The paper describes the main components of the SIGMASTAT system developed by the SIGMA-DELTA technology for statistical data analysis on the ES computers.

Development of application software for problem solving by computer in various application domains is of both theoretical and practical interest. Relevant issues in this context include improved software production and integration technology, longer product life cycles, better software quality based on accumulated experience and new knowledge, and many other topics in the theory of modern programming systems.

New approaches to the solution of fundamental theoretical problems are incorporated in the base/support package development technology for mathematical software [1]. Special support tools provided for the time consuming stages in the process of design, operation, and improvement of mathematical software [1] substantially increase the productivity of the developers and raise the quality of the software systems.

The fundamental system development principles and the conceptual models and methods of software development using this technology have been tried and tested in the development of a family of statistical data-analysis programs around the base system DELTASTAT [2]. Comprehensive enhancement of this system, allowing for practical experience with the previous version and latest achievements in the theory and practice of application software design, has produced a qualitatively new software product — the SIGMASTAT system. This article presents a description of the fundamentally new features of the SIGMASTAT system.

1. PRINCIPLES, CONCEPTION, AND MODELS

The topics presented in this paper focus on the technology of software development, integration, and improvement, software reliability, and ways to satisfy the user requests in different categories.

One of the most important topics in this context is the choice of the base model for the application software. The two-level conceptual structural-functional (CSF) model of software systems [1] has been chosen as the base model for SIGMASTAT. The CSF model organically combines the knowledge base paradigm with the principle of modularity of the system and functional components of the software package. The CSF model makes it possible to construct the system and the functional component according to the same principles, using common models for both program and data modules.

Formally, the CSF model of a software system is described by the expression

\[ \Delta = (R, L_1, L_2, \mathcal{M}, \mathcal{P}, M, P). \]  

where \( R \) is the main program of the special-purpose operating system for the application software package; \( L_1 \) and \( L_2 \) respectively are the source languages of the first- and second-level control programs; \( \mathcal{M} \) is a model that describes informational and logical interaction between system programs (modules realizing the OS functions); \( \mathcal{P} \) is the set of programs
Fig. 1. Interaction of components in application systems corresponding to the model (1).

Fig. 2. Interaction of the main components in SIGMASTAT.

Fig. 3. Interaction of integrator components. A is NUCLEUS.