ISSN: 2350-0328

International Journal of AdvancedResearch in Science, Engineering and Technology

Vol. 5, Issue 10 , October 2018

Algorithm and architecture of software for formation of quantitative signs from feature sets of electronic educational resources

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ABSTRACT: The Scientific work considers the problem of formation of quantitative features from the initial set of different types of data when constructing classification algorithms under conditions of high dimensionality of an attribute space. To solve this problem, a new approach has been proposed, based on the Boolean separation of classified electronic educational resources.

KEY WORDS: Electronic educational resources, course elements, complex of features, database, classification.

I.INTRODUCTION

It is central question nowadays to carry out monitoring over electronic information systems, the quality of electronic resources, their validity and their continual update [1,5].

The database of information, saving the information existed even before the invention of computers. This was done with the help of notepads, special copybooks for notes and so on. Together with the society information systems are also developing. The state also has taken several measures to develop the sphere and to apply computer technology in different areas of society including the institutions and establishments.

The essence of this approach is as follows. The studied subsets of different types of data are checked for the presence, if they exist in the database of electronic resources, depending on the presence of formed elements in the database are assigned values of 1 or 0, then based on the generated data, an algorithm is proposed for generating quantitative N signs by normalizing the elements consisting of valid numbers.

II. PROBLEM STATEMENT

There are various classification features of electronic educational resources (EER), therefore, their characteristic parameters should be identified [1,2,5]. Usually, the main object of the LMS (Learning Management System) systems is understood as course elements, in which EER are considered as software products. Therefore, given the many types of e-learning resources, their classification by goal and specific features seems relevant. Electronic educational resources consist of course elements, in turn, course elements include a complex of various signs (in the form of texts, numbers, dates, etc.), for example:

1. Lecture - $x_{pi}^{j_1}$ $(j_1 = \overline{1, k_1})$, course element consisting of complex j_1-signs -p-class object;
2. Task - $x_{pi}^{j_2}$ $(j_2 = \overline{k_1 + 1, k_2})$, in which it has also the complex of text features $(j_2 = \overline{k_1 + 1, k_2})$:
3. Test tasks - $x_{pi}^{j_3}$ $(j_3 = \overline{k_2 + 1, k_3})$;
4. Glossary - $x_{pi}^{j_4}$ $(j_4 = \overline{k_3 + 1, k_4})$;
5. Seminar - $x_{pi}^{j_5}$ $(j_5 = \overline{k_4 + 1, k_5})$;
6. Forum - $x_{pi}^{j_6}$ $(j_6 = \overline{k_5 + 1, k_6})$;

ISSN: 2350-0328

International Journal of AdvancedResearch in Science, Engineering and Technology

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7. Chat - $x_{pi}^{j_7}$ $(j_7 = \overline{k_6 + 1, k_7})$;
8. Resource - $x_{pi}^{j_8}$ $(j_8 = \overline{k_7 + 1, k_8})$;
9. DB - $x_{pi}^{j_9}$ $(j_9 = \overline{k_8 + 1, k_9})$;
10. Wiki - $x_{pi}^{j_{10}}$ $(j_{10} = \overline{k_9 + 1, k_{10}})$;
11. Questionnaire - $x_{pi}^{j_{11}}$ $(j_{11} = \overline{k_{10} + 1, k_{11}})$ and so on.

In other words, course elements consist of objects that include various sets of features. The numerical representation of these complexes is carried out in 2 stages: at the first stage, depending on the presence of formed elements in the database, 0 or 1 values are assigned, then at the second stage, based on the generated data, the transformation takes the form of normalization of elements consisting of real numbers.

Thus, after the first stage, e-learning courses x are presented as a group of the following course elements.

$$x = \left(\underbrace{x^1, x^2, \dots, x^{j_1}}_{\text{group 1}}, \underbrace{x^{j_1+1}, x^{j_1+2}, \dots, x^{j_2}}_{\text{group 2}}, \dots, \underbrace{x^{j_{N-1}+1}, x^{j_{N-1}+2}, \dots, x^{N}}_{groupN} \right) \quad (1)$$

For example, the 3rd group of a set of features expressing types of computer testing includes the types of tests, the form of answers, the bank of questions.

III. PROBLEM SOLVING

Now, based on the above data and using (1), we can present electronic educational resources of the class X_p in the context of groups of course elements in the form of the following table.

$$X_p = \begin{bmatrix} x_{p1}^1, x_{p1}^2, \dots, x_{p1}^{j_1}, x_{p1}^{j_1+1}, \dots, x_{p1}^{j_2}, x_{p1}^{j_2+1}, \dots, x_{p1}^{j_{N-1}+1}, \dots, x_{p1}^{j_N} \\ x_{p2}^1, x_{p2}^2, \dots, x_{p2}^{j_1}, x_{p2}^{j_1+1}, \dots, x_{p2}^{j_2}, x_{p2}^{j_2+1}, \dots, x_{p2}^{j_{N-1}+1}, \dots, x_{p2}^{j_N} \\ \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \\ x_{pm_p}^1, x_{pm_p}^2, \dots, x_{pm_p}^{j_1}, x_{pm_p}^{j_1+1}, \dots, x_{pm_p}^{j_2}, x_{pm_p}^{j_2+1}, \dots, x_{pm_p}^{j_{N-1}+1}, \dots, x_{pm_p}^{j_N} \end{bmatrix} \quad (2)$$

Here $p = \overline{1, r}$ means the total number of courses taught in an r – educational institution, and m_p – expresses the number of teachers who teach p– discipline.

This table is completed based on the software [4] developed as part of the work. Elements of the table consist of the digits 0 or 1, which are determined using the program. If teachers introduced the parameters of the course element to the system, this element is assigned the value 1, if not - 0. The elements of this table reflect the quality of the training course created by the teachers, in addition, the table allows you to determine the quality and completeness of courses, monitor the training course on an ongoing basis items.

The above EERs are classified based on hidden data relationships using the proposed classification methods [1,3].

At the second stage, the set of j_3 – tests i – the electronic training course given with respect to (1) has the parameters of extensive tests. Thus, the assessment of the EER is related to the significance indicators of these extensive internal parameters, which are determined by experts in different scales. The simplest indicator is the presence or absence of a parameter. After that, it becomes possible to make special criteria for evaluation.

$$x_{pk}^1 = \frac{1}{j_1} \sum_{i=1}^{j_1} x_{pk}^i \, , x_{pk}^2 = \frac{1}{j_2 - j_1} \sum_{i=j_1+1}^{j_2} x_{pk}^i ,$$

ISSN: 2350-0328

International Journal of AdvancedResearch in Science, Engineering and Technology

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$$x_{pk}^{3} = \frac{1}{j_3 - j_2} \sum_{i=j_2+1}^{j_3} x_{pk}^{i} \ , \dots, x_{pk}^{N} = \frac{1}{j_N - j_{N-1}} \sum_{i=j_{N-1}+1}^{N} x_{pk}^{i}$$

Here x_{pk}^{i} – parameters of course elements $k = \overline{1, m_p}$. As a result, a table is formed, the normalized elements of which consist of real numbers.

$$X_p = \begin{bmatrix} x_{p1}^{1}, x_{p1}^{2}, \dots, x_{p1}^{N} \\ x_{p2}^{1}, x_{p2}^{2}, \dots, x_{p2}^{N} \\ \dots \dots \dots \dots \dots \dots \\ x_{pm_p}^{1}, x_{pm_p}^{2}, \dots, x_{pm_p}^{N} \end{bmatrix} \quad (3)$$

IV. ARCHITECTURE OF SOFTWARE

Based on the above-mentioned algorithm, based on the requirements of the current software market, the demand for client / server technologies is strong. At the same time, the web client role must be browser-server function - web-servers.

Taking into account that the development of web browser-style user interfaces is one of the most striking changes in creation of software, the need for special client software layouts is solved, the platform selection problem is solved, and most importantly, the application will be able to access the software from anywhere.

The software should perform the following tasks:

1) read the information stored on the EER level (EER, author, its users, etc.).
2) Introduction of assessment tools.
3) check of references.
4) Formulation of reports.
5) use of client-server technology.

Monitoring of the big cover is the quality of the knowledge process. It should becorne in mind that in the process of studying monitoring, we can assess whether weare able to overcome the problem, and whether or not the student has a positive ornegative impact on education. It is also important to develop a tool for timely and timely delivery of relevant information to the trainee.

ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 5, Issue 10 , October 2018

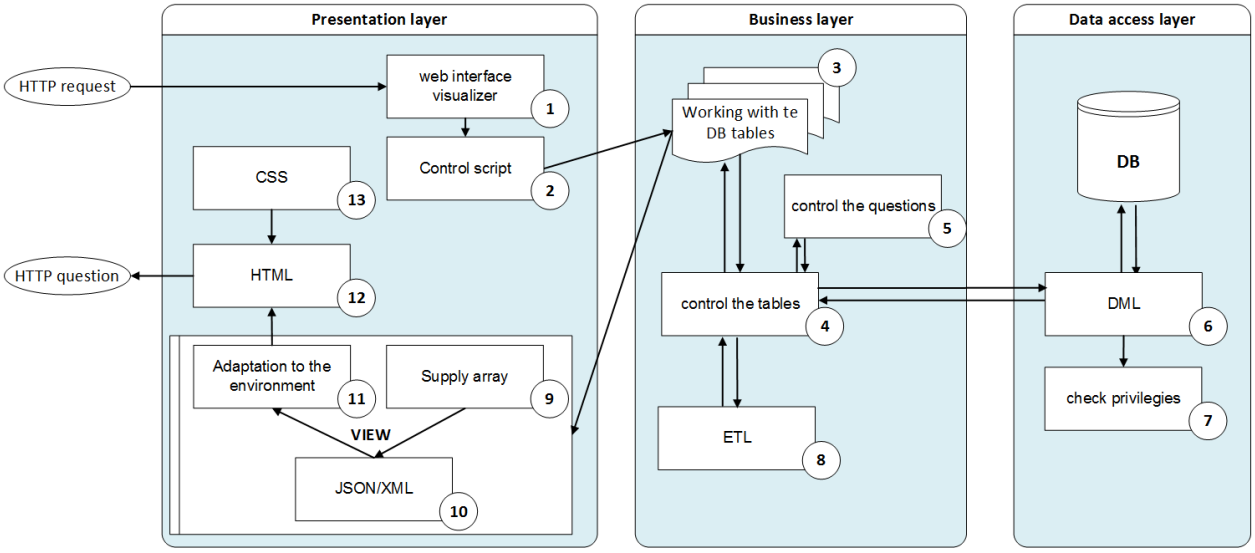

Fig1: Software architecture

The compact tool created in such an architecture ensures that the electro phase monitors the quality of the training parsing into LMS systems and reduces the bandwidth of the EER.

V. CONCLUSION

The mathematical expression of the classification of the components of electronic educational resources, course elements is formed in the context of signs. Training courses created by teachers are presented in tabular form using course elements. It is justified the assignment of the elements of the table (2) values of 0 or 1 using the software. An algorithm for generating a standardized quality table (3) using course elements has been developed.

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ISSN: 2350-0328

International Journal of AdvancedResearch in Science, Engineering and Technology

Vol. 5, Issue 10 , October 2018

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