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Software implementation of electronic textbooks "Fundamentals of the theory of electronic circuits"

Abstract. *This document has considered the experience of developing electronic textbook «Fundamentals of the theory of electronic circuits». Filed under concept, structure and principles of development of the electronic textbook. Detailed procedure for evaluation of knowledge.*

Keywords: electronic textbook, distance learning, virtual learning environment.

The self-study is form of knowledge that now widespread in Ukraine and abroad. It is a self - directed individual activity that independent of knowledge and experience. In the West, this form has had quite a long time and has great popularity among students and teachers through its economic performance and training effectiveness.

There are technologies used for learning: Moodle, Atutor, Claroline, eCollege. However, the disadvantage of the above technologies is that they work with "standard test" and automatic generation of input data for exercises is not allowed. This leads to the fact that after multiple learning on the limited set of tasks students can guess the correct answer and not solve the exercise that does not improve theirs skill. So today there is no software that could effectively solve the problem of learning, namely to allow the student can study on a limited set of tests to solve new tasks for which input data are not repeated.

So important is the creation of methodological and instrumental bases of simulation training systems management and control knowledge, adequate current trends in information technology and didactic principles of organizing and conducting training.

The concept of the textbook "Fundamentals of the theory of electronic circuits, which jointly developed in the faculty of Lviv and Kyiv Polytechnic, edited by Professor Yu. Bobalo based on considering the following factors: complexity of the learning process, which is the integration of various forms of activities - lectures, practical laboratory, independent, under the volume of tasks allocated credits; importance of self-knowledge and effectiveness of training for laboratory work.

The feature of the software tool that used for learning in the course "Fundamentals of the theory of electronic circuits, it is necessary to display Greek characters in the standard window Windows, the answer in the form of formulas, tables, availability exercises, that providing some answers and more.

The process of learning involves the presence of two components:

1) Training material M - has short or full theoretical calculations. It is organized as a tree, which corresponds to the depth of nesting of topics M_i and sub-topics M_{ij}. It is characterized by the number of sub-topic $|M_{ij}|$, and time t_i allotted for teacher learning, questions of certain levels of difficulty Q_{ik} and points cushion R_{ik}.

2) Tests T - consist of the questions Qt_i, answers V_{ij}, difficulty level Sk_i and type of task Tq_i.

$$E = \langle M, T \rangle, M = \langle M_i, \{M_{ij}\}, t_i, \{Q_{ik}, R_{ik}\} \rangle,$$
$$T = \langle Qt_i, \{V_{ij}\}, Sk_i, Tq_i \rangle$$

The teacher indicates the number of certain complexity for each theme and gives time to perform tasks. If the allotted time is finished and student does not answer all the questions, the test automatically stops, and program puts scores obtained by those questions that the student had answered:

$$\sum_{i=n}^{n} t_i \geq Ts,$$

where n - number of sub-topics, which student tested, Ts – time for which student complete the test.

Student can see randomly generated set of test questions:

- if a student takes 71-100 points - then it is recommended him to start learning the next section;
- if a student takes 40-70 71-100 points - then it is offered to take Option 2 to clarify his level of knowledge;
- if a student takes 0-39 - it is recommended to repeat the whole section.

In the program there are developed the following modules:

1) Analysis of arithmetic expression and its automatic calculation - for the implementation of issues-based problems generated by parameters;

2) The formation of special alphabet characters, their processing, redrawing the window to display the characters and the introduction of expressions from the keyboard;

3) Determine the type of questions and answers and display them in the form: text, formulas, figures, table, mixed;

4) Validation of tests - Analysis of errors by the teacher - specification of the number of incorrect answers, non-existent type of question, etc.;

5) Formation of random questions bank, that consider a given number of questions by level of difficulty for a student;

6) Check the correct answers a student;

7) Determination of the total assessment of student;

8) Setting the time of testing;

9) Definition of related topics that is necessary to examine the student to achieve better results.

Questions - exercises include circuits, its parameters and their values. Parameter values are generated automatically and exercise solves by a formula. Then the student submits his answer.

The tutorial demonstrates a new approach to the teaching of basic subjects for study. Electronic parts also allows you to make an independent assessment of knowledge online.

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