

## THE EXPERIENCE OF DEVELOPMENT AND APPLICATION PERSPECTIVES OF LEARNING INTEGRATED EXPERT SYSTEMS IN THE EDUCATIONAL PROCESS

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**Abstract:** *The main principles and experience of development of learning integrated expert systems based on the third generation instrumental complex AT-TECHNOLOGY are considered.*

**Keywords:** *learning integrated expert systems, problem-oriented methodology, educational process.*

**ACM Classification Keywords:** *I.2..1 Artificial Intelligence: Applications and Expert Systems*

The most important property of next generation intelligent learning systems is the possibility of *individualization* for learning processes both with the help of using different remote controlled educational technologies and further integration of models, methods and technologies related to expert systems with learning systems in the context of united architecture of integrated expert system (IES) which combine interacted logical-linguistic, mathematical, imitating and some other kinds of models.

The problem-oriented methodology of construction IES that was offered in the middle of nineties [Rybina, 1997] and unique next generation tooling supported it - the complex AT-TECHNOLOGY [Rybina, 2005, Rybina, 2004] allow to realize the development including wide class of *learning* IES having advanced intelligent resources in learning, monitoring and testing of the trainee that suppose:

- construction of the *trainee's model* (considered personal psychological portrait) and *sample model* of a course (in particular developing before *teacher's model*);
- construction of adaptive *learning model* which essence is in dynamic modification of *learning strategy* in compliance with current trainee's model and following generation of the set of *teaching actions* most effective on the given learning step considered psychological features of trainees;
- trainee's activity control and generation of controlling decisions for the corresponding adjustment of trainee's activity with the purpose of achievement of given educational goals;
- construction of the model of problem domain and explanation model for the assessment of the decision-making logic, calculation results, explanation (if necessary) for wrong alternative or problem-solving step;
- possibility of using hypertext internet-textbook, playing programs, etc, having standard state of teaching actions.

All models, techniques, algorithms and procedures formed in aggregate a concrete methodology of construction of learning IES in the context of problem-oriented methodology of construction of wide IES class should be noted as original (published in 38 papers); and supported instrumental tools embedded in the complex AT-TECHNOLOGY present itself automated workplace for subject-teachers in engineering and specialized disciplines, i.e. those disciplines which are expedient for creating learning IES like training simulators of teaching kind with the purpose of saving of the unique non-formalized techniques and experience of concrete courses and disciplines teaching.

The experience of using several generations of complex AT-TECHNOLOGY for development of a number of learning IES also showed great perspectives for the creation of web-oriented IES just for educational purposes since, on the one hand, powerful functionality of the learning IES (the construction of trainee's model, adapted model of learning, model of problem domain, explanation model, teacher's model) is wholly inherited, on another hand, all basic features of contemporary client-server architecture such as system independence from platform,

accessibility, simplicity of informational renewal, convenience in administration and technical support that in particular simplify processes of subject-teachers knowledge accumulation noticeably.

Experimental approbation of dynamically developing supportive tools for construction of learning IES functioned in compound of third generation complex AT-TECHNOLOGY were held on the example of development:

- learning IES on the courses "Designing systems based on knowledge" and "Intellectual dialogue systems" (department of Cybernetics of Moscow Engineering Physics Institute (State University) – (MEPhI);
- learning IES on the course "Automation of experimental physical devices" (department of Automatics of MEPhI);
- learning IES on the differential diagnostics of insult kinds (together with Scientific Research Institute of Neurology Russian Academy of Sciences);
- learning IES for the diagnostics of respiratory tract illnesses (together with children's municipal polyclinic № 109 North-West Administrative District Moscow), which demonstration is provided for the exhibition "Telecommunications and new informational technologies in education".

As a whole complex AT-TECHNOLOGY is a multifunctional automatic workplace for knowledge engineers and also students and post-graduate students studying the theory and technology of construction IES that since 1995 allowed complex to use efficiently in educational process in MEPhI and other institutes for specialists preparation in the area of static and dynamic IES and knowledge management systems also [Rybina, 2005].

As a basic software tool complex AT-TECHNOLOGY is included in the structure of imitating-simulated stand (IMS) constructed in the educational-scientific laboratory "Systems of Artificial Intelligence" department of Cybernetics MEPhI on the base of local web consisting of 8 PC Pentium connecting to Internet-web MEPhI. In the compound of software tools of IMS there are foreign licensed products G2, GDA, Telewindows, etc. that are used for practical support of the courses and disciplines in departments of Cybernetics, System Analysis, Automatics [Rybina et.al., 2004, Koltsov et.al., 2006].

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