration, do a number of exercises and reassess yourself.
2.	Misinformed	Carefully study the textual part again, take help from the different types of learning material.
3.	Doubt	Comprehend the solved problems, do some exercises and reassess yourself
4.	Pre Mastery	You may move to the next phase. But this will be effective if you study more with some advanced material and practice some additional exercise.
5.	Mastery	Congratulations! Move to the next phase.

Table 3. Recommendation to the learner.

D. Recommendation Generation

According to the different quadrant groups of learner a recommendation is generated and it is shown to their interface. This is expected that these recommendations will help the learner enhance their confidence along with the knowledge level. The recommendations are shown in Table 3.

Level of Learners Confidence and Knowledge	Number of Students in Phase I	Number of Students in Phase II
Uninformed	13	9
Misinformed	3	1
Doubt	8	4
Pre Mastery	7	11
Mastery	3	9

Table 4. Report of test

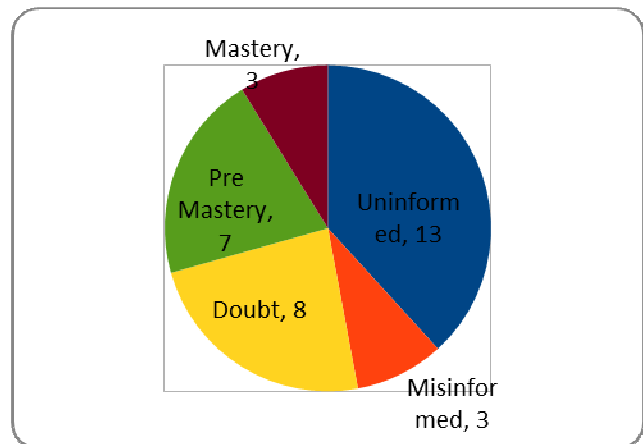


Figure 5. Pie chart analysis of test report after phase-1.

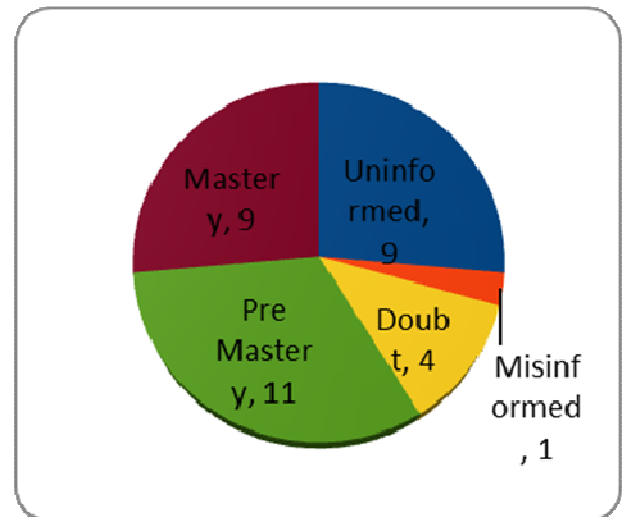


Figure 6. Pie chart analysis of test report after chapter-2.

III. EXPERIMENTAL DESIGN

In this section a few important screen shots of designed system are represented. Fig. 3 depicts one of the pages of online MCQ test on the subject of "Introduction to user-defined function and its requirements". After completion of entire test learners are delivered recommendation Fig. 4 for boosting their confidence and improving knowledge as well.

IV. RESULT AND DISCUSSION

Depending on the model, a prototype has been devised which was based on the proposed system. It applied twice on the same set of 34 randomly selected school level students from eleven standards (19 males & 15 females) of CBSE board. The test paper framed was on a chapter namely "Introduction to user-defined function and its requirements" from C language of Computer Science syllabus. The chapter covered the way of defining and various usages of functions in different ways. It included scopes and rules of functions and variables, local and global variables etc. and it spanned before the beginning of structured data type. After finishing the chapter they appeared in an MCQ test. According to the performance they were categorized into different levels like uninformed, misinformed, etc. The test was conducted in two phases on the same students. The Table 4 depicts the numbers of students in each phase. Two pie charts Fig. 5 and Fig. 6 are drawn to compare the results. It is clear from pie chart analysis and table data that the proposed system seemed to have the efficiency for boosting the learners' confidence.

V. CONCLUSION

Physical absence of a teacher is a great problem which is frequently faced by e-learner, affecting their confidence level adversely. Keeping this problem in mind this paper has projected an online recommendation agent which the ability to forecast the confidence level and knowledge of a learner through some test. After determining the level of confidence, several recommendations will be generated according which will boost up the learner to proceed and retain interest. Now on the basis of the proposed system, a prototype has been developed which will applied on a few students of class XI standard. That the system is able to churn up the level of confidence in an e-learner is evident from the result of the test.

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