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Monitoring System as Method of Intellectual Evaluation of Student's Exams

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ABSTRACT

The proposed method for assessing knowledge is appropriate to apply if you think it is advisable use monitoring systems, carrying out a comprehensive test of student knowledge and containing element of an artificial intelligent. And as for first claim, then it means that the PS may include questions from various topics of the training course, have different complexity.

Element of artificial intelligent can be monitoring system built on the basis of fuzzy logic, don't ask hard answer to the question and evaluate answers linguistics.

Keywords: Artificial intelligent, Evaluate, Information technology, Monitoring, Assessing knowledge.

JEL codes: D20, D83, 034,

1.INTRODUCTION

The modern information technology training includes as an obligatory element the use computerized training and monitoring system, and often simulators. From the standpoint of didactics and they can be defined as pedagogical software (PS).

The all PS contains a knowledge assessment block. The principles of knowledge evaluation differ depending on to where the PS is used.

However, many PS uses the simplest way to evaluate effectiveness of training (E)
 $E = (KP/KC) \cdot 100\%$, where KP – number of correct answers; KC – total number of question asked [Safwan Al Salaimeh, 2011].

The developers of PS provide a limitation when designing a question only factual material of the domain (for example: there is a fact, no fact) and cannot build questions by cause – effect relations, anticipating answers with varying degrees of confidence. It seem expedition to use intellectual assessment of students' knowledge.

1.FORMULATION OF THE PROBLEM

We will construct a system for assessment the knowledge of trainees that allows:

1. Take into account of complexity of the problem without weighting coefficient, that is, without recourse to the training of experts built;
2. Answer questions as follows: “I am of the fairness of answer option number () by () percentage” or “I am sure with fairness in justice () answer options”.

The task of presenting an assessment to the trainees is viewed as a mapping:

$$X^* = \{X_1^*, X_2^*, \dots, X_n^*\} \rightarrow D = \{d_1, d_2, \dots, d_m\}, \quad (1)$$

Where X^* - multiple response level of particular trainee, wherein X_i , $i = \overline{1, n}$ – level of i^{th} response to the question of monitoring systems (it belongs below a lot of fuzzy terms {L – low, L_a –below average, A- average, A_a – above average, H - high}); n- number of question of monitoring system; D – set of estimates; m- upper limit of the scoring[4-7].

For example, if $m=4$, the d_1 – unsatisfactory (2); d_2 - satisfactory (3); d_3 – good (4); d_4 – excellent (5).

Other ($m>4$) bounds. For example, if $m=10$, then d_{10} - bigger than very excellent (5^+); d_9 - excellent (5); d_8 –almost perfectly (5^-); as so on.

We form the task of assessing knowledge of trainees using monitoring system based on fuzzy logic: by the levels of response of particular trainees $X_i = \overline{1, n}$, determined by it is work all monitoring system, it is necessary to find some rules of inference, with the help of which to get an assessment of this trainee.

3.METHOD OF EVALUATION

The process of obtaining an evaluation d_j does break to a several stages:

Stage 1: build a matrix of knowledge by several values of the level of answers X_i , $\overline{1, n}$, and the corresponding assessments d_j , received or based on the results of work, experimental group of trainees with monitoring system or according to the recommendations of teachers of experts;

Stage 2 – fix multiple levels of answers $X^2 = \{X_1^2, X_2^2, \dots, X_n^2\}$ specific examiners learners;

Stage 3- construction of the membership function;

Stage 4 – establish a connection between input and output variable using the compositional interference rules.

Stage 5 – finding an estimate d_j examining learner through networking.

Let us disclose some of the above concepts. Under the matrix of knowledge is meant the matrix, each line that corresponds to the process of assessing the knowledge of one experimental trainee.

In each i^{th} column, except the last is the level of response to the i^{th} question in monitoring system. The last column contains the estimate.

Accessories functions are understood as a set of some function, receiving value from the range $[0, 1]$ and determining the degree of belonging of the students answer to each term. Under the compositional rules inference is understood the set of rules for inference, based on which the set X^2 there is an assessment of the trainee [Leviken V.M. 1998; Brian David Goff, 2009; Stefan Bayarov, 2010].

An example of monitoring system.

For simplicity, we will assume that monitoring system consists of three control questions and proposes three answers to each question. The score is displayed on a point scale, that is a lot

$D = \{d_1, d_2, d_3, d_4\}$, when presenting an assessment to specific trainee we will take into account the values y_j confidence (in percentages) in justice i^{th} answer to the I question I, j, then x_i , the level of the answer to i^{th} question, depends on factors $y_{i1}, y_{i2}, y_{i3}, y_{i4}, \quad i=\overline{1,3}$;

The relation between linguistics variables is determined by the relation ship

$$d = f_d(x_1, x_2, x_3), \quad (2)$$

$$x_i = f_{xi}(y_{i1}, y_{i2}, y_{i3}), i = \overline{1,3} \quad (3, 4, 5)$$

Consider the following monitoring system:

Q1) for finding the meaning of which function a branching algorithm is used?
(for each variant of the answer indicate the degree of your confidence in its fairness):

1. $f = 4x + 7$, x – is changed from 1 – 2, to increments 0,1;
2. $f = 4x + 7$, $x = 1$;
3. $\begin{cases} 4x + 7, & x = 1; \\ 6x + 9, & x \geq 1. \end{cases}$

Q2) specify the percentage of each option to the total number of operator input data in the language v. basic.

- 1- Input,
- 2- 2- read data,
- 3- input, 3- print.

Can we use a function $\log(x)$ to describe a function $\log_{(10)}(x)$? (for each variant of the answer indicate the degree of your confidence in his justice): 1- yes; 2- I don't know; no; we notice that in the questions that monitoring system, they have different complexity degree of a fairness.

Taking this remark into account, relation 2-5 can be represented as some matrix of knowledge. Based on this matrix of knowledge and result of working with membership functions can be obtained the evaluation of some student based on results of his answer to the question and the monitoring is composed.

4.RESULTS AND PRACTICAL RECOMMENDATIONS

The proposed method for assessing knowledge is appropriate to apply if you think it is advisable use monitoring systems, carrying out a comprehensive test of student knowledge and containing element of an artificial intelligent. And as for first claim, then it means that the PS may include questions from various topics of the training course, have different complexity.

Element of artificial intelligent can be monitoring system built on the basis of fuzzy logic, don't ask hard answer to the question and evaluate answers linguistics. When building such a monitoring system, you must follow the procedure:

- 1- Determining how and what question you will ask trainees, and what options for the answer will be offered to him for thought;
- 2- Determine their number and meaning of linguistics fuzzy terms which used for the final assessment of the knowledge of trainees (this number depends on the number of graduation grade) and to evaluate each current response;
- 3- Construct a hierarchal evaluation system (output tree), so that at each level of the hierarchy the number of signs is no more 7 ± 2 ;
- 4- Taking into example 1 -3 into account, build the knowledge matrix it is possible to involve an expert in this field of knowledge, which are the teachers in this specialty.
- 5- Set the membership function of response level with fuzzy terms, as defined in paragraph two. And for this you can use the standard membership functions or build a new;
- 6- To calculate the value of the membership function for each fuzzy terms of each student answer, and then using the knowledge matrix and output trees, calculate the value of the membership function of fuzzy terms intermediate feature at each level the hierarchy level;
- 7- Using the knowledge matrix, calculate the value of the multidimensional membership functions for all estimates and their type defined in point 2;
- 8- Determine the desired solution assessment of the knowledge of the exams of the trainees. And for this it is necessary to find the maximum value of the membership function of the answers to this maximum value (see point 7) and to allocate an estimate, corresponding to this value.

If, however, the values of some of the neighboring membership functions of point 7 matches, that is possible 5 points for action:

- A. Correct the original membership function;
- B. Correct the knowledge matrix;
- C. For estimation use a scale with a large number of gradations;
- D. Increase the number of PS questions and add corresponding rows and comment in the knowledge matrix;
- E. To encourage the students, choose a higher rating.

When using the first two options it is advisable to involve experts.

5.CONCLUSION

The use of an approximate method requires certain competition costs and time, but it can be justified by the possibility of processing intelligent information.

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