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UFO-ELEMENT PRESENTATION IN METAMODEL STRUCTURE OF TRIUNE CONTINUUM PARADIGM

This paper describes results of UFO-element formal description in metamodel structure of Triune Continuum Paradigm. This can promote the solution of a problem of development of methods of mutual system-object UFO- and UML-models transformation for providing of more effective information systems designing, in particular, for visual modelling CASE-tools Rational Rose and UFO-Toolkit integration.

Keywords – CASE-tool, metamodel, systemological approach, Triune Continuum Paradigm, UML.

Now CASE-technology of creation and support of information systems (IS) which provides a high level of technological support of processes of development and maintenance of the software was received the wide circulation. However, IS-developers frequently meet difficulties uses of CASE-tools in a complex with other similar tools. It is explained either the various paradigms supported by various tools or problems of data transmission and management from one tools to another [1].

The majority of existing CASE- tools is based on methodologies the structural or object-oriented analysis and designing which as mark the majority of IT-specialists, don't coordinate in the basic principles [2]. The task of complex IS creation shares on some subtasks. This division depends on the used approach, but at any of them always there are two actions. The first - collection of the information and the business modelling, the second - the future system architecture construction. The problem consists that the first task is solved with the help of the structural approach more effectively, the second - with the help object-oriented approach, i.e. both approaches are necessary to share.

This problem can be solved in a private kind due to use developed in walls of the scientific-educational Knowledge Acquisition Laboratory of the Kharkov National University of Radio Electronics the system - object (systemological) approach «Unit - Function - Object » (UFO-approach) which coordinates to principles as structural so object-oriented approaches and is adapted for the decision of business modelling tasks [2]. On the other hand the system architecture construction task can be solved effectively with the help of the Unified Modelling Language (UML) supporting object-oriented methodology and recommending among IS-developers. Thus, the aforementioned problem can be reduced to a task in sharing the UFO-approach and UML language. In a practical kind, to sharing CASE-tools UFO-Toolkit, supporting the UFO-approach, and Rational Rose, supporting UML.

For achievement of this purpose it is necessary to solve some basic tasks:

- to define semantic accordance between UFO- and UML-metamodels concepts;
- to coordinate UFO- and UML-principles.

The decision of the first aforementioned tasks can be carried out due to introduction of the general formal basis. The Triune Continuum Paradigm (TCP) [3] which gives the consistent structure of a metamodel both a necessary and sufficient set of Basic Modelling Concepts («Point in Space», «Point in Time», «Time Interval», «Space Interval», «Object», «Environment», «State», «Action») can serve those. Thus, for accordance of semantic conformity between UFO- and UML-metamodels concepts it is necessary to present them to TCP-metamodel.

As it is defined in [3] each concept of any object-oriented modelling framework is either one of the TCP Basic Modelling Concepts, or one of the TCP Specification Concepts, that are their specialization. We shall analyze the UFO-element, the basic concept of the UFO-approach, and we shall present it to TCP-metamodel.

«The UFO-element is a representation of any system in appearance of the three elements construction, i.e. at the same time as «Unit», «Function and «Object». «Unit» is a representation of the system as the structural element of the super system, as a crossroad of the relations with the other systems» [2]. Apparently from definition «Unit» is a structural element, i.e. non-spatiotemporal concept, namely concept of the «Model Constitution Continuum» in TCP terms. In TCP it is entered two Basic Modelling Concepts of the «Model Constitution Continuum»: «Object» and «Environment» [3]. It is obvious, that «Unit» is not TCP «Object» or its specialization as «Unit» sets conditions for existence of concrete «Object» due to introduction of concrete incoming and outgoing system links - «a

crossroad of the relations with the other systems» [2]. Thus, «Unit» can correspond only to TCP "Environment" or its specialization. Really semantics of «Unit» will well be coordinated to TCP «Environment» concept which represents scopes of corresponding «Object» existence [3]. **«Unit»** specifies TCP «Environment» concept due to introduction of concrete incoming and outgoing system links, that is **corresponds to TCP Specification Concept that specifies "Environment"** - TCP Basic Modelling Concept.

Now we shall consider the «Function», the second component of the UFO-element. «Function» is a representation of the system as the functional element, doing a definite role for supporting super system by balancing the given unit». It is important to note also, that in the UFO-element «Function» realizes corresponding «Object» of given «Unit» [2]. Apparently from definition in TCP terms «Function» represents certain spatiotemporal information about a non-spatiotemporal element. It is obvious from semantics of concept of functional element which represents dynamics of behaviour of some structural element. Apparently from the second part of the specified definition this structural element is «Object». It fully complies with definition of the TCP «Information Element» [3]. Thus, **«Function» corresponds to the «Information Element»** - TCP Basic Modelling Concept. It is important to note, that there is no opportunity to specify «Function» as in the UFO-approach «Points in SpaceTime» and «SpaceTime Interval» spatiotemporal concepts formally are not entered. TCP enables us to define these concepts formally. Then it is possible to speak about value of «Function» in the «Points in SpaceTime » and on the «SpaceTime Interval», that corresponds to TCP Basic Modelling Concepts «State» and «Action» accordingly.

Let's consider «Object» - last component of the UFO-element. «Object» is a representation of the system as the substantial element realizing the given function in the appearance of some material formation, having constructive, operational and other characteristics» [2]. In TCP there is a similar concept of «Object», as constitutional element. Hence, **«Object» of the UFO-element corresponds to «Object» TCP** - to Basic Modelling Concept in TCP.

Thus, it is possible to make the following conclusions:

- it has been determined, that «Unit» of the UFO-element corresponds to concept specialization of the «Environment» in TCP, «Function» of the UFO-element - to concept of the «Information Element» in TCP, «Object» of the UFO-element - to concept of «Object» in TCP;
- «Points in SpaceTime» and «SpaceTime Interval» concepts have been formally entered in the UFO-approach that has been allowed to specify «Function» of the UFO-element and to enter «State» and «Action» concepts in the UFO-approach;
- the set of the UFO-approach concepts which contains all concepts of a necessary and sufficient set of TCP Basic Modelling Concept that provides construction of model for any aspects of an universe of discourse has been determined and allows to present any of UML language concepts.

The received results allow to present the UFO-element to TCP metamodel, namely to give the semantic description of its components in TCP concepts that is necessary for the decision of a search task of semantic conformity between concepts of UFO- and UML-metamodels. For the decision of this task the further researches suppose representation of UML language concepts in TCP metamodel and the description with the help of formal - logic system of the Russell's theory of types, one of TCP base theories, interrelations between concepts of UFO- and UML-metamodels, that will provide logical rigor and accuracy at definition of conformity between them. For achievement of an end goal - search of mutual transformation UFO- and UML-models methods for providing of IS designing, it is necessary to coordinate basic principles of system - objective and object-oriented approaches and to find out what influence they will render on mutual transformation UFO- and UML-models. The decision of the aforementioned tasks also will allow carrying out sharing of CASE-tools UFO-Toolkit and Rational Rose.

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