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Algorithm for Assessing Learners' Knowledge in Automated Learning Systems

N. Karimov
Associate ptofessor, Department of Information Technology and Mathematics, Andijan Institute of agriculture and agrotechnologies
Sh. Abdurahimov
Lecturer, Department of Information Technology and Mathematics, Andijan Institute of agriculture and agrotechnology's

Abstract. The article presents the measurement of the arithmetic mean value while the assessment consists of the answers to several questions in the assessment of learners knowledge in an automated learning system, and the assessment algorithm is given.

Keywords: Algorithmization, system, teacher, learner, algorithm.

In pedagogical practice, it is shown that the student's knowledge is assessed taking into account three main factors, the nature of the error, ie the weight, the time spent on solving the problem and the complexity of the problem being solved. If the level of knowledge covers several issues, it is usually measured by the arithmetic mean of the overall assessment c, with the following formula:

$$C = \left[\frac{1}{n}\sum c_i\right]$$

In the four-point system c, the total score of the student c_i for the answer to problem i, if i is incorrect, then $c_i = 2$. n – C is the number of tasks the student needs to solve to get an overall grade.

In an automated learning system (ALS), it is expedient if the learner's response is calculated as a total assessment of the learner based on the given formula, and teaching in an automated system is close to traditional learning.

In both ALS and conventional teaching methods, objective assessment should be an expert algorithm that evaluates each question, the correct or incorrect answers to each question, and the time taken to answer them in difficult situations.

Here we focus on a number of features of the SPOK ALS.

One of the first features is that the author focuses on the fact that each question is designed to get a set of correct or incorrect answers for each one individually. If the answer matches the specified correct answer, then the learner is instructed to move on to the next step from ALS. There may be such cases. The task is solved correctly, but does not correspond to the correct answer, in which case the learner is given a clear instruction or the concrete solution is accepted by the teacher.

The author gives a convincing explanation that the answer to the wrong solutions is wrong. The learner's incorrect answer indicates that the learner has worked to some extent with the learning material allocated to the study, but not enough to make a satisfactory assessment. In most cases recorded experimentally [2], the learner makes 1 error in each case. After receiving an explanation, they get the correct answer on the first move.

The weight of a single error in the answers to simple problems should be high. From the second set of errors in the answers to complex questions, the ALS of the second feature, the author can not predict the exact errors of the learner. That's why we call mistakes unintended answers.

In order to help the learner to answer correctly, the author includes a correction hint. This can be a general concept or a general solution, and so on.

Incorrect answers indicate that the learner has not studied the learning material adequately. Experiments show that three or four corrective tips will suffice to solve the problem. The third feature of ALS is that the learner gives the correct answers after all the tips given for correction.

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ALS ensures a correct response in a short time. Therefore, the learner is penalized by measuring the correctness weight of the answer depending on the time to solve the problem. If the accuracy weight is low and spends more than the specified time, it should be evaluated as unsatisfactory. The third feature is that the correct answer is displayed after all the tips have been given. Thus, for example, ALS recommends the correct solution to the learner as soon as possible after the system has been given all the assumptions, rather than solving the correct solution. In this case, the student is given a large fine, receiving an unsatisfactory grade. In view of the above, the SPOK system divided the learner's answers into classes with sufficient grounds, classified them (correct, intended, incorrect, unintended answers) and determined by the weight of the time taken to solve, depending on the number of incorrect answers, indicating the complexity of the problem. In this case, the assessment of each task is determined as follows:

$$Ci = 2 \quad if \quad (L_i/L_1 + m_i/M_i)R_i \succ a_1$$
$$Ci = 3 \quad if \quad a_1 \leq (t_i/L_1 + m_i/M_i)R_i \succ a_2$$
$$Ci = 4 \quad if \quad a_2 \leq (t_i/L_1 + m_i/M_i)R_i \succ 0$$
$$Ci = 5 \quad if \quad (t_i/L_1 + m_i/M_i)R_i = 0;$$
$$R_{\partial i} = 1, \quad if \quad t_{ip}/t_{io} \succ 1,$$

where, t_i is the amount (number) of the learner's incorrect answers intended to solve task i-4

$L_i - i$ is the total number of incorrect answers intended by the author in solving the task.

$m_i - i$ is the number of unintended answers to the task,

M_i - the total number of helps provided by the author i with the provision of hints.

R_i - is the whole coefficient, which takes into account the time taken to solve the task.

$t_{ip} -$ is the time spent solving the task i,

$t_{io} -$ is the time allotted to solve the task i;

a_1, a_2 - are the coefficients that determine compliance with the given price.

The system recommends estimating the values of the coefficients a_1 and a_2 for each section or by a separate expert method.

Taking into account the functional capabilities of the SPOK ALS system, the assessment for each issue is calculated on the basis of a special program. This method is recommended based on the results of experiments. [3].

In summary, the knowledge assessment algorithm presented is intended for SPOK-type ALSs.

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