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FORMATION OF ANALYTICAL ACTIVITY SCENARIOS

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Advanced analytics is one of the most required information technologies. Research of a scenario formation process of analytical activity is required for advanced analytics realization. Analytical activity scenarios define order of analytical activity conduction for obtainment of necessary information that assist to produce informed decisions. Scenario formation contains of scenarios building and optimization. The subject of the article is improvement of domain model over which analytical activity is performed. Object-oriented modeling method and adaptive object model approach is used to build analyzable domain object model. An adaptive object model that submits classes, attributes and relationships as metadata is built. Use of improving domain model in scenario area method that is used for scenario optimization conducts to enhancement of scenario optimization results. Scenario area method is adopted with account of domain object model building that includes analytical activity scenarios. Class diagram has been developed for domain and scenarios object model and can be used as computer model element of information-analytical program platform.

INTRODUCTION

Advanced analytics, new generation analytics and actionable analytics there are terms that Gartner used to identify information technology trends in analytics [1]. “Optimization and simulation is using analytical tools and models to maximize business process and decision effectiveness by examining alternative outcomes and scenarios, before, during and after process implementation and execution”, in this way Gartner identifies Advanced analytics [2]. Advanced analytical systems don’t have enough theoretical bases in development of information-analytical platform.

Advanced analytics application in decision management systems demands task solution of process of analytical activity scenarios formation. Analytical activity consists of regular collection and processing of information that can be used to support decision making and to study and investigate objects and processes features. Analytical activity scenarios specify order of analytical activity implementation with the aim of getting necessary information for sufficient decision-making. Scenario formation contains of scenarios building and optimization. That is why building and optimization methods are considered separately.

Design of information-analytical program platform requires development of adaptive elements in computer model of this system. It is necessary to create adaptive method of advanced analytics scenario formation according to the concept of object-oriented design and object model adaption for program platform.

ANALYSIS OF LATEST SCIENTIFIC RESEARCH AND ISSUES

Scenario building methods in scenario planning for socio-economic system development have being studied by V.V. Kulba [3, 4], S.A. Yudickiy [5]. Yudickiy gave a definition to the term scenario as a set of acts-operations that are imple-

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mented in current order either parallel or sequentially. The circuit-recursive method, suggested by Yudickiy S.A., is based on functional units building. Implementation of a scenario research with circuit-recursive method assumes decomposition of a system on component parts and defines the next parts of triad scheme:

- executive structure;
- scenarios as picture of planned behavior of executors;
- "supervisor" — manager that directs executors' behavior in accordance with specified scenario and real situations that particularly appear by exposure of external activities.

Circuit-recursive approach assumes sequentially entering and analyzing of new schemas that is associated with the result of previous modeling schemas. Relations between them display by tree-like graph. System consists of three levels and hierarchic structure. High difficulty of the system can cause the large number of functional units that are complicated to interpret or can cause contradictions in it. To remove existing limitation have been suggested to use object-oriented approach.

Methods of scenario optimization have been studied by P. Van Notten [6], P.H. Shumaher [7], A. Yang and H.A. Abbas [8], D.A. Kononov [9, 10], Z.K. Avdeeva and V.I. Maximov [11]. Those methods are using to find positive, negative and neutral variants of actions development.

Object structure includes a set of factors that define state of object and relationships between factors. This allows us to carry out an aggregation of factors into unified indicator. There is no necessity to conduct the aggregation of factors during scenario optimization because of different object entities in domain.

The aim of scenario area method is generation of possible scenarios that correspond to specified criteria. Criteria are used to split alternative set on groups and to make selection from variants due to conditions.

Analytical activity automation consists of two stages:

- Description of Domain — the stage where domain object model is constructed.
- Generation of Analytical activity scenarios — the stage in which functional part of information analysis process is built.

Analytical activity scenarios use domain object model (AOM) for access to correspondent objects. In this way we suggest to build adaptive object model that simultaneously includes description of domain and scenarios.

The aim of this article is development of adaptive object model (AOM) of domain and analytical activity scenarios that can be used to design programming platform of information-analytical system.

Object-oriented modeling method (DOMM) and adaptive object model approach are used to build domain object model for scenarios. Object-oriented modeling method assumes composing of object-oriented analyze and design. A result of applying OOMM is domain object model development [12].

Adaptive object model architecture has being studied by H.S. Ferreira [13], N. Revault [14] and L. Welicki [15,16]. An Adaptive Object-Model is a system that represents classes, attributes, and relationships as metadata. It is a model based on instances rather than classes. Users change the metadata (object model) to reflect changes in the domain.

An Adaptive Object Model is where the object representation of the domain under study has itself an explicit object model (however partial) that is interpreted at run-time. Such an object model can be changed with immediate (but controlled) effect on the system during it's interpretation and runing [17].

The real power in Adaptive Object-Models is that the definition of a domain model and rules for its integrity can be configured by domain experts external to the execution of the program [18].

The main advantage of adaptive object model is ease change. Adaptive object model is used for development of system which allow user to "program without programming" [19]. AOM is appropriate solution when system domain has been changing permanently or users have need of dynamically configuring their applications.

Scenario area method was suggested for scenario optimization. Concept of variable and its range are used in this method. We applied this method for building scenario object model and made two analogies: from value to "Entity" of domain object model and from value of variable to "Attribute" (see next).

An adaptive object model that submits classes, attributes and relationships as metadata in the notation of class diagram has been developed using the concept of model-oriented approach and basic methodology of Adaptive Object Model building which create a possibility to form object model in accordance with mathematical model and analytical activity scenarios on the basis of object model (Figure).

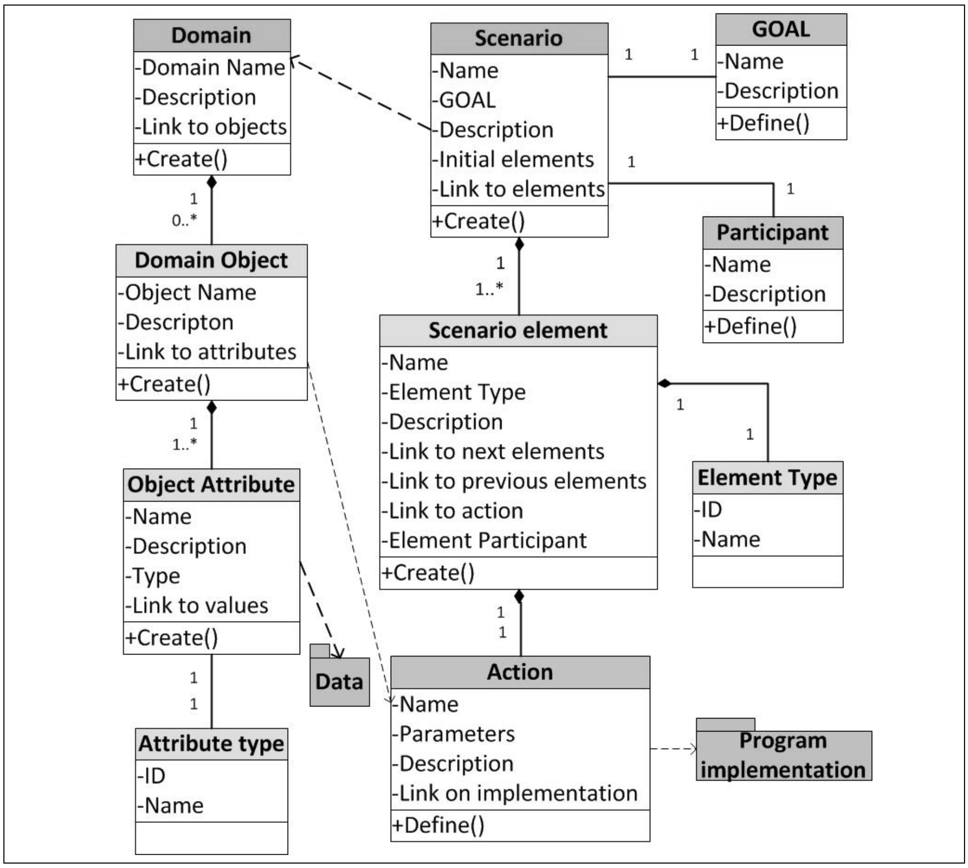

Figure. Adaptive object model of domain and scenarios

Adaptive object domain model includes following items: “Domain”, “Entity”, “Attribute” and “Attribute Type”.

- “Domain” — a combination of interrelated concepts that characterized by following properties:
  - “Domain Name” — a short name of the subject area;
  - “Description” — a brief description of the subject area;
  - “Reference to entities” — a link to all entities that compose description of the subject area.
- “Entity” — combination of objects in the domain. It has following properties:
  - “Entity name” — a short name for domain entity;
  - “Description of the entity” — a brief description of domain entity;
  - “Link to the attributes” — a reference to the list of attributes that characterize this entity.
- “Attribute” — characteristic property of domain entity:
  - “Attribute name” — a short name for attribute of entity;
  - “Attribute type” — a type of value for attribute (numeric, text, etc.);
  - “Link to value” — a reference to program data containers, which provide access to values of attribute in appropriate structures of data (files, databases).

Value — data structures that store attribute values of domain entities.

Data structures — data in different file types (text, executive, multimedia) and elements of databases and data warehouses.

Values can be single (number, character string) or plural (database record, database table, data warehouse cube).

- “Attribute TYPE” — a directory of all scenario event types with following properties:
  - “Code ID” — a unique code for each type of attribute;
  - “Type name” — a name of attribute type.

Scenario object model includes following items: “Scenario”, “Scenario Element”, “Element Type” and “Action”.

- “Scenario” — a combination of interconnected elements of scenario in various types (actions, events, messages, etc.).
  - “Name” — a short name of scenario;
  - “Scenario GOAL” — a goal of scenario analysis;
  - “Description” — a brief description of scenario;
  - “Scenario participant” — a participant of scenario (Analyst, domain expert or users and also members of processes that interact with this scenario);
  - “Initial Elements” — a link to initial elements of scenario (one or more), from which it begins;
  - “Link to elements” — a reference to all elements of scenario (scenario element can be part of some scenarios).
- “Scenario Element” — an entirety of consistently associated between each other scenario elements that specify different activity types (actions, events, messages, etc.) and maintain links to implement their functions.
  - “Element Name” — a short name of scenario element;
  - “Element type” — an identifier of actions, events, messages, etc.;

- "Description of the element" — a brief description of element;
- "Link to the following elements" — a reference to elements of scenario that will be enforced after this action;
- "Reference to previous elements" — a reference to scenario elements that precede on this action;
- "Function Reference" — a reference on description of function that implements functionality of the scenario element;
- "Element Member" — a subject that activates execution of this element.

• "Element Type" — an element type specifies various mechanisms of the element implementation during scenario execution.
- "Type ID" — a unique code for each scenario element type;
- "Type Name" — a text description of scenario element ("action", "event", "message", etc.).

• "Action" — describes functional realization of scenario elements. An object "Action" has following properties:
- "Function name" — a function name, which is used when calling action of those exist;
- "Options" — a list of action parameters (possibly empty);
- "Description of action" — an algorithm of action in terms of domain objects;
- "Link to implementation" — a reference to software implementation of actions (module, service).

Software implementation — is a software module or a service that implements the algorithm for corresponding action.

Access to data is performed through the metadata of domain model. In this way scenario model doesn't depend on data and can be configured on different data sources through appropriate metadata.

This building model feature allows modelling of scenarios executing using relative data in test mode. Scenario can be configured on real data base after it testing through configuring of the appropriate metadata.

Such elements of adaptive object model as "GOAL" and "Participant" are incomplete which demand more detailed research.

SUMMARY AND CONCLUSIONS

Use of described adaptive method of analytical activity scenarios formation extended the possibilities of scenario-target approach application in management activity. Advanced class diagram can be used in information-analytical system on program platform. Analyze and assessment of socio-economic, ecological-economic and similar processes in region and those that related to it will be simplified by analytical activity processes.

Area of research in this field is the next-generation research. Tasks that should be considered are: development of information technology for fast interpretation of adaptive object model and enhancement of this model by defining objects "Goal" and "Participant".

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