

ANALYSIS OF KAZAKHSTAN SOFTWARE AND COMPUTER SYSTEMS IN ELECTRIC POWER SYSTEMS

Bitimanova Saltanat Serikbaevna

87057685414@mail.EN

PhD doctoral student (2 years of study) at the Faculty of Information Technologies of
L.N.Gumilyov Eurasian National University,
specialty "6D070200 - Automation and Control", Nur-Sultan, Kazakhstan
Scientific supervisor - A.K. Shukyrova

Abstract. The domestic information and intellectual system is primarily a knowledge of technology and local conditions, including knowledge of domestic regulatory and technical documentation. The concept of intelligence system is based on programmed algorithms that allow automatic control of the system depending on the current situation. This paper describes the most common programs in Kazakhstan used for electrical calculations and for computer-aided design of electric power facilities.

Keywords: intelligence system, electric power system, software systems.

Introduction. At present, modern electric power systems are so complex objects with a variety of feedback and interaction factors that the solution of any issues related to the design, management and operation of electric power facilities is unthinkable without the use of a powerful apparatus of computational mathematics and all types of computer technology, communication systems and telecommunications.

The software used in the power industry is designed to solve one of two types of problems – design and operational.

When operating electric power systems, operational and dispatching control is carried out to maintain reliable and high-quality power supply in a constant mode. Such management in modern conditions requires the use of a large complex of systems for collecting and processing information. There are quite a lot of such systems on the market. Initially, they were only used for collecting and displaying data. At the moment, they can be equipped with additional modules for calculating and analyzing information and submitting recommendations to the dispatcher.

Based on the analyzed material for industrial applications, they can be classified into the following:

- software for collecting and storing telemetry information;
- software for performing electrical calculations;
- CAD system;
- software for staff training;
- software for solving other production tasks.

This division is very conditional, since software developers are constantly improving and expanding the capabilities of their own products.

Was reviewed by software developers which are the Russian (and in some cases Soviet) specialists, such as the SDO-6 [1], DAKAR [2], RastrWin[3], ANARES-2000[4], CASCADE-RETREN [5], COSMOS [5], RTP 3[5], CS Energy [6], TKZ-3000 [7], ARM SRZA[7]. Describes the function of the most well-known programs of foreign firms used in Kazakhstan for the solution of similar tasks: EUROSTAG, PSS/E, DigSILENT PowerFactory.

To assess the functionality was studied user documentation the above program complexes (PC) to calculate the modes, on the basis of this was formed the comparative characteristic of functional capabilities (Table 1). The table shows that the most functional PC are DigSILENT, PSS/E, ANARES-2000 and DAKAR - they can solve almost all kinds of electric grid problems. Such software complexes, as RastrWin and Space is designed primarily for the calculation of the established modes and failure analysis. Software systems Mustang and Eurostag is aimed at the analysis of the static and dynamic stability of power system. It should be noted that software packages

PSS/E and DigSILENT not have a Russian interface, which greatly complicates their use in Kazakhstan. Evaluation of the advantages and disadvantages of the PC, which is presented in table 2.

Table 1 - Comparative characteristics of the functional features of software systems

Function	RastWin	Mustang	DAKAR	ANARE S-2000	PSS/E	DigSilen	Space	EUROS TAG
The function for calculating the electric mode								
The existence of restrictions on the dimension of the mathematical model.								
The function for calculating the Electromechanical transients.								
A variable step of integration.								
A function of calculating electromagnetic transients.								
The function for calculating short-circuit currents.								
The ability to asymmetry in the elements of ES.								
The presence of base elements of the electric network.								
The function of frequency analysis.								
Optimization mode.								
Functions reduction scheme of the power system.								
Availability of models of PPT and FACTS to calculate electric mode dynamics.								
The existence of standard models RZ and PA.								
The possibility of weighting of the mode to the desired path.								
The ability to create custom models.								
The graphical display schemes.								
Russian interface.								
Licensing.								

Table 2 - Assessment of the advantages and disadvantages of software systems

PC	Advantage	Disadvantages
RastrWin	<p>User-friendly and straightforward interface.</p> <p>Ability to calculate modes using different algorithms. Possibility to use macros for formula creation. Possibility to import and export information into Excel file.</p>	<p>Lack of an electronic network element library.</p>
M ustang	<p>Ease of use. Distributed free of charge. Ability to set the characteristics of any automation.</p>	<p>Inconvenient graphical display of data. There are no ready-made sets of automatics.</p>
D AKAR	<p>Availability of a database of network elements. Multifunctionality.</p>	<p>Inconvenient interface. It is not possible to keep a history of changes to the calculation model.</p>
ANA RES-2000	<p>Availability of a database of network elements. Multifunctionality.</p>	<p>Inconvenient interface. It is not possible to save the history of changes in a file than an electronic one.</p>
PS S/E	<p>Can combine source data with Google Earth™ and display electrical networks geographically. Can solve any power grid problem</p>	<p>The Russian version is missing. Not adapted for use in Kazakhstan networks.</p>
DigSilent	<p>Vertically integrated software allows the use of a single software "engine" and PowerFactory interface for various applications and market segments - generation, transmission, distribution of electricity, power supply systems.</p>	<p>The Russian version is missing . The lack of a library of grid elements. Not adapted for use in Kazakhstan networks.</p>
EURO STAG	<p>Availability of a set of automatics. Possibility to create models of system automatics. Possibility to set the transient characteristics of unconventional power sources.</p>	<p>Inconvenient interface. For the simulation of transients have a detailed job characteristics of each network element.</p>
Space	<p>A powerful component of the state estimation. Sufficient scope of anchor calculation programme for the OIC and other complexes through the mechanism of the formats of the CDU.</p>	<p>Outdated interface technology, which, although implemented in a graphical way under Windows, but actually mimics the Windows interface, with many restrictions. Orientation to the text storage of data and results, limited graphical schematic editor.</p>

Conclusions

The analysis showed the following:

1. software systems for analyzing electrical modes have minor differences related to the representation of source data, output parameters, and export/import capabilities;
2. software systems manufactured in the CIS, as a rule, have a narrow focus on specific technological tasks;
- 3) foreign-made systems are positioned as comprehensive tools that can solve all operational tasks, as well as problems of economic optimization or choosing the optimal strategy in the electricity market;
- 4) software systems manufactured by CIS can work with the format of the dispatching control center, which allows importing and exporting data from one software and computing complex to another for solving various tasks.

Currently, there are problems in the energy system of Kazakhstan with the installation of an electricity dispatching system, especially the work on the distribution of electricity in some local power networks, and the issues are still very significant. Many power dispatching systems use distributed software systems. Each software has large differences and does not have a system. The program "Digital of Kazakhstan" proposed construction goals and requirements for the functionalization, automation, dispatching and control of the integrated power grid. In accordance with national requirements for monitoring and managing power system capacity, it is necessary to use information digital graphics technology. To improve the architecture of the dispatching of power supply and to provide high quality services supply.

Literature

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SYNTHESIS OF ADAPTIVE SYSTEMS BY METHOD OF FUNCTIONS OF LYAPUNOV

Myrzagul A.

Myrzagul Aigerim - master student;
L.N. Gumilyov Eurasian National University, Nur-sultan, Kazakhstan
Scientific supervisor - Beisenbi M.

Adaptive control systems are called systems that determine the desired control law based on an analysis of the behavior of an object when its characteristics change and disturbances acting on it [6]. There are a number of methods for the synthesis of parameter adaptation algorithms [4], [5], [7] - [10]. Some of them are simple to implement, but they can only be stable in the small. Moreover, since when constructing adaptive systems its structure is nonlinear, it is rather difficult to solve the stability problem [1], [2]. The considered method of synthesis of an adaptive system with direct adaptation using the Lyapunov function method allows us to obtain conditions for the stability of the system in large, therefore, the stability problem does not arise.