

**IMPROVEMENT OF A DATABASE AND KNOWLEDGE BASE OF AN INTELLECTUAL
MANAGEMENT SYSTEM**

**СОВЕРШЕНСТВОВАНИЕ БАЗЫ ДАННЫХ И БАЗЫ ЗНАНИЙ ИНТЕЛЛЕКТУАЛЬНОЙ
СИСТЕМЫ УПРАВЛЕНИЯ**

**ИНТЕЛЛЕКТУАЛДЫ БАСҚАРУ ЖҮЙЕСІНІҢ МӘЛІМЕТТЕР ЖӘНЕ БІЛІМДЕР
ҚОРЫН ЖЕТІЛДІРУ**

A.E. ISMAIYLOV
А.Е. ИСМАЙЫЛОВ
А.Е. ИСМАЙЫЛОВ

(Almaty Technological University)

(Алматы технологиялық университеті)

(Алматинский технологический университет)

E-mail: box_email61@mail.ru

There are developed software of formulation a knowledge base for operation and the computing operations intelligent system control of technological process of biochemical production in a database management system.

There is tested database and knowledge base which in result adjusted data and rules, also their improvement by successful sequence method of carrying out simulation and semi-natural modeling.

Автором разработаны программные средства формирования базы знаний для эксплуатации и проведения вычислительных операций в системе управления базами данных интеллектуальной системы управления технологическими процессами биохимического производства.

Проведено тестирование базы данных и базы знаний, в результате которых скорректированы данные и правила, а также их совершенствование методом последовательного улучшения проведением имитационного и полунатурного моделирования.

Биохимиялық өндірісте технологиялық үдерістердің интеллектуалды басқару жүйесінің мәліметтер қорын басқару жүйесін қолдану және есептеу амалдарын орындау үшін білімдер қорын жабдықтаудың бағдарламалық қамтамасы жасалынды.

Мәліметтер қоры мен білімдер қорын тестілеу нәтижесінде мәліметтер және ережелер түзетілді, сондай-ақ мінсіз және үздіксіз жетілдіру әдісі арқылы имитациялық және жартылай натуралдық моделдеу жасалды.

Key words: information systems, intellectual control systems, biochemical manufacture, technology, base of knowledge, database, technological process, testing and improvement.

Ключевые слова: информационные системы, интеллектуальные системы управления, биотехнологическая производства, технология, базы знаний, базы данных, технологические процессы, тестирование и совершенствование.

Негізгі сөздер: ақпараттық жүйелер, интеллектуалды басқару жүйелері, биотехнологиялық өндіріс, технология, білімдер қоры, технологиялық үдерістер, тестілеу және жетілдіру.

Introduction

Currently information systems are used in various spheres of management [1]. However some information systems have no opportunities of intelligence - analytical processing of the information, requiring the user knowledge of the programming language and structure of storage of the data [2, 3]. The intellectual control systems (ICS) unite in themselves opportunities of control systems of databases and technology of artificial intelligence, thanks to the fact that the storage of the information about features of objects of biochemical manufactures (BCM) is combined with its processing and preparation for use at decision-making. Unlike usual analytical and statistical models, ICS [4] allow solving hard formalizing semi structured tasks.

Objects and Methods research

Biochemical manufacture, simulation and semi-natural modeling

Results and Discussion

Distinctive features, functional tasks, the formalization of a problem situation ICS and their comparison with usual information systems are given in [5]. Let's consider the basic moments of a choice of technology underlying developed ICS BCM.

There is a huge amount of platforms for development of a database (DB) and base of knowledge (BK). For example, the technology Oracle supports numerous tools of development, including integrated in JAVA, PHP, Microsoft.NET, i.e. is based on support of the centralized and allocated bases and databanks of global scale. Thus the basic tools are: Data Guard, Recovery Manager, Resumable Operations. The tool Data Guard allows the manager DB to choose what is more important: avoiding of loss even of the smallest amount of the data or maximal productivity. The tool Recovery Manager helps restoration of the separate block of a file of the data. Function Resumable Operations allow to fight other very much widespread kind of failures: shortage of space in a database. For example, the technology MS SQL Server very much convenient for support of corporate databases.

Taking into account these examples MS Access and Delphi were chosen for technologies underlying developed ICS BCM since they have some advantages, necessary for us, compared to other environments of development [6, 7].

MS Access is more convenient for initial stages of development DB (fig. 1), and Delphi for visual display of technological processes in BK (fig. 2). In strategy of construction ICS BCM we plan use DB and BK as training means or simulator-educational complex.

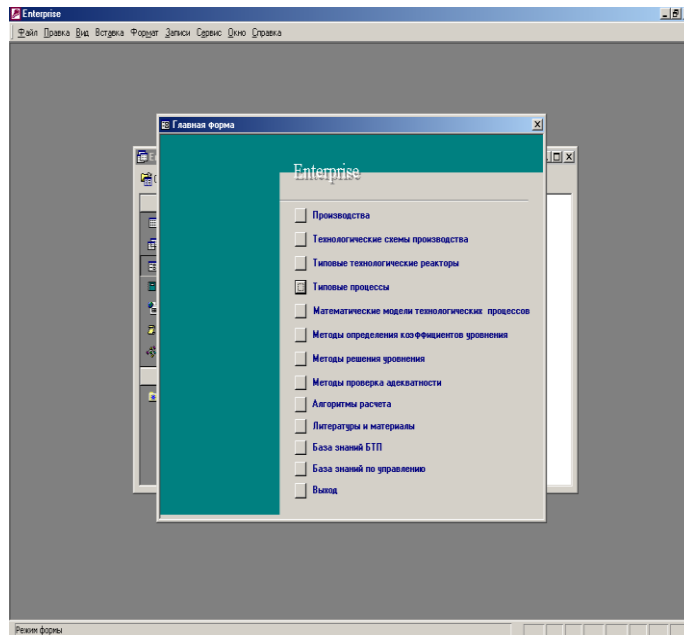


Fig. 1. - Screen form simulation

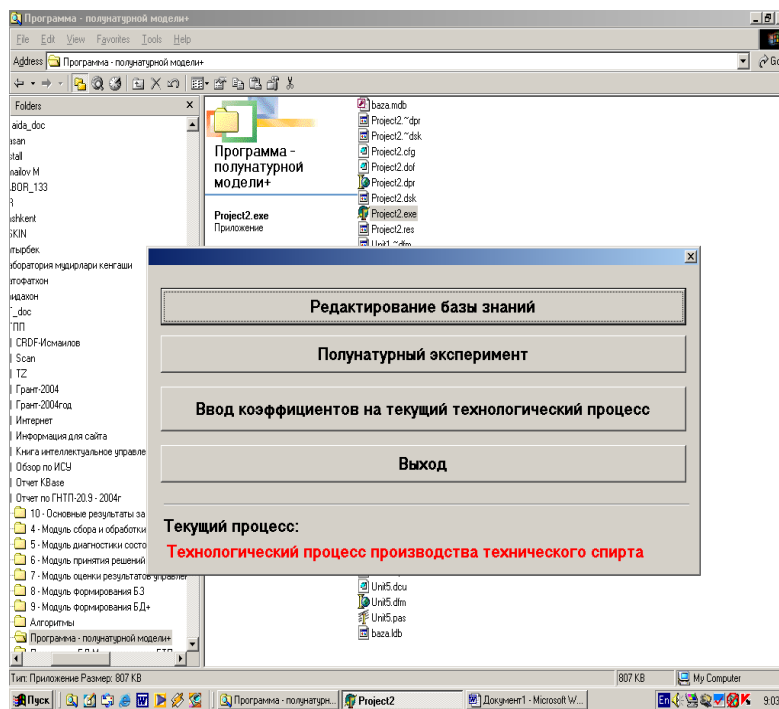


Fig. 2. - Screen form semi-natural simulation

Testing is very important at the stage of creation ICS BCM [8]. Testing DB and BK is understood as the whole complex of works connected to creation of the test plan, realization of test procedures and distribution of results of the carried out researches. Last, represents DB about mistakes, in which are constantly traced and the mistakes (with the indication of date and

other auxiliary information are registered which is important at testing).

Before a spelling of the test plan the debugging of the program was made [9]. Thus all available information on was collected, and also the potential items of information, which will be used at testing further.

At the following stage carried out detailed research of the available information; defined existing features, which testing already is sufficiently fulfilled and it is known, and also allocated those features, the ways of testing which are not yet known and are subject to an establishment [10].

The realization of test procedures connected to performance of the test plan, represents rather labor-consuming and long process, as the developed test procedures «were "banished" for each version ICS, i.e. on the initial stage have created the first version DB and BK ICS, was exposed to test researches. After created DB about mistakes and malfunctions, which subsequently were corrected (completely or partially) in following versions. It in turn, was again investigated and so on until the corrected final version DB and BK has turned out.

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At creation DB and BK ICS the principle «from simple to complex» was used. Thus in the initial versions realized not all conceived features, but only their part, and further was carried out with various additions and perfection.

Let's result some examples of the carried out test procedures.

For testing BK the means of debugging were used standard built - in program environment. In the experimental purposes some trial start on BK, not regular situations, containing 7 kinds, and 15 attributes were made, in all cases BK ICS correctly put the diagnosis.

For check of a correctness of calculation of final result the following test was made. Two kinds of not regular situations occurring in BCM, having very close attributes were specially selected; with the purpose of check of a correctness ICS the start of system was made, on which input these similar attributes were sent. Beforehand "by «manual" way by us is counted and the final result is calculated. ICS after the tax of the information about not regular situations correctly has revealed beforehand planned condition.

At perfection DB and BK were based on a method of consecutive improvement ICS BCM. The given method in turn is based on three ways: imitating modeling, half natural modeling and realization of experiments at the enterprise. Feature of a method is step by step improvement ICS and realization of its modernization in parallel in DB and BK.

Imitating modeling at perfection ICS has allowed: to develop skills of management of object in various modes of functioning (operational, pre-emergency, emergency); to investigate course of technological process both in a mode appropriate to the rules, and at occurrence of not regular situations without experiment on the expensive equipment; to ensure realization of various strategy (optimum control, elimination of not regular situations, study of relationships of cause and effect).

In common structure ICS BCM imitating modeling DB (fig. 3) has allowed to improve the following modules: mathematical models; DB of technological processes; BK of not regular situations; BK of typical processes; a choice of the recommendations on management in not regular situations.

For modeling not regular situations the typical infringements (situation) and their reasons are systematized. The not regular situations subdivided as broken threshold restrictions of parameters on: operational (infringement optimum, allowable operational norms) and emergency (infringement emergency, pre-emergency of norms).

Semi-natural modeling (fig. 4) as the system of imitation of external environment is intended for improvement of technological processes in conditions most approached to real. The debugging BK ICS on the stand sem-natural of model is economically more favorable, than half natural of test on real object. On the stand semi-natural of model carried out debugging BK on management of technological processes and BCM as a whole. Improvement and perfection DK on management on the stand half natural of model made by means of imitation of behavior of object in all possible modes of operation. Thus the modes conditionally have divided into two basic kinds: "«static" and "«dynamic". "The «static" mode has allowed to carry out testing BK on management. In "a «dynamic" mode carried out imitation of process of management of real object. For example, for technological devices in "a «dynamic" mode made complete modeling of processes - start-up, loading of raw material and materials, realization of the process, stops. Thus it is possible to make changes of structure of raw material, productivity, parameters of model, i.e. to vary all entrance parameters of object of management.

Semi-natural modeling as the means of perfection ICS provides copying the information, registration of simulated processes, and also primary and secondary data processing, including the express train - analysis and graphic representation of results.

Improvement of DB and BK were based on realization of experiments as methods of researches: the collection of the statistical data and comparison them with the various factors of typical processes and external environment; physics-chemical, biological and kinetic of research of behavior cellular of structures at various external influences; realization of modeling experiments and long monitoring.

The method of consecutive improvement ICS BCM is iterative. After making improvements DB and BK by imitating and half natural modeling, and the realizations of experiments the process went back to the first step for revealing of new group of shortcomings.

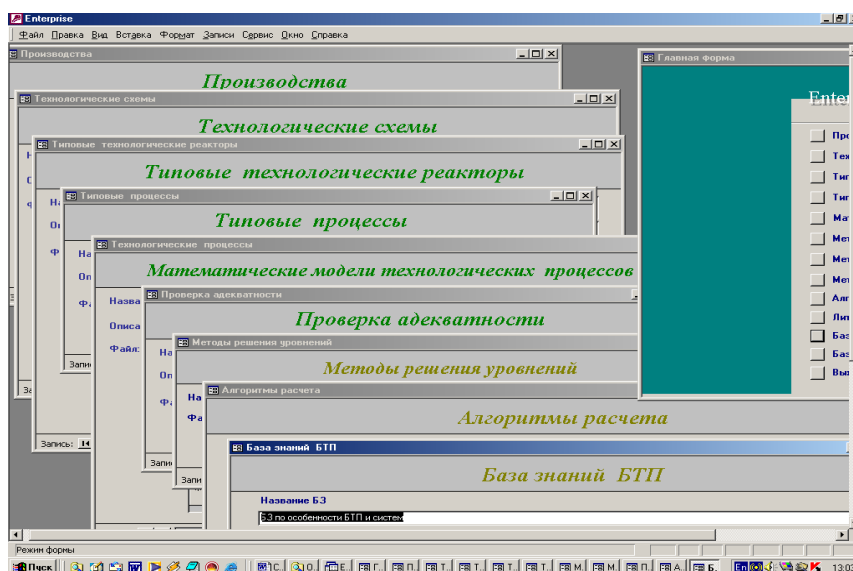


Fig. 3. - ICS BCM imitating modeling DB

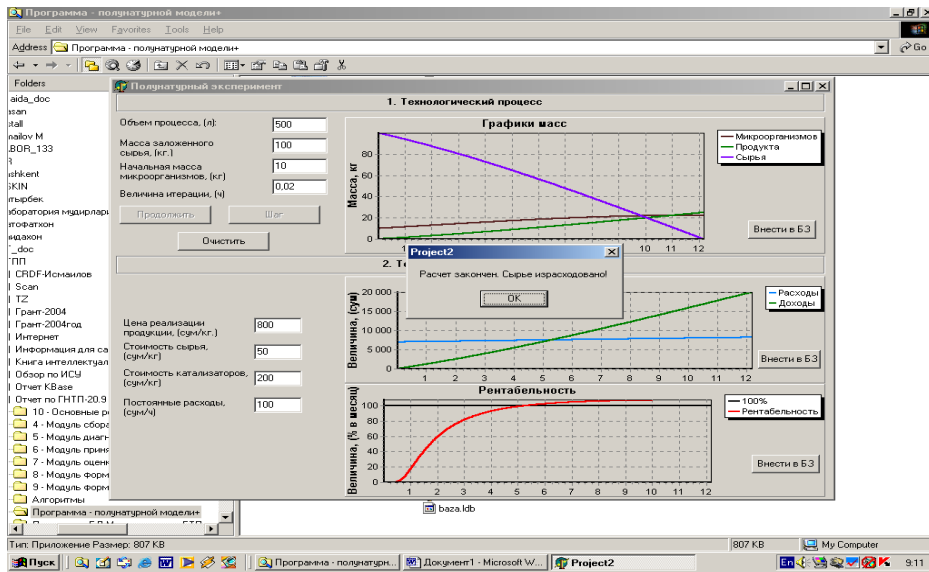


Fig. 4. - Semi-natural modeling

With each iteration ICS improved a lot. End of improvement by a method of consecutive the program of consecutive improvement has come at enhancement by imitating and half natural modeling not allocation of means on the following cycle of are corrected. perfection DB and BK ICS.

Further current characteristics of the ICS BCM were estimated. On macrolevel ICS have divided into functional and interface components. A functional component expressed by tasks solved ICS; the interface component - set of mutual relation between ICS and maintaining personnel.

In various modern operation systems combined styles of interaction are used. For example, in the graphic interface of operation system Windows the direct manipulation, and also menu, dialogue elements, forms and language of teams are used. Such approach is important for the user of ICS, as it allows carefully considering and analyzing the given task to choose the best option. Therefore in ICS BCM we also apply the complex approach to creation of the interface. The tables, menu, forms and dialogues here are used a direct manipulation.

Thus the main purpose of creation of the ergonomic interface in ICS BCM was to display the information as effectively as possible for recognition of the operator - technologist and to structure display on the monitor so that to attract attention to most important units of the information, i.e. minimization of the common information on the screen and representation only of those elements, which are necessary for the user.

Finally, conclusions

Thus, the main results are:

- the software of formation DB and BK for operation and realization of computing operation in ICS by technological processes BCM are developed;
- the testing DB and BK was carried out, as a result of which the data and rules, and also their

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