

ONTOLOGY MODELS APPLICATION FOR THE SOFTWARE SYSTEMS DEVELOPMENT

Ye.V. Burov

Lviv Polytechnic National University, Information Systems and Networks Department

Increase in the integration degree of the enterprises business processes, the e-commerce development and world economy globalization lead to the increase in the rates of change in the business environment and, as a consequence, the need for constant adaptation of software systems to the changing environment of their functioning.

Traditional methods of design and architectural principles of the software systems building are focused on the software product development based on a fixed set of requirements. Hence, we get the systems that do not respond well to changing requirements and external factors which are expensive in the support and operation. There are often failures and emergencies in these systems.

The modified requirements usually lead to the necessity of a new version of software product release that requires the time-consuming and resource-intensive stages of analysis, design, coding, testing and implementation of a new product version.

Adaptation of a software system requires a consideration of the expert knowledge of the relevant subject areas. Typically, these experts are not programming experts. Hence there is a need for a clear statement of the system developer requirements by the experts. Errors and misunderstandings in the management system requirements in the conceptualization represent a significant proportion of the failure causes in software development. One way of solving this problem is to separate the logic of the software system functioning from the mechanism of its processing and implementation. Meanwhile, the functioning logic is represented in the form of a particular formal model. One way of implementing this approach is MDD / MDA (Model - driven design / model-driven architecture) established in the works by Shlaer and developed by Mellor. This approach is the formalization of the program in the form of models and their subsequent compilation into code. Long-continued cultivation of this approach, in addition to the benefits, identified its significant shortcomings, in particular, the complexity of the creation and modification of the models complex which is comparable with the complexity of creating a system in the traditional way.

Another way of MDD implementing is the use of ontologies for the software systems building. Indeed, by Gruber definition an ontology is a formal model of the subject area conceptualization. This model contains the definition of the subject area entities and dependencies between them. Building software systems based on ontologies we avoid re-conceptualization of the subject area, thereby reducing the use of resources at the analysis and system design stage. A barrier to the use of ontologies when building software systems is purely a declarative nature of ontologies, their lack of procedural knowledge representation.

The paper shows the mathematical formalization of a software system built on the basis of the ontological models. The apparatus of the algebraic type theory is used for its construction. We have developed a formal representation of models and their systems processing.

The use of ontological models can improve the efficiency of solving problems in various subject areas. Theoretical and experimental studies on the development of methods of the ontological models in the business analytics systems held within the state budget topic at the Information systems and networks department in Lviv Polytechnic National University for several years. In particular, the experimental model of an instrumental program complex for the system modeling using ontological approach and models is developing. A mathematical model of knowledge representation presented in this article provides a formal basis for building a tool set and its validation.

Keywords - knowledge base, mathematical model, ontology, model