The intelligent office cognitive engineering by rational and reactive mind invariants

Kostenko Konstantin I.
candidate of science, assistant professor,
Kuban State University
Stavropolskaya str. 149, Krasnodar, Russia, 350040
kostenko@kubsu.ru

Lebedeva Anastasiya P.
senior teacher,
Kuban State University
Stavropolskaya str. 149, Krasnodar, Russia, 350040
lebedeva@fpm.kubsu.ru

Levitskii Boris E.
candidate of science, assistant professor,
Kuban State University
Stavropolskaya str. 149, Krasnodar, Russia, 350040
bel@kubsu.ru

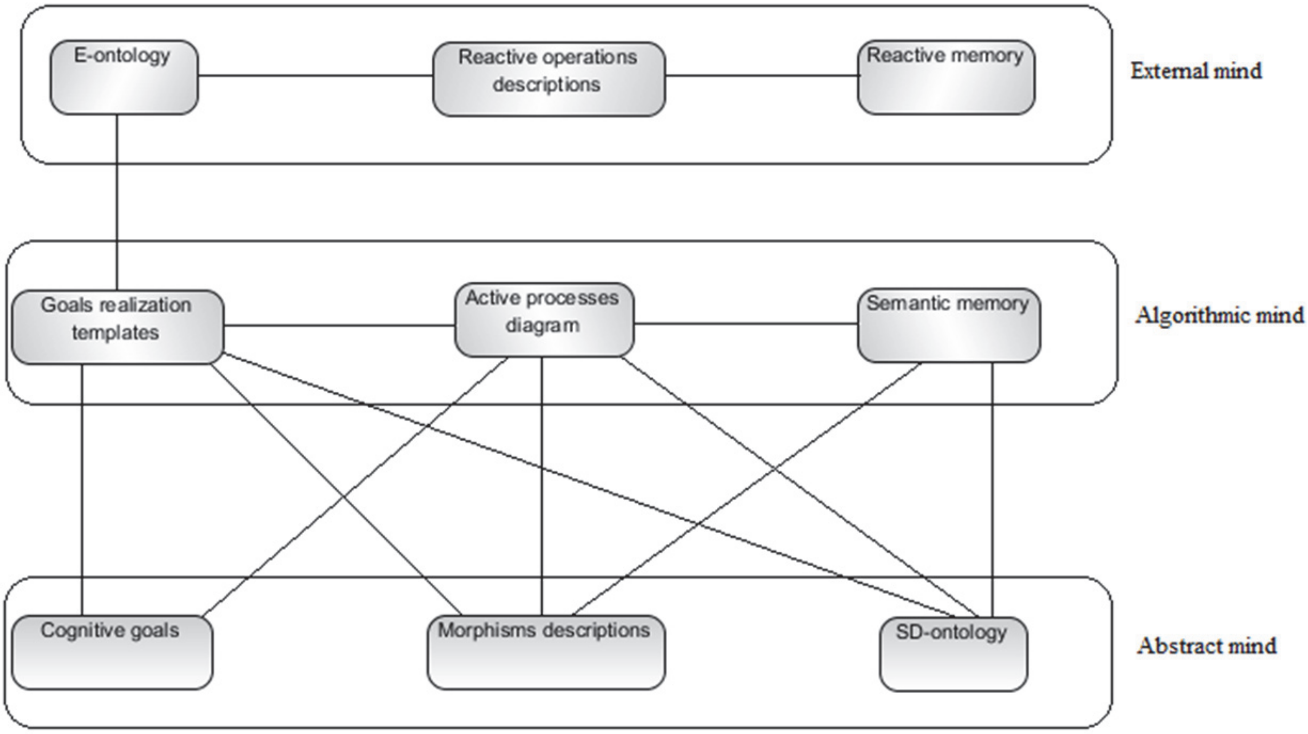
Abstract: Effective professional tasks management at modern office suggests creating the special tools for knowledge area content representation, distribution and application, focused on business goals realizations. The technologies of cognitive synthesis guided by formalized descriptions for knowledge area subject and professional knowledge are the cornerstone of such tools. The offered office goals management technology based on unified invariants for describing the intelligent goals realization processes and organized as multi agents system. Invariants allow imbedding into content of areas with complicate semantics. The cognitive synthesis processes based on applying the mind thinking processes formalized scenarios. Their general descriptions implemented by cognitive goals realization templates as scenarios include the knowledge processing operations. Synthesis processes use the knowledge bases realized as ontologies created for professional activity areas. These ontologies constructed by reversible decompositions of the weakly formalized professional activity area content distributed into spaces of knowledge area subject and professional knowledge. Cognitive synthesis consists in integrating the ontologies elements into complex semantic structures of semantic hierarchies used as general format for transforming ontologies content into professional goals implementations.

Keywords: intelligent office, professional goal, cognitive goal, cognitive synthesis, ontology, knowledge processing, subject content

1 Intelligent office as an abstract system

Intelligent office is a system for modelling and control the professional activity at given subject domain by tools that simulate information structures, operations and processes at human mind. Uniform structure for intelligent office based on integration of functional and informational entities from different knowledge areas, involved into studying the mental structures and processes. The set of such areas includes linguistics, psychology, mathematics and philosophy. Ensuring the correctness and accuracy for formalized office model imply special importance of mathematical tools for modelling the office structure and functionality. Fundamental initial concepts at the knowledge areas ontological modelling consist in applying the classes of linguistic and mathematical objects represented as symbolic sequences. The first class called *names*, and second one – *formal expressions*. The names elements used for designation the professional language entities. Expressions represent entities descriptions realized as elements of mathematical language and called formulas. Mathematical expressions as ontology class's elements define additional content based on semantic relations between expressions and names.

Intelligent office, as example of general formalized system, has multilevel uniform information components structure, approved for thinking process modelling. We shall discuss the three level universal architecture for such structure that allows extension and adaptation of considered levels components into prototypes of specialized abstract and applied intelligent office models. This architecture borrows principles of rational and reactive minds with well-balanced levels called as minds [1]. Outlined levels named as external, algorithmic and abstract minds. Their fundamental information and functional components represented on picture 1.



Picture 1 – Office uniform information components structure

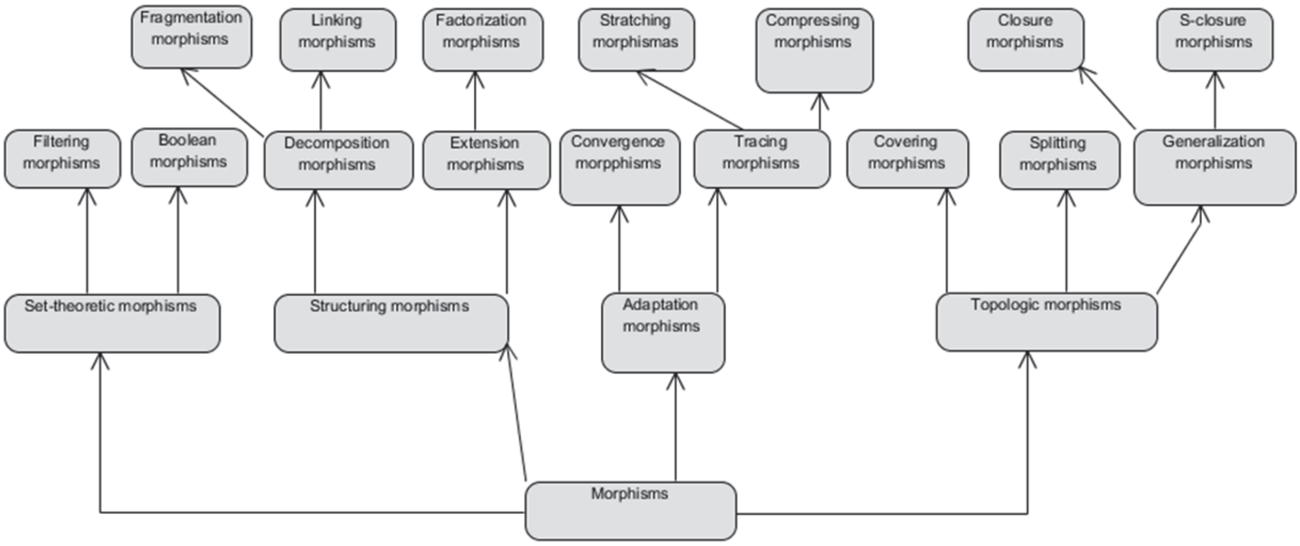
External mind has cursory status [2]. It realizes external information flow quick heuristic analysis, and includes three main structural component. In short, information flow reflects at reactive memory as sequence of information objects processed by reactive operations with results as E-ontology elements. Such ontology accumulates results of input information analysis, performed for unstructured objects by procedures based on general activity domain content representations formats. Reactive operations perform transformation and transition of data from reactive memory into E-ontology. These operations activated when general activating conditions satisfied. The E-ontology content integrates external data for activating the professional goals and their implementation by algorithmic mind agents.

The level of algorithmic mind includes informational structures that used for professional activity simulating organized as system of coordinated cognitive goals realizations. Such goals recognized by processing E-ontology content. Their activating consists in selecting the appropriate goals type and searching goals realization templates. The followed necessary steps realize adaptation of selected goals to situations that activates the goals processing. The active processes diagram used for activated goals templates realization control. Semantic memory is a structure, uniformly formatted as hierarchical structure that used for processes results accumulating, and interchanging.

The abstract mind level keeps abstract entities for human intelligence simulation with formal systems of abstract knowledge transformation morphisms and knowledge area ontology.

The cognitive goals information component includes declarative descriptions of weakly formalized basic cognitive goals. Basic goals types system used for simulating set of human thinking processes types that seemed to be substantially full. Such developed in detail system primary introduced by B. Bloom widely approved and recognized within specialists [3, 4]. Goals descriptions form hierarchies in relations of inclusions and aggregation. The cognitive goals component includes also rules for complex cognitive goals constructing from the primary or basic goals. Morphisms descriptions component keeps formal definition of operations, included at goals realization templates descriptions. The morphisms classes' hierarchy includes elements that simulates formalized objects, analogous to set-theoretic, algebraic, logic and topologic invariants of formal systems. These morphisms classes allow explicit mathematical descriptions and separate morphisms computability with constructive domains and ranges called as morphisms bases.

The morphisms descriptions area accumulates abstract morphisms classes defined as analogs for functional components at mathematical theories and adapted to unified knowledge representation formats. Example of the morphisms classes' hierarchy, able to make cognitive goals implementations by modelling the human thinking operations and processes represented on picture 2 [5]. This hierarchy ordered by classes' inclusion relation. The abstract mind is an intelligent system level that realized as formal and abstract description based on grounds for thinking processes simulation.



Picture 2 – The basic classes of knowledge processing morphisms

Components pointed on the given picture correspond to formally defined classes of morphisms. Every class definition includes description of domain and range for knowledge processing operations, performed by intelligent agents as basic elements for functional intelligent office components. Descriptions supplied by pointers at information components subareas for extracting initial data and keeping morphisms results. Agents integrated by classes distributed between levels components on picture 1. All agents realize their functionality by exchanging results stored at intelligent office semantic memory.

The abstract mind level last information component is subject domain ontology (SD-ontology). It used for keeping the elementary and simple knowledge at simulated professional activity domain. The sets of elementary knowledge and semantic relations supplied by elementary knowledge classification and integrating tools, general within ontologies.

There are two universal formats exist for modelling the intelligent office information keeping components. The first one based on knowledge algebraic structure as binary trees marked with composition operation at internal vertices and elementary knowledge assigned to tree leaves. The second format distinguish elementary knowledge as individual knowledge and knowledge relations. Last format operates with marked binary tree based structures, with relations assigned to internal vertices and individuals at leaves. Structured objects realized by last format called semantic hierarchies [5].

2 The knowledge area ontology uniform structure invariants

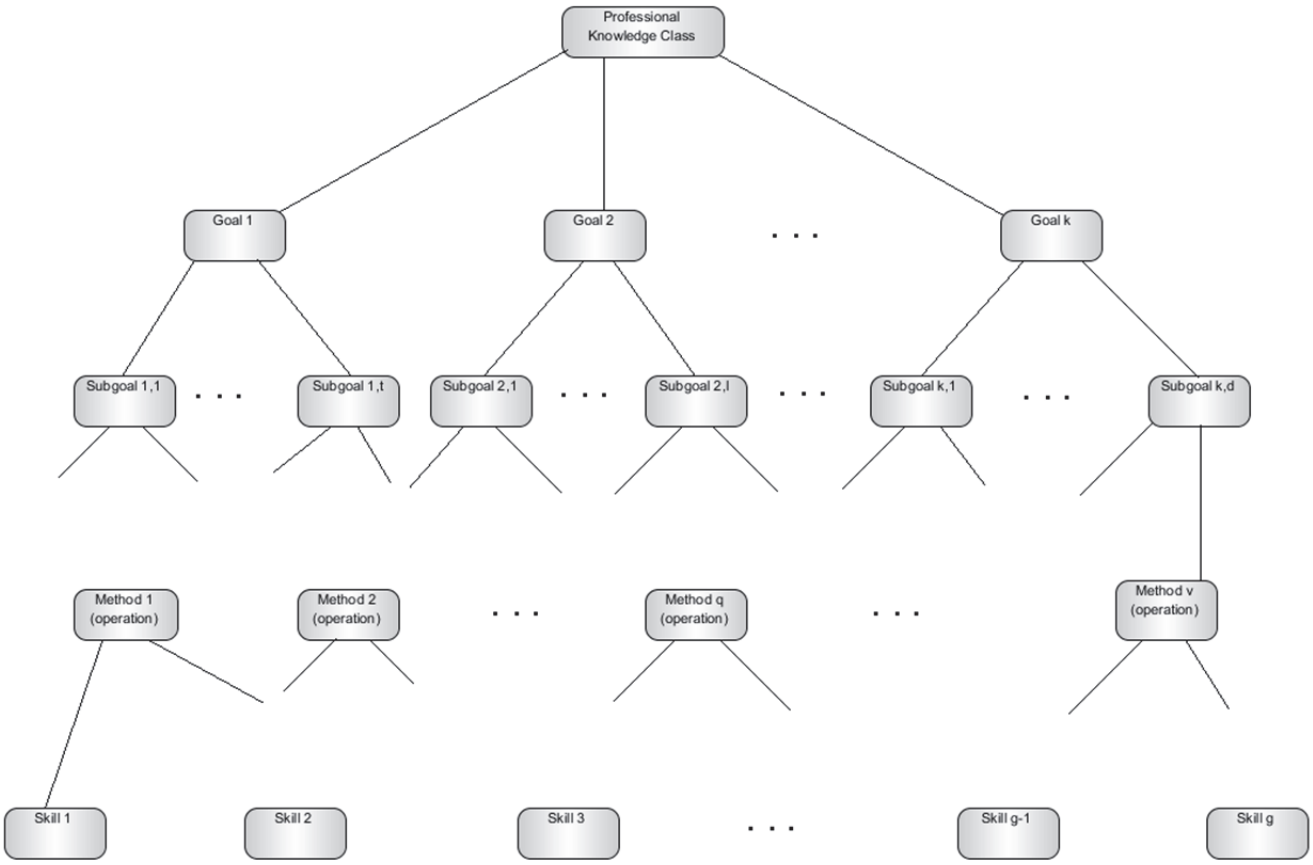
Intelligent office at some professional activity domain serve to be the high level tool for managing the processes of professional goals realization, based on subject and professional knowledge at such domain. The basic knowledge have uniform representation formats and classified as elementary and simple knowledge. Elements of these classes considered elementary or undividable. They form the basic set with names or mathematic expressions as its elements distributed among two type's classes. By the first type of classes realized the ontology linguistic aspects. They include objects with common properties and processing procedures. The classes elements used for synthesizing the complex knowledge descriptions as structured context based on names of entities and relations. Classes of formalized mathematical expressions represent formal laws and dependencies at subject domain. They allow automatic processing within simulation the algebraic and logic computations. Mathematic expressions may include names of subject domain entities where they represent expressions parameters with values of types assigned to algebraic and logic operations within expressions. Mathematic expressions and subject names supplied with sets of entities properties (classes) and relations. They define space of subject knowledge.

The knowledge area elementary and complex knowledge classifying based on the special hierarchical structures of knowledge representations classes. Systems of knowledge semiformal classification for such domains use several universal classifiers that allows defining independent knowledge parameters applied for realization knowledge processing at intelligent systems. We shall distinguish classifiers for subject knowledge, knowledge roles in knowledge area content, professional knowledge and knowledge qualitative filters. All these classifiers structured by classes' inclusion relations, usual for formal models based on ontologies.

The subject classifier defines knowledge area content multilevel partition with following possible variant of levels names: domains, subdomains, sections and subsections. The subject knowledge classifier allows preparing initial data for SD-ontology creation by tools of SD-ontology classes extracted from classes of subject knowledge classifier. Such classes contain knowledge for searching the professional problems solution, suitable to current or initial circumstances.

The classifier of knowledge *roles* operate with knowledge attribute, used for elementary knowledge appointment into complex knowledge structure representations. *Roles* are important for constructing the knowledge area ontology as classes that contain elements included into fixed positions of synthesized semantic structures and knowledge relations to other knowledge structure elements. These classes used as general information resources for creating the pattern of cognitive synthesis processes. Such patterns allows accumulate scenarios for simulating the knowledge synthesis processes by formalized descriptions, intermediated between implicit cognitive goals semantics and explicit operational semantic for knowledge processing operations. The specific separate knowledge *role* feature expressed by property of uniqueness for the way at roles hierarchical structures from classifier top to the most exact meaning considered knowledge role. There are two possible variants for roles application at knowledge areas ontologies. The first one based on special class that accumulate roles classifier elements. These elements joined with ontology knowledge entities by *entity role* relation. The second variant based on splitting the general classes of knowledge into subclasses with roles reflection within classes' names. The first case is preferable to situations with great roles variety. Second way used when there are big knowledge subclasses with the same role assigned to separate knowledge. The ontology classes' partitions caused by roles convenient if consider them as stages of ontology developing. For example, general class of mathematical expressions partitioned into following classes named by following common roles meanings: equations, constrains, tasks solutions, tasks settings, formal concepts definitions, theorems and hypothesis. All these roles are useful for knowledge processing opportunity.

The next professional knowledge classifier represents multilevel structure for integration the professional goals (tasks) properties and processes formal descriptions. Levels of such structure possible names: tasks, subtasks, methods, professional skills. Example of such a structure presented on picture 3.



Picture 3 – Classification the subject domain professional knowledge entities

The knowledge area professional knowledge classifier has uniform level structure. Its first level represented by list of professional goals. Such level integrates subject domain goals into general classes of independent general goals variants. Realizations of such classes' elements correspond to complete system of office lifecycles. Elements of goals level joined by different relations. These relations serve to be the foundation for goals combination, estimation and selection.

Goals realization scenarios form special information area by processes based on patterns operations/ Scenarios created as schemes of template sequential and parallel composition, processes splitting and integrating, supplied with descriptors of operations selecting, accommodation and coordination. The professional knowledge space elements used for creating the processes diagrams components. These diagrams located into algorithmic level of intelligent office information structure. Such diagram changed dynamically by inserting goals realization scenarios adapted to current circumstances, deleting completed scenarios and extracting new experience added to knowledge area ontology.

Next picture 3 level used for representation intermediate entities (sub goals) that decrease distance between goals subject domain semantic and operational semantic for knowledge processing operations. Connections between first and second level elements define sets of sub goal whose elements form goals structures. It is possible for goal to have several such structures as independent variants of goal realization scenarios based on sub goals. Such scenarios collected from combinations of sub goals sequences, variants and compositions as scenarios for goals realizations. Implicit scenarios descriptions based on sub goals represented at special part of digital office ontology. The third level of professional knowledge classifier contains techniques (operations) for sub goals realizations. One sub goal realized by every operation it connects with. These operations differ in initial conditions that recognize operation realization activating and ending. Every operation joined with previously given scenario's operation. The diagram skills level accommodates activity domain specialist's personal experience, used as parameters for efficiency increasing for the operation simulating procedures.

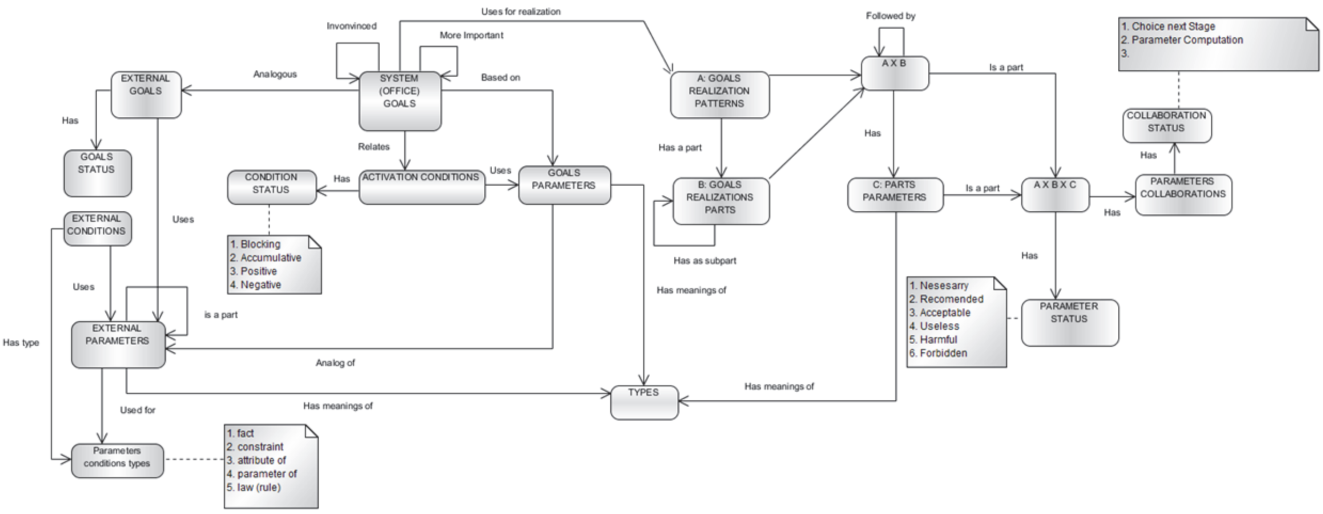
The professional knowledge classifier elements used for modelling the structure of cognitive goals realization processes. The professional knowledge classifier elements and their intercommunications allows activate series of problems solving diagrams and control their joint realization. Diagrams elements corresponds to professional classifier elements and have hierarchical structures defined by classifier levels and relations between one level elements that define semantic of diagrams based simulating of problems solving.

Filters designate classifier for qualitative knowledge properties represented by sets of possible meanings of property existence degree. Filters allows selecting sets of knowledge with given qualitative properties that provide an opportunity for synthesized knowledge qualitative homogeneity. The filter classifier structure consists of substructures that relates to such universal properties of knowledge as completeness, importance, validity and accuracy. Every separate knowledge define unique way at universal substructure of filters classifier from universal class as top through classes that contained given knowledge.

2.1 Ontology of goals activating and control general structure

System of cognitive goals integrates imaginations for variety of human thinking processes. General goals classification introduced by B. Blum divide goals by classes of knowledge understanding, remembering, estimating, applying, generalization, analysis and synthesis [2]. These classes are general and weakly formalized for complete and explicit realization by algorithms. They provide informal declarative descriptions and tools for composition into stages of scenarios for complex goals realizations. Associations between goals and abstract operations define way for cognitive goals simulation by knowledge processing morphisms. These morphisms belong to different classes defined as analogs for functional objects at existing mathematic systems [4].

Let us consider the ontology example of fragment as the digital office ontology classes relates to problem of goals realizations activating for current circumstances.



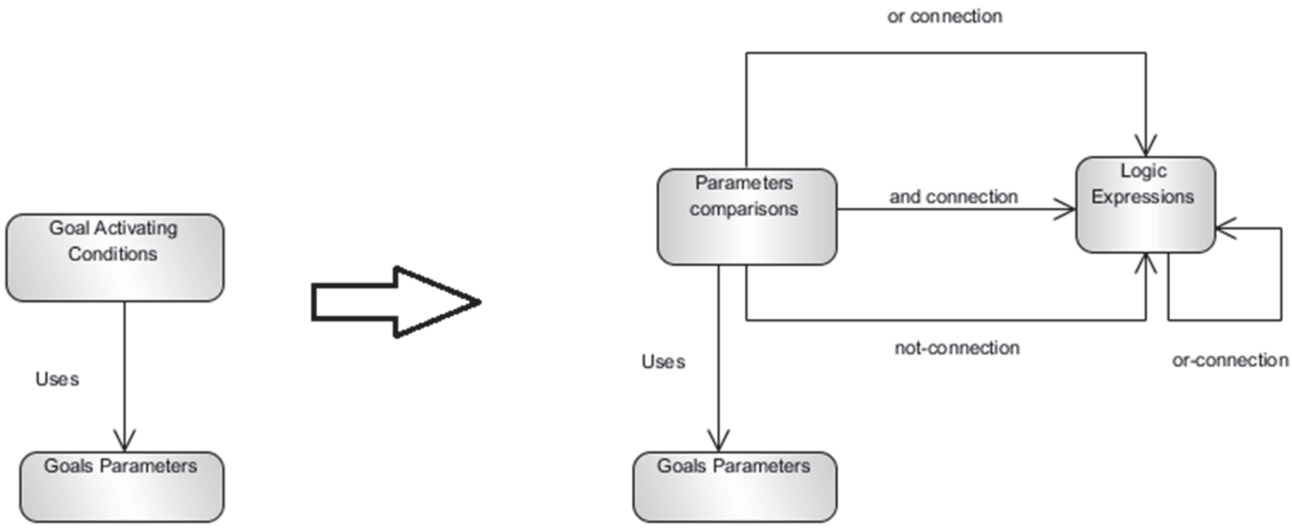
Picture 4 – Basic classes for intelligent office ontology

Example of such fragment represented on picture 4 as cognitive map. That example includes classes for all levels at uniform intelligent office structure. The E-ontology fragment represented by four classes on cognitive map left side. These classes are external goals, external goals status, external parameters and external conditions. Classes content used for keeping the initial data processing results that describe initial situation formal representation by sets of recognized objects and relations as reasons for goals activating. These goals outlined with their status extracted as statuses class element. Goal status defines its significance and priority among other goals, extracted from set of recognized goals. External conditions represent goals circumstances and current situation formal descriptions based on system of comparisons for goals and situation attributes and parameters. System of comparisons and their logical combinations forms class *external conditions* in picture 4.

So far, we consider five left classes at knowledge map as example of E-ontology realization. External conditions class elements (parameters) attributed with property of conditions (parameters) types. These types expressed by elements served to be descriptions of condition status, presented by elements within note, anchored to class of condition types and recognized by reactive operations at external mind level.

Goals recognizing and activating processes concentrated at algorithmic mind level. They involve processes of testing the goals activating conditions as well as selecting the goals templates needed for realizations. The class of professional goals activating ontology given on last picture as class of system goals. The goals activating processes based on sets of activating conditions structured by relations with conditions statuses parameters. The condition status parameter, as example, determines separate conditions roles for goal activating. This attribute meanings used when conditions is met. For used knowledge resources, it is possible to estimate goal activation arguments and select goals system with initial circumstances of goal's implementations. Condition testing includes computations based on settings the goals parameters meanings constraints that take place for current situation description provided by E-ontology. Descriptions transferred into conditions for analogous goals parameters by relation between classes of goal parameters and external parameters. External parameters conditions included into goals activating conditions and verified by checking the truth of implication between transferred parameter comparisons and comparisons at activation conditions. For example, transferred condition « $temperature > 200$ » implied by transferred condition « $temperature = 314$ » and not implied for transferred parameters comparisons « $temperature < 400$ ».

Goals activating conditions general format allows to use possible any logical expressions as condition representation. That implies possibility of complex semantic constructions, created by elementary conditions combinations. Elementary condition looked as pair of algebraic expressions, connected by relation between expressions meanings. The simple form for such conditions includes the knowledge area name, knowledge area objects parameter and its meaning, joined by comparison. The mentioned condition format convenient for facts descriptions at professional tasks settings. The complex conditions expressions apply different schemes for conditions combinations based on Boolean, modal, threshold, neural, preferential tools, usual at experts knowledge representation formats. Example of activation conditions class at basic ontology extension into detailed ontology model description presented on picture 5.



Picture 5 – Basic ontology extended fragment for simulating the complex activating conditions structure

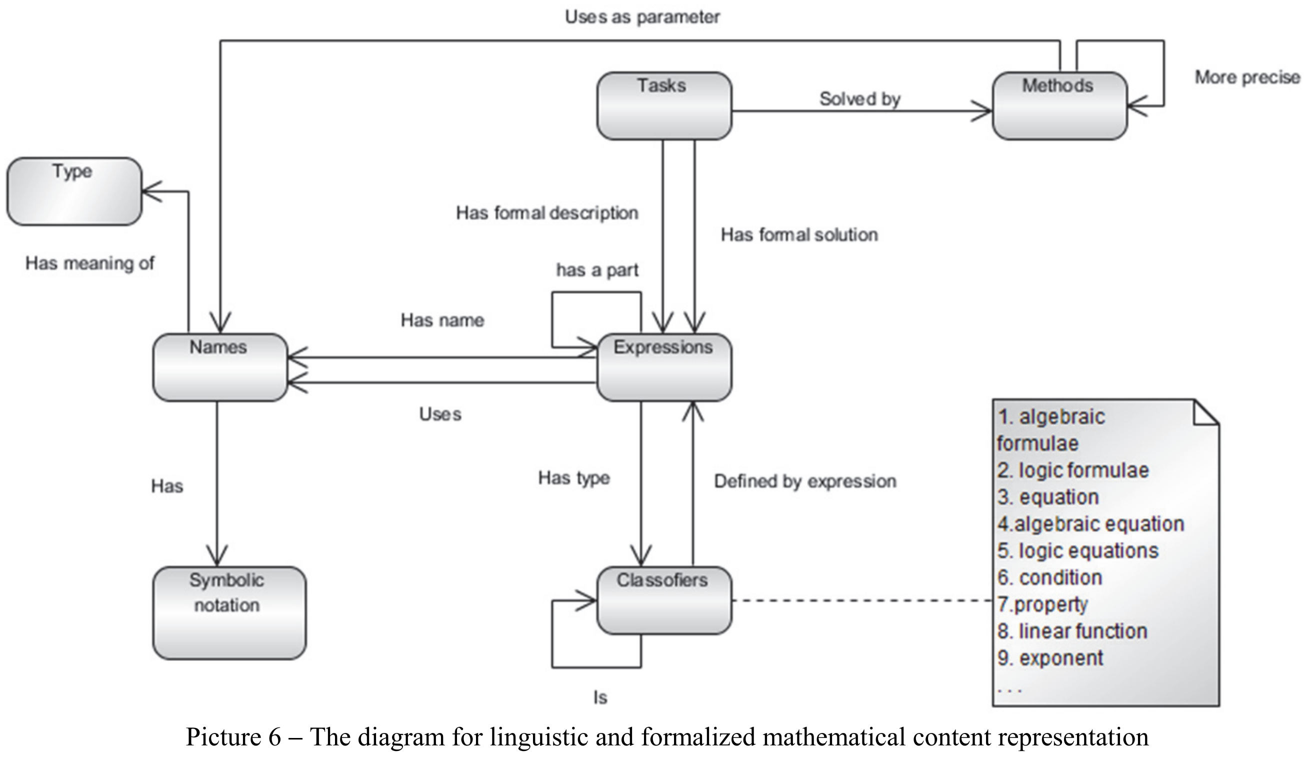
Simplified basic ontology third part placed on right half of picture 4. That fragment contain knowledge descriptions for goals realizations patterns and relates to algorithmic mind level on picture 1. Every pattern has individual name. Patterns divided onto parts, integrated into scenarios and ruled by scenario parts parameters for goal realization process simulating. Basic classes applied for description the pattern structure and parameters integrated into classes compositions ($A \times B$ and $A \times B \times C$). Classes compositions used as special form for simulating predicates with any number of parameters. Pattern structure is hierarchical (has no loops) for considered case. But it allows splitting and integrating pattern realization processes by constructs of variant and sequence. These constructs described by parameters of collaborations and statuses. Every subject domain correlation represented by mathematical expression based on its status, goal setting and realization elements meanings, computable pattern parameters. Considered ontology fragment extension allows simulating more complicated and detailed patterns formats adapted to application domains. Possible extension example provide transfer of properties variety for separate knowledge as parameters and collaborations status classes. Adding new elements into existing classes natural for class of collaborations statuses for new professional areas. That class filled up with such elements as goal realization abnormal termination, temporary suspension, waiting for other goal pattern realization.

2.2 General office goals and operations classifications

One can explain the general concept of goal as situation that demand mental activity based on knowledge area formal description. Such description is a result of activity area content decomposition into sets of elementary and simple knowledge (relations between elementary knowledge) called as subject domain ontology. These knowledge form domain basic semantic structure added by auxiliary constructs of elementary knowledge classes, relations between classes, classes and relations inclusions. Introducing into consideration special functional tools for systems of elementary and simple knowledge processing leads to transformation the general ontology concept into ontological formalizations, usually realized by appropriate descriptive logic. The set of such logics developed by expanding the sets of knowledge properties (attributes) and basic knowledge processing operations. Creating the complex knowledge processes for solving the professional tasks suppose applications for powerful set of knowledge processing operations. These operations analogous to functional invariants at fundamental mathematic systems: set theory, abstract algebra, formal logic and topology. Integrating operations of different types into scenarios allows simulating for cognitive goals realizations by establishing ties between denotation cognitive goals semantics and operation semantics at morphisms' based scenarios. Unified system of basic goals, defined for intelligent systems full system of stages and lifecycles, includes knowledge understanding, remembering, applying, estimating, and generalizing. Goals of these classes used for simulating the processes of professional tasks solving by human experts.

2.3 Formats for knowledge area mathematical content management

Developing ontology of goal activating conditions suppose integration into considered ontology structure new formal entities represented by special classes and relations. Every such structure associated with concrete goals system and based on parameters comparisons, comparisons logic combinations and comparisons modality. Extended system of classes that represents new goal activating conditions possibilities synthesized from knowledge area cognitive map with unified format provided by picture 6.



Picture 6 – The diagram for linguistic and formalized mathematical content representation

2.4 Semantic memory general format

The knowledge area ontology, adapted to professional activity domain, is a foundation for realizations the cognitive goals by formalized knowledge algebraic structures. Every knowledge processing operations transform operation domain elements into elements of operation range. Elements of operation domain extracted from classes of external and internal resources. External resources formed by classes originated out of systems and considered as initial data for intelligent system operations and processes. Resources of the second type created as results of intelligent system scenarios and operations realization. These resources remembered and kept mainly into general semantic representation, called as semantic memory state.

Preferable format for integrated resources representation based on elements of semantic hierarchies' spaces [6]. Any such hierarchy represented by binary tree with leaves marked by elementary knowledge (subject area names or expressions) and internal vertices, marked by semantic relations between content for left and right subtrees of these vertices. Semantic memory content formed as structured set of unbounded binary tree finite marked subtrees. Every subtree used for keeping the one of performed operation results as set element.

System of unified complex knowledge structures for knowledge synthesis processes and operations results based on ontology elements. It includes ordered and unordered knowledge representation sequences, knowledge neighborhoods of different radius, knowledge compressions and transformations by algebraic computations and logical inference schemes [5]. The semantic memory structure initiated by set I of finite binary sequences ordered by sequences inclusion relations. Such structure defines the infinite binary tree with binary sequences as vertices. Semantic memory regular structures modelled by subtrees $I_{\alpha} = \{\beta \mid \alpha \subseteq \beta\}$, branches $I_{\alpha} = \{\beta \mid \alpha \subseteq \beta\}$, neighborhood with given radius. For describing the semantic memory fragments regular mathematic expression applied. Expressions define sets of considered fragment vertices. Semantic memory subtrees used as memory parts for inserting goals realization processes results into subtrees with given root vertices. It means that setting semantic memory subtrees, founded on regular set of vertices classes' descriptors, assigned to goals patterns realization results. Such addressing used for extracting and integrating semantic memory subtrees as operations initial data. Other possible way for addressing the semantic memory subtrees based on descriptors that used at selecting the filtering operations [5]. Descriptors used also, when operations' results spited and inserted into semantic memory by parts separately. Information deleting from semantic memory simulates forgetting fragments of thinking processes results.

3 Goal realization architecture functional modelling

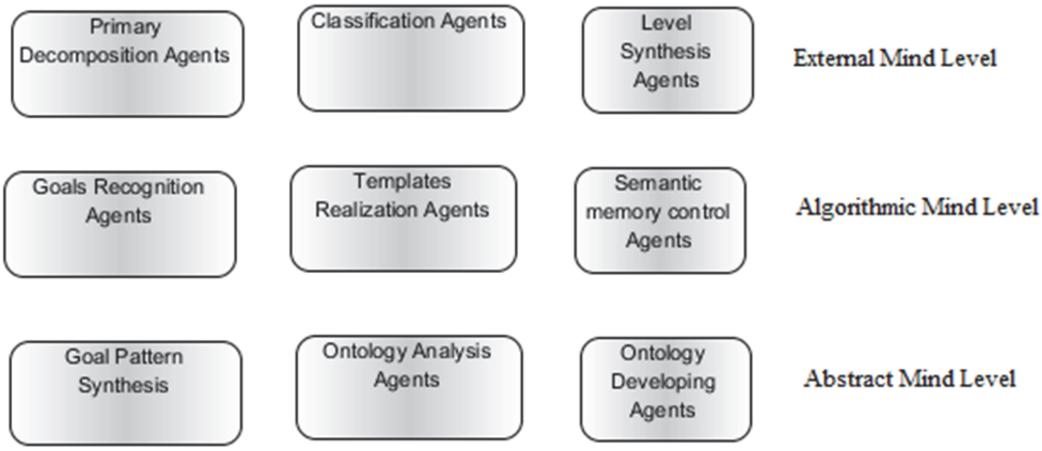
The office epistemology realized by system of intelligent finite and infinite agents. Agents realize operations represented at operations and processes hierarchy that used at lifetime of intelligent system. These agents are independent and appear as functional object within office functionality component. Agents used when it is necessary to simulate intelligent processes for activated cognitive goals realizations. Finite agents became active for realization the operation that recognized by the active processes diagram analysis. Such analysis performed by infinite agents as result of diagram elements status consideration. Finite agent activated for performing one-step of goal realization template, inserted into diagram. For that step extracting the data for processing performed by infinite agent that activate finite agents. These data search areas include semantic memory, E- and SD-ontologies fragments and other appropriate components of office information structure. Systems of components extracted fragments integrated into one semantic structure and used as modelled operation domain elements. Operation results prepared as complex knowledge representations for operation range elements. Such structured elements spitted into sets of fragments and inserted separately into semantic memory by two possible ways. The first one based on results associated with definite semantic memory fragments that described as regular structure assigned to results types. Unified example of such format for agents' results location gives knowledge sequences and knowledge neighborhoods. The second way based on goals descriptions, realized by properties of knowledge structure, inserted into semantic memory. Last format provide the independence for results, inserted into semantic memory. By ending the operation applied to certain activated goal template structure element by the agent, originated for such operation, stops his lifecycle and deleted from intelligent system lifecycle modelling.

3.1 Basic agents classes

Full intelligent agents' classification must carry out difference of their roles for logical and structural intelligent processes control as well as for separate knowledge processing operations adapted to concrete circumstances extracted from information flows and reflected at reactive memory. We shall distinguish two types for intelligent agents' functionality related to content transformation and content recognition. Transforming by set theoretic agents realize such transformation of domain elements into range elements that rearrange these elements. Transforming by data applying agents do not rearrange domain elements but realize themselves by expanding initial data into new content.

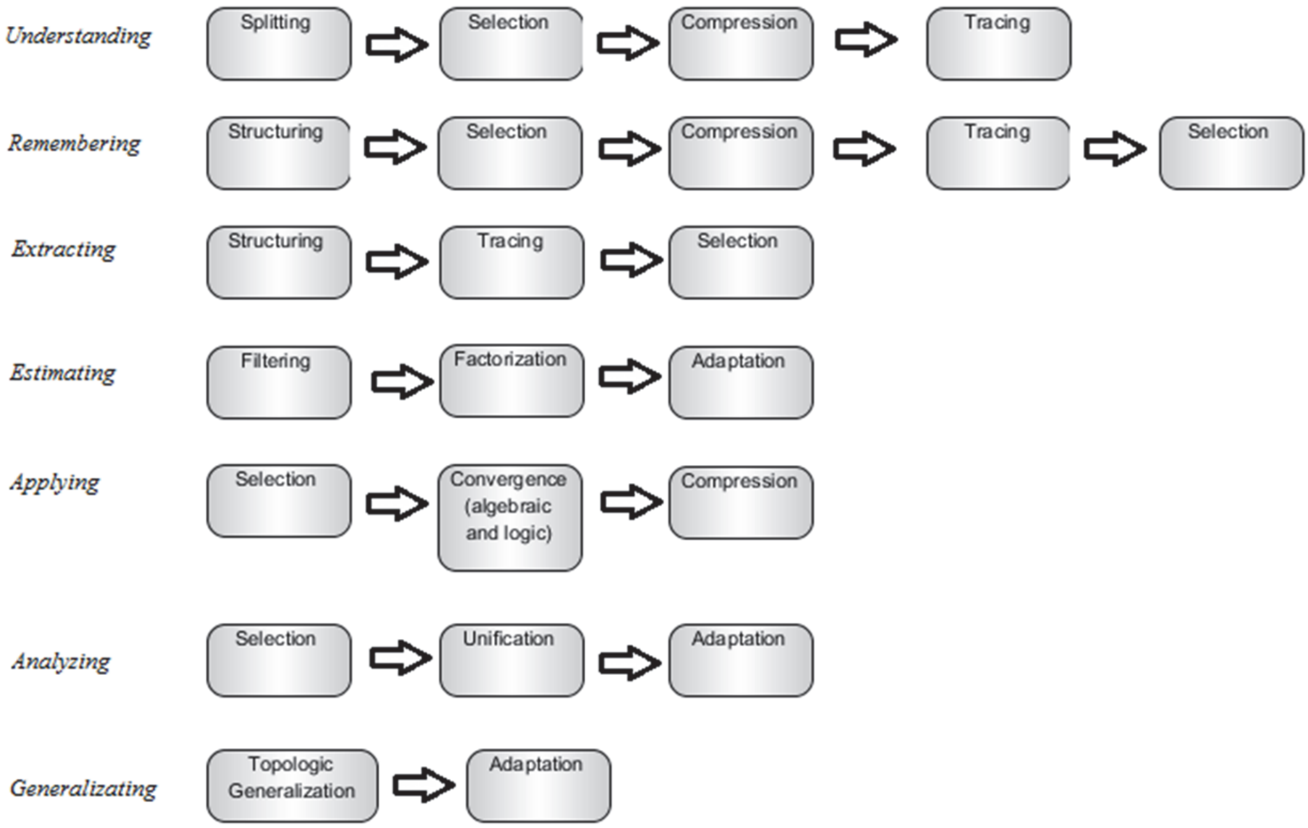
Recognizing agents prepare initial data for knowledge processing by transformations agents, activated when such data completed and recognized by agents. Structured object obtained as splitting the transformations agents results inserted into semantic structures, prepared for results inclusions into the information components introduced within office model. Transformation agents have finite lifecycles determined by time, needed for taking initial data and processing it into results. Such agents activated automatically by determining their type with selecting initial data and deactivated by putting their results into levels information components special areas. Example for levels oriented agent classes introduced by picture 7.

The external mind level agents realize information at their own formats and transform these data into descriptive logics explicit formats. Agents based on class of set-theoretic morphisms within morphisms classes' hierarchy, introduced on picture 2. Neural networks are natural as such agents with their ability for information object classification by filtering morphisms adaptation. Filtering leads to information's flows recognition and their further representation into E-ontology as statements about belonging to ontology classes. Other morphisms types used by agents at external mind level relate to information flow objects decomposition into elementary parts with further joining by semantic relations extracted from preliminary defined set. Such parts and their relations allows creating the E-ontology as structured description for outer word state developing that imply algorithmic and abstract levels agents processing. The inverse processes exist for transforming E-ontology elements inserted as algorithmic level processes results. Such transformations include synthesis structures with complex semantic and their inserting into reactive memory. External mind level functional elements general constraints based on fast feasibility of strait processes. Level inverse processes realized by backward synthesis processes.



Picture 7 – Level oriented agent classes

Algorithmic level agents define extensive variety of functional object that grouped by invariant of cognitive goal realization with templates as foundation for such realization. Templates based on cognitive operations that simulated by abstract morphisms, morphisms domain and ranges, predicates for activating and completing the process of template stages realization. Separate cognitive goals classes' templates represented as morphisms classes' sequences. Examples of such sequences for main types of cognitive goals shown in picture 8.



Pictures 8 – Cognitive goals realization templates as morphisms sequences

These types represented by left row elements. Other raw elements form ordered structure of template stages, associated with types of operations performed for these stages. The first raw establishes template for understanding goal with the assigned actions performed in sequence. Splitting operation means operation ended by receiving the decomposition of initial data. Operation performed under formalized meta-ontology for initial information control. Result of splitting stage represented by series of recognized structural elements. The second understanding template stage realizes transformation that selects SD-domain ontology fragments that represent knowledge connected with elements of decomposition. Such fragments composed with result of splitting stage into complex knowledge representation. The second stage result interpreted as SD-ontology based explanations for elements of decomposition. The stage followed the selection consists in optimization the selection result by deleting the duplicating structures and insignificant parts of semantic structure fragments. The last scenario element based on tracing operation used for extracting substructure of given semantical structure by appropriate tracing mapping/ That provided receiving the initial information explanation with demanded accuracy. The additional type of scenario description elements make rules for stages results remembering within semantic memory area at used knowledge representation format. Parameters of rules descriptions specify inserted structure and its location at memory, as well as access formats for other scenarios realization operations within intelligent office lifecycles and goals realization processes. Additional semantic memory attribute used for keeping the inserted fragments temporal properties.

Transition conditions for scenario stages represented by predicates whose logical meanings used for ending stages performance and transition to the following template stages. Special predicates used for templates realization ending, stopping and continuing. Other goals template linear scenarios represented on picture 8 show possible variants for all types of Blum's cognitive goals realizations. These goals classes are general, but they define complete cognitive goals system and any concrete goal belongs to one of these classes or is a combination of classes' goals. Every goal realization template allowed existence the variety of possible template detailed descriptions. They determined by choosing the morphisms classes' elements, remembering and extracting domain and range data at information components of office architecture.

The abstract mind level agents based on cognitive goals and abstract morphisms descriptions as well as descriptions the ontology processing scenarios. These agents realize processes that prepare abstract fragments of SD-ontology, structures of morphisms classes and cognitive goals types required by agents activated at algorithmic level.

3.2 Active processes diagram processing agents

Processes diagram is a dynamical structure that contain selected goals realization scenarios included into diagram as adapted templates for activated goal realizations. Uniform structure for patterns based activated goals implementations diagram is patterns sequence ordered by realization priority. Patterns appeared at such sequence, if correspondent goals activated and deleted if goals realizations terminate. Pattern realization process controlled by agents based on templates separate performing by assigning operations (morphisms) to stages, checking processing's results and control the transitions between patterns stages. Stages' results used for planning further actions at realization the template processing. Processes diagram elements marked with ending attribute assigned by pattern selection operation. Pattern fragment deleted from diagram when its performance completed. The pattern element at processes diagram description associated with agents for initial data extracting, stage realization morphism activating and results insertion. They coordinate processes of templates realization.

4 Final results and conclusions

The three level architecture for human mental behavior simulation well known between specialists in psychology [1]. Its adaptation to knowledge-based processes at artificial intelligent systems enable developing structural and functional invariants that allow intelligent systems comprehensive mathematical exploring. Three level intelligent system architecture fundamental invariants help to suppose universal framework for creating artificial intelligent system with complete modelling the thinking processes and professional goals implementation at any professional activity area. The human mental processes universality and completeness provides such systems intelligent abilities, comparable with knowledge area specialists thinking operations extended by tools for goals analysis, activating and performance controlling. Constructs and invariants introduced into provided unified general purposes intelligent system model forms solid base for develiping the special intelligent offices creating platform.

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