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B. Karkulovskyi[1], V. Karkulovskyy[2], R. Kryvyy[2], D. Korpyljov[2], R. Panchak[2]
[1]Lviv Polytechnic National University, ISM Department,
[2]Lviv Polytechnic National University, CAD Department

AUTOMATED SYSTEM FOR STUDY COURSE "DESIGNING METHODS"

In the article the approach to building an automated training system that allows us to study modern methods of design, conduct classes with students to assess their level of knowledge. The system is easy to use, open to development and reliable operation.

Keywords: CAD, training system, design method, design process.

АВТОМАТИЗОВАНА СИСТЕМА ДЛЯ ВИВЧЕННЯ КУРСУ "МЕТОДИ ПРОЕКТУВАННЯ"

Розглядається підхід до побудови автоматизованої навчальної системи, яка дає змогу вивчати сучасні методи проектування, проводити заняття із студентами, оцінювати рівень їх знань. Система є зручна у користуванні, відкрита для розвитку, надійна в експлуатації.

Ключові слова: САПР, навчальна система, метод проектування, процес проектування.

Introduction

At present, the intensity of the training process has increased dramatically. This is especially true of training in information technology. Improved educational process can be achieved by the introduction of computer methods. Creating automated training systems – this is one of the most promising ways to improve the process of learning [1].

The purpose of learning is for educational goal of the system is to:

- knowledge in a particular subject area;
- skills to use different methods and algorithms;
- problem solving skills;
- assessment of acquired knowledge and skills.

The main purpose is the development and implementation of core training system that allows are:

- learn advanced design techniques used in CAD;
- conduct laboratory and individual lessons;
- assess the quality of student learning.

Thus, it is necessary to develop an automated training system with the provision of such claims:

- usability;
- openness;
- reliability;
- compatibility;
- protection against unauthorized access;
- the ability to develop;
- competitiveness.

The design process

The design process [2] – is a complex iterative process that can introduce such a scheme (Figure 1):

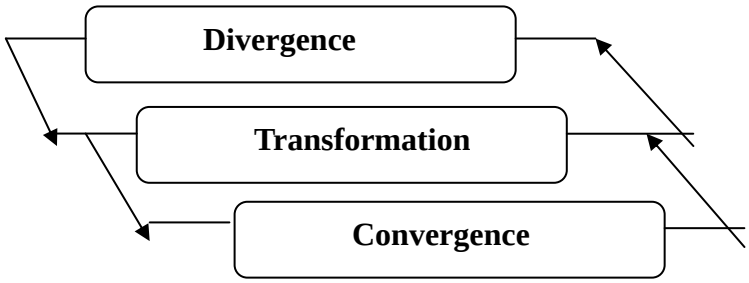

Fig. 1. Block diagram of the design process

Divergence. This stage can extend beyond project situation to ensure broad enough and effective enough space to find solutions. Search divergence can be seen as a check on the stability of everything that has to do with solving the problem. Work on this phase includes logical and intuitive steps, search and analyze large amounts of information.

Transformation. The main purpose of this stage – to search results divergence impose some conceptual scheme, sufficiently accurate for convergence to a single project. After that adopt this project and fix it in detail. The task is divided into subtasks. It is believed that all tasks can be solved in parallel or in series and largely independently.

Convergence. The main goal – as soon as possible to reduce uncertainty, reduce everything to a single project. Models are less abstract and more ddetalizovanymy. At this stage uses two strategies:

- from internal to external
- from external to internal.

Straegy and methods design of complex objects and system

For the design of complex objects and systems based strategy design. Strategy design are classified in two terms:

- the degree of involvement;
- search scheme.

Predefined (ready strategy) fixed in advance. Best suited for designing in familiar situations (for combining or modifying objects and systems).

Such strategies are:

- linear;
- branched;
- cyclic.

When the designer action are independent from each other can be used extensive strategy. Its composition may include parallel steps that increase the number of designers working simultaneously on the project. There can be competitive stages that conditions preclude change strategy planning, taking into account the results of previous stages of design.

To strategies that change in the design process include:

- **Adaptive strategy**, which is characterized by the fact that at the start is given only one etep. This is the most effective strategy design, because the scheme search solution is always based on the most complete information available about the project situation.
- **Strategy increments** is the foundation of traditional design methods. In this strategy-based method for automated optimization.
- **Strategy random search.** In absolute lack of initial action plan, it may be useful for design innovation.

All design methods can be classified into groups, of which the design strategy:

- strategy ready;
- methods of control strategy design;

- methods of finding ideas;
- research methods of project situation;
- research methods of structure problems;
- evaluation methods of design solution.

During aided design must quickly change the methods included in the initially selected strategy. It is therefore important to know the methods that can be applied at the right time. This issue is devoted to developed educational system.

Architecture of educational system

The architecture of the educational system, which is presented in figure 2.

To protect the separation system made access levels:

1. the level of the student;
2. the level of the teacher;
3. the level of system administrator.

User interface for an external system has the ability to consistently perform tasks.

Formation and details of tests conducted using teacher *test editor*. Forming a task choices. All this is recorded in the *database*.

The teacher has the ability to build method of training (*editor of the technique location*).

For testing using a *processing unit of the test results*. It provides the ability to test, process results and record them in the *database* (teacher journal). The student has access only to zovnishnho interface.

To perform the tasks (learning of theoretical material, laboratory, settlement-graphic and tests) is a *processing unit of the the tasks results*.

In *unit of the mathematical support* placed appropriate mathematical models, methods, algorithms and programs for the system

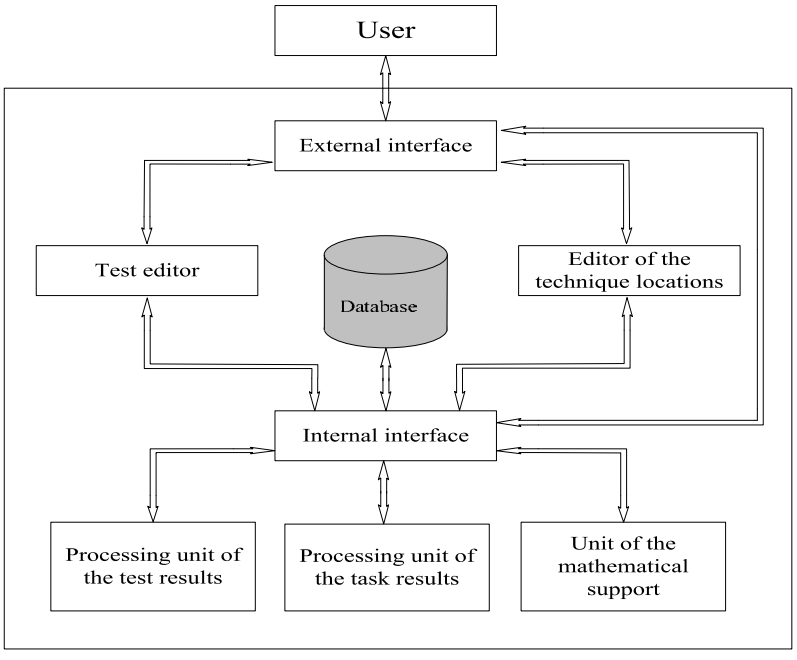

Fig. 2. Architecture of educational system

Realization of educational system

The basis for the automated system assigned object-oriented approach that provides stability system allows relatively easy to carry out its modification.

The developed methods class diagram that represents the class methods used in the system. At the top level of the hierarchy is the class “design methods”, which combines the similarities and common interface all grades techniques.

Software implementation carried out among the Embarcadero RAD Studio [4] -integrable environment of rapid application development that supports the development of applications for different operating systems.

Fig. 3–4 show examples of individual elements of the educational system.

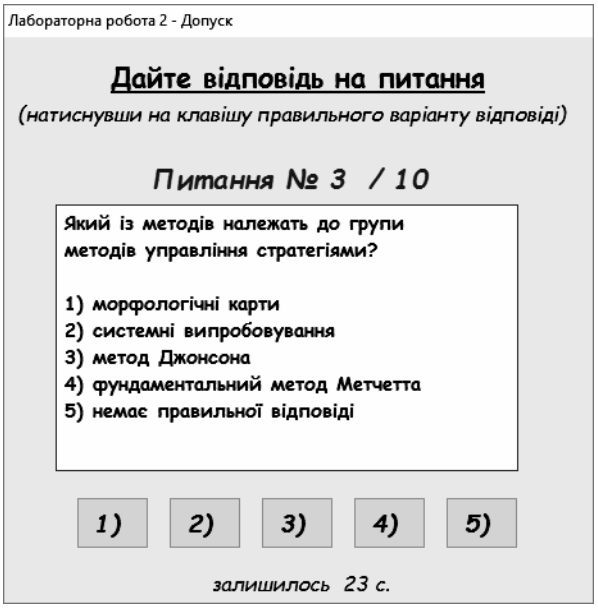

Fig. 3. Testing window

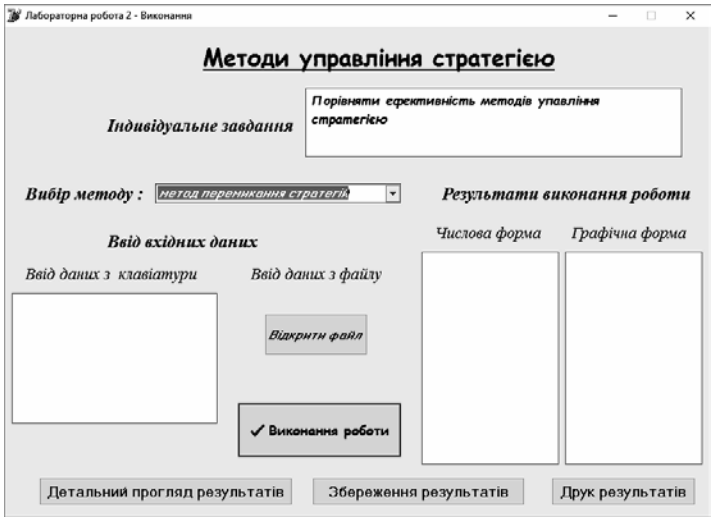

Fig. 4. Window of laboratory work

Conclusion

Developed and implemented an automated educational system that performs the following functions: allows the study of theoretical material, conducting testing; providing each student individual task; sells laboratory and process of settlement and graphic works; provides results of conservation; has the ability to adapt to changes in the educational process.

1. Ilkiv R., Karkulovskyi B., Karkulovskyy V., Bolshevskyy R. Educational System for Simulation Micro-accelerometers // Досвід розробки і застосування САПР в мікроелектроніці: матеріали XIII міжнародної конференції CADSM-2015. 24–27 лютого 2015, Поляна, Україна / Національний Університет "Львівська Політехніка". – Л.: Вежа і Ко, 2015 – С. 487–488. 2. Джонс Дж. К. Методы проектирования. – М.: Мир, 1986. – 326 с. 3. https://www.embarcadero.com/ru/products/rad-studi