Method of Mapping for Semantic Static Constructions into Syntactic Constructions in the Design of Information-Active Systems

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Abstract. The design of information-active systems provides the formation of the model representation of automated tasks, which is invariant to the environment and means of software and hardware implementation. The syntactic (info-logical) model representation of applied problems will be adequate to initial requirements only if they provide meaningful unity. It is determined by the initial formation of a knowledge model or conceptual representation of applied tasks. The conjugation of semantic and syntactic static constructions is based on the regularity of mapping in the framework of the methodology of intellectual labor automation. The formal description of connections (mapping) of semantic (conceptual) and syntactic (info-logical) representations on the basis of the regularity of mapping allows limiting the set of possible relations and connections in verbal syntactical constructions for representation of subject tasks and providing completeness of the formalized (syntactic) representations at the expense of their semantic addition.

The design of information-active systems provides the formation of such a model representation of automated tasks, which is invariant to the environment and means of software and hardware implementation.

The syntactic (infological) model representation of applied problems will be adequate to initial requirements only if they provide meaningful unity. This is determined by the initial formation of a knowledge model or conceptual representation of applied tasks.

The conjugation of semantic and syntactic static constructions is based on the regularity of mapping in the framework of the methodology of intellectual labor automation.

The grounds for the regularities of mapping conceptual representations in the infological are the following provisions [1,2,3,4]:

1) general structure and composition of semantic and syntactic representations and their models;

2) unified mechanism for generating models (for generating each component of conceptual and infological models - static and dynamic - the mechanism of abstractions is used);

3) unified structure of the patterns of model generation, which determines that:

- the composition of the patterns of generation for each type of model is the same and includes the patterns of generation of static, dynamic and / or functional components of the model;
- the pattern for each component of the model includes the generation of structures at each level of abstraction and their linkage into a single whole;
- a single procedure (synthesis or analysis) for any regularity at a certain level of abstraction;

4) the presence of laws of cyclicity, causing the generation of ternary relations and derived structures: the law of cyclicity of scientific knowledge for conceptual models and the law of cyclicity of sign representation for infological models.

Taking into account the above, the regularity of mapping of conceptual models into infological ones can be formulated as follows: the identity of the application of abstractions in the process of generating (forming) relations for static, dynamic and functional components of models of the same level of abstraction of the same type of representation.

Such a pattern of mapping is a manifestation of a more general pattern of this world and, accordingly, may have analogies or associations with any phenomena in other fields of knowledge, for example in biology, the DNA model, which implements the mechanism of transmission (mapping) of hereditary information.

The mapping for representations of subject tasks determines the correspondence of the knowledge system of the subject area and the system of sign structures as a formal-linguistic embodiment of this knowledge for a specific subject problem.

The mapping structure will be considered as: mapping of models, mapping of model components.

Mapping of representation for subject tasks involves mapping models only at the object ($z=n$) and concrete ($z=nm$) levels of abstraction.

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At the same time, mapping is also fixed by static, dynamic and / or functional components (Fig. 1).

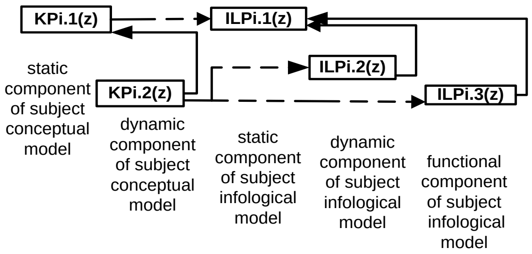

Fig. 1. The general structure of mapping a model of any level (i) in a subject representation

In this case, the static relations $KPi.1(z)$ and $ILPi.1(z)$ are revealed as a combination, respectively: of the main structures - binary and ternary relations on the element, derived structures - schemes of elements and their binary relations (Fig. 2).

The mapping of models at each level of abstraction for representations of subject tasks is performed by the components of the model [6]:

$\mathrm{Ki(z)} \to \mathrm{ILi(z)}$:

by elements: $\mathrm{Mi(z)} \to \mathrm{Li(z)}$and

by static constructions: $\mathrm{THi(z)} \to \mathrm{DEi(z)}$:

$$\mathrm{Ti(z)} \to \mathrm{Di(z)}, \mathrm{Hi(z)} \to \mathrm{Ei(z)}, \overline{\mathrm{Hi(z)}} \to \overline{\mathrm{Ei(z)}}, \mathrm{Thi(z)} \to \mathrm{Dei(z)}.$$

Let us prove the interconnections of conceptual and infological models for subject problems: the construction of permissible subject infological structures is ensured by applying the “natural join” operation to relations representing the ratio of structural elements and the corresponding fixed construction of the subject conceptual model.

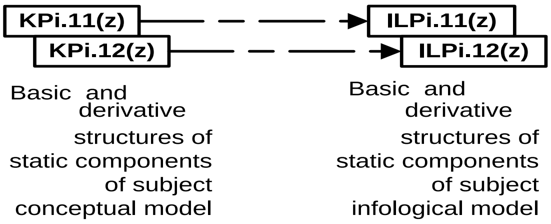

Fig. 2. The mapping structure of the static components of semantic and syntactic models

The following laws serve as a formal substantiation of interconnections:

$$\overline{\mathrm{GDi(z)}} = \mathrm{GMi(z)Li(z)} >< \mathrm{GTi(z)} >< \mathrm{GMi(z)Li(z)}$$

-for basic subject constructions,

$$\overline{\mathrm{GDei(z)}} = \overline{\mathrm{GHi(z)Ei(z)}} >< \mathrm{GThi(z)} >< \overline{\mathrm{GHi(z)Ei(z)}}$$

- for derived subject constructions,

Thus, the revealed mapping structure for the subject representation and formally justified mapping procedures for the static component of the model allow to formally describe the mapping rules.

For static constructs at the object level (i=2 and z=n), the feature is the re-assignment of sets of elements, i.e.

$$\mathrm{M2(n)} \equiv \mathrm{A(n)} \text{ и } \mathrm{L2(n)} \equiv \mathrm{C(n)}.$$

The mapping of conceptual elements into elements of infological structures at the object level is performed taking into account the identity of the generation mechanism for each pair of elements, that is, to use the same abstraction in the generation of both the subject category (SC) and the named structural element (NSE): either refinement or decomposition.

The mapping of binary relations of conceptual elements into binary relations of elements of infological structures is determined by the fact that SC connectivity determines the connectivity of corresponding NSEs.

The pattern of mapping the basic conceptual structure on the SC to the infological structure on NSE is shown in Fig. 3.

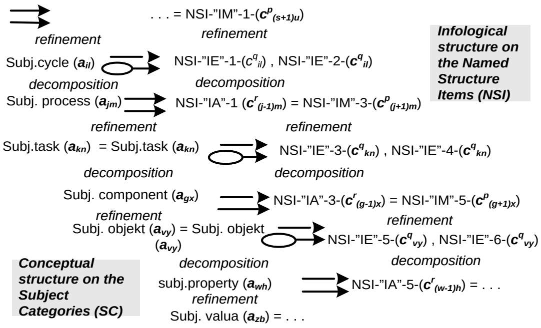

Fig. 3. The pattern of mapping conceptual structures on SCs to infological structures on NSEs

It shows that the degree of complexity and variety (the number of SC distant from the most complex one and the number of different SC of the same class) of a specific conceptual design determines the degree of complexity and diversity of the infological structure.

In fact, this sets the levels of abstraction (complexity) and the diversity of these structures at each level in an automated environment.

Formally, the rules for the transition from a conceptual model to an infological model at the object level for elements are the following:

$$\mathrm{A(n)} \to \mathrm{C(n)},$$

where $\mathrm{A(n)} = \{\mathrm{a_{il}}\}, \mathrm{C(n)} = \{\mathrm{c^{p}_{ik}}\}$.

The duality in the mapping of structural SCs in NSE can be represented as follows:

a) structural SC determines (taking into account the connection with contextual SE name of type "Information Attribute (IA)":

$$\mathrm{a_{jm}} \to \mathrm{c^{r}_{(j-1)m}};$$

b) structural SC determines (taking into account the connection with the monadic SC) SE name of the “Information Module (IM)” type”:

$$\mathrm{a_{jm}} \to \mathrm{c^{r}_{(j-1)m}};$$

Duality when mapping contextual SCs to SE names can be represented as follows:

c) the contextual SC determines the SE name of type "Information Entity (IE)": $a_{il} \to c^{q}_{il}$;

d) binary connections between contextual SCs define a special SE name of type "IE": $(a_{il}, a_{if}) \to c^{q}_{(i+1)l}$;

Thus, when mapping semantics (content) into the syntax (form), the syntax elements are doubled.

The names and states of structural units are generated in accordance with this regularity from subject and copies of subject categories of meaningful (semantic) constructions of the knowledge system of the subject area. This provides maximum objectivity and rationality in the formation of design static structures of an automated task.

For binary relations of elements: $\mathrm{T2(n)} \to \mathrm{D2(n)}$.

Duality in the mapping of model

elements causes additional differentiation of their binary connections:

- the ordering of structural SCs of one subset determines the ordering of SE names of one subset of the "IA" type (taking into account the connection of structural SCs with contextual SCs):

$$\begin{aligned}&(a_{jm}, a_{jm}) \to (c^{r}_{(j-1)m}, c^{r}_{(j-1)m}),\ \ (a_{jm}, a_{js})\\ &\to (c^{r}_{(j-1)m}, c^{r}_{(j-1)s}), (a_{js}, a_{js}) \& (a_{jm}, a_{js})\\ &\to (c^{r}_{(j-1)s}, c^{r}_{(j-1)s}) \& (c^{r}_{(j-1)m}, c^{r}_{(j-1)s})\end{aligned}$$

and "IM" type (taking into account the connection of structural SCs with monadic SCs):

$$(a_{jm}, a_{jm}) \to \left(c^{p}_{(j+1)m}, c^{p}_{(j+1)m}\right),$$

$$(a_{jm}, a_{js}) \to \left(c^{p}_{(j+1)m}, c^{p}_{(j+1)s}\right),$$

$$\begin{gathered}(a_{js}, a_{js}) \& (a_{jm}, a_{js}) \to\\ \left(c^{p}_{(j+1)s}, c^{p}_{(j+1)s}\right) \& \left(c^{p}_{(j+1)m}, c^{p}_{(j+1)s}\right);\end{gathered}$$

- the ordering of contextual SCs of one subset determines the ordering of NSEs of one subset of the "IE" type:

$$(a_{il}, a_{il}) \to (c^{q}_{il}, c^{q}_{il}),$$

$$(a_{il}, a_{is}) \to \left(c^{q}_{il}, c^{q}_{(i+1)l}\right) \&$$

$$(a_{il}, a_{is}) \to \left(c^{q}_{(i+1)l}, c^{q}_{(i+1)l}\right) \&$$

$$(a_{il}, a_{is}) \to$$

$$\to \left(c^{q}_{(i+1)l}, c^{q}_{(i+1)l}\right) \& \left(c^{q}_{il}, c^{q}_{(i+1)l}\right) \&$$

$$(a_{il}, a_{is}) \to \left(c^{q}_{(i+1)l}, c^{q}_{is}\right) \&$$

$$(a_{is}, a_{is}) \& (a_{il}, a_{is}) \to\to (c^{q}_{is}, c^{q}_{is}) \& \left(c^{q}_{(i+1)l}, c^{q}_{is}\right);$$

- the composition of the structural SC of the monadic SC determines the composition of the named SE type "IM" of the named SE type "IE" (the composition of the NSE type "IM" includes all NSE type "IE") :

$$(a_{jm}, a_{kn}) \to \left(c^{p}_{(j+1)m}, c^{q}_{kn}\right),$$

$$(a_{jm}, a_{kn}) \to \left(c^{p}_{(j+1)m}, c^{q}_{(k+1)n}\right),$$

if the name of the SE type "IE" is determined by binary relations between contextual SCs;

-the composition of a contextual SC of structural SCs determines the composition of a named SE of type "IE" from named SUs of type "IA" (that is, both ordinary and special NSEs of type "IE" include NSEs of type "IA"), i.e. :

$$(a_{il}, a_{jm}) \to (c^{q}_{il}, c^{r}_{(j-1)m})$$

if the contextual SC defines a SE name of type "IE",

$$(a_{il}, a_{jm}) \to \left(c^{q}_{(i+1)l}, c^{r}_{(j-1)m}\right)$$

if the SE name of type "IE" is determined by binary connections between contextual SCs;

- the layout of structural SCs within the contextual SC determines the layout of NSEs of type "IA" within NSEs of type "IE":

$$\begin{aligned}&(a_{jm}, a_{js}) \& (a_{il}, a_{jm}) \& (a_{il}, a_{js}) \to\\ &\qquad \to (c^{r}_{(j-1)m}, c^{r}_{(j-1)s}) \& (c^{q}_{il}, c^{r}_{(j-1)m}) \&\end{aligned}$$

$$\& (c^{q}_{il}, c^{r}_{(j-1)s}),$$

if the contextual SC defines a SE name of type "IE"

$$\begin{aligned}&(a_{jm}, a_{js}) \& (a_{il}, a_{jm}) \& (a_{il}, a_{js}) \to\\ &\to (c^{r}_{(j-1)m}, c^{r}_{(j-1)s}) \& \left(c^{q}_{(i+1)l}, c^{r}_{(j-1)m}\right) \&\end{aligned}$$

$$\& \left(c^{q}_{(i+1)l}, c^{r}_{(j-1)s}\right),$$

if the SE name of type "IE" is determined by binary connections between contextual SCs;

- the layout of monadic SCs within the framework of the structural SC determines the layout of NSEs of type "IE" within NSEs of type "IM" (taking into account the specific order of NSEs of type "IE"):

$$\begin{aligned}&(a_{kn}, a_{ks}) \& (a_{jm}, a_{kn}) \& (a_{jm}, a_{ks}) \to\\ &\qquad \to (c^{q}_{kn}, c^{q}_{ks}) \& \left(c^{p}_{(j+1)m}, c^{q}_{kn}\right) \&\end{aligned}$$

$$\& \left(c^{p}_{(j+1)m}, c^{q}_{ks}\right),$$

if the CSC defines the name of the SE type " IE",

$$\begin{aligned}&(a_{kn}, a_{ks}) \& (a_{jm}, a_{kn}) \& (a_{jm}, a_{ks}) \to\\ &\qquad \to \left(c^{q}_{(k+1)n}, c^{q}_{ks}\right) \& \left(c^{p}_{(j+1)m}, c^{q}_{(k+1)n}\right) \&\end{aligned}$$

$$\& \left(c^{p}_{(j+1)m}, c^{q}_{ks}\right),$$

if the SE name of type "IE" is determined by binary relations between contextual SCs.

Thus, the layout defines a special unified order for NSEs of type "IE" within NSEs of type "IM".

The mapping of the category triad into the triad of structural elements is carried out on the basis of a structure-forming connection between the contextual and structural SC, which, taking into account the rule for mapping elements, determines the connection between SE names of type "IE" and "IA" in the triad of named SEs.

In this case, the shifted triad mapping is manifested, due to the identity of type s of abstractions applied to the elements (decomposition). Thus, ternary connections are also doubled in syntactic representation.

For ternary relations on elements: $\mathrm{H2(n)} \rightarrow \mathrm{E2(n)}$:

$$\mathrm{h}^2_{\mathrm{iljmkn}} = (\mathrm{a}_{\mathrm{il}}, \mathrm{a}_{\mathrm{jm}}, \mathrm{a}_{\mathrm{kn}}) \rightarrow$$

$$\rightarrow \mathrm{e}^2_{(\mathrm{x}+1)\mathrm{yil}} = \left(\mathrm{c}^{\mathrm{p}}_{(\mathrm{x}+1)\mathrm{y}}, \mathrm{c}^{\mathrm{q}}_{\mathrm{il}}, \mathrm{c}^{\mathrm{r}}_{(\mathrm{j}-1)\mathrm{m}}\right),$$

$$\mathrm{h}^2_{\mathrm{iljmkn}} = (\mathrm{a}_{\mathrm{il}}, \mathrm{a}_{\mathrm{jm}}, \mathrm{a}_{\mathrm{kn}}) \rightarrow$$

$$\rightarrow \mathrm{e}^2_{(\mathrm{x}+1)\mathrm{y}(\mathrm{i}+1)\mathrm{l}} = \left(\mathrm{c}^{\mathrm{p}}_{(\mathrm{x}+1)\mathrm{y}}, \mathrm{c}^{\mathrm{q}}_{(\mathrm{i}+1)\mathrm{l}}, \mathrm{c}^{\mathrm{r}}_{(\mathrm{j}-1)\mathrm{m}}\right).$$

A graphic illustration of the mapping of elementary schemes of conceptual models into elementary infological schemes at the object level is shown in Fig.4.

The mapping of schemes of element for conceptual and infological models at the object level is carried out taking into account the fact that the mapping of elementary SC schemes into NSE elementary schemes is based on a structure-forming connection between contextual and structural SC. In this case, a shifted mapping of elementary schemes is manifested, due to the identity of type s of abstractions applied to the elements (decomposition). Then the SC scheme as a structure from the set of elementary schemes with one common contextual SC is mapped in the NSE scheme as a structure from the set of elementary schemes with one (common) pair of named SEs of type "IM" and "IE".

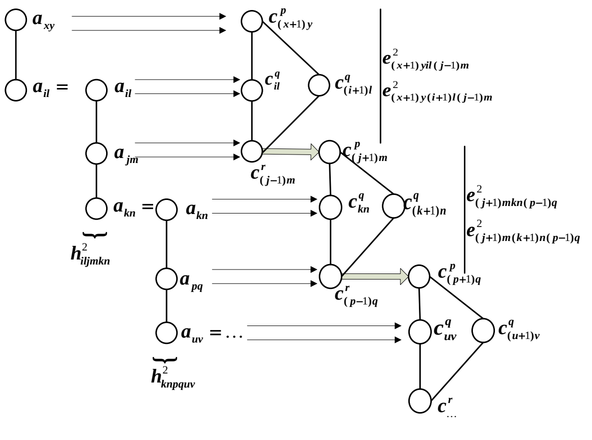

Fig. 4. Mapping of ternary relations or elementary schemes

The relation of binary relations of element schemes in conceptual and infological models is defined by that connectivity of schemes of SC causes connectivity of the corresponding schemes of NSE (Fig.5).

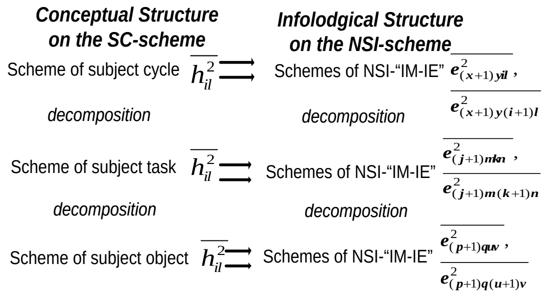

Fig. 5. Mapping pattern of element schemes

Since the element schemes are formed on the basis of many elementary schemes or triads, then, taking into account mapping of triads, we have the following formal connection between element schemes (in the figure):

$$\overline{h^2_{\imath l}} \rightarrow \overline{e^2_{(x+1)y\imath l}},$$

$$\overline{h^2_{\imath l}} \rightarrow \overline{e^2_{(x+1)y(\imath+1)l}},$$

Schemes of subject categories define a certain level of complexity and the degree of diversity of derivatives of semantic constructions on the set of subject categories, therefore, these schemes specify the corresponding level of complexity and degree of diversity for schemes of a syntactical representation of a given level.

For binary connections of element schemes элементов $\mathrm{Th2(n)} \rightarrow \mathrm{De2(n)}$ we have (Fig. 6):

- the ordering of schemes of subject categories determines the ordering of schemes named SE:

$$(\overline{\mathrm{h}^2_{\imath\mathrm{l}}}, \overline{\mathrm{h}^2_{\imath\mathrm{l}}}) \rightarrow (\overline{\mathrm{e}^2_{(\mathrm{x}+1)\mathrm{y}\imath\mathrm{l}}}, \overline{\mathrm{e}^2_{(\mathrm{x}+1)\imath\mathrm{l}}});$$

$$(\overline{\mathrm{h}^2_{\imath\mathrm{l}}}, \overline{\mathrm{h}^2_{\imath\mathrm{f}}}) \rightarrow (\overline{\mathrm{e}^2_{(\mathrm{x}+1)\mathrm{y}(\imath+1)\mathrm{l}}}, \overline{\mathrm{e}^2_{(\mathrm{x}+1)\mathrm{y}(\imath+1)\mathrm{l}}}),$$

$$(\overline{\mathrm{h}^2_{\imath\mathrm{l}}}, \overline{\mathrm{h}^2_{\imath\mathrm{f}}}) \rightarrow (\overline{\mathrm{e}^2_{(\mathrm{x}+1)\mathrm{y}\imath\mathrm{l}}}, \overline{\mathrm{e}^2_{(\mathrm{x}+1)\mathrm{y}(\imath+1)\mathrm{l}}}),$$

$$(\overline{\mathrm{h}^2_{\imath\mathrm{l}}}, \overline{\mathrm{h}^2_{\imath\mathrm{l}}}) \rightarrow$$
$$(\overline{\mathrm{e}^2_{(\mathrm{x}+1)\mathrm{y}(\imath+1)\mathrm{l}}}, \overline{\mathrm{e}^2_{(\mathrm{x}+1)\mathrm{y}(\imath+1)\mathrm{l}}})\&$$
$$(\overline{\mathrm{e}^2_{(\mathrm{x}+1)\mathrm{y}\imath\mathrm{l}}}, \overline{\mathrm{e}^2_{(\mathrm{x}+1)\mathrm{y}(\imath+1)\mathrm{l}}}),$$

$$(\overline{\mathrm{h}^2_{\imath\mathrm{l}}}, \overline{\mathrm{h}^2_{\imath\mathrm{l}}}) \rightarrow (\overline{\mathrm{e}^2_{(\mathrm{x}+1)\mathrm{y}(\imath+1)\mathrm{l}}}, \overline{\mathrm{e}^2_{(\mathrm{x}+1)\mathrm{y}\imath\mathrm{f}}}),$$

$$\left(\overline{\mathrm{h}^2_{\imath\mathrm{l}}}, \overline{\mathrm{h}^2_{\imath\mathrm{l}}}\right) \rightarrow \left(\overline{\mathrm{e}^2_{(\mathrm{x}+1)\mathrm{y}\imath\mathrm{f}}}, \overline{\mathrm{e}^2_{(\mathrm{x}+1)\mathrm{y}\imath\mathrm{f}}}\right)\&$$

$$\&(\overline{\mathrm{e}^2_{(\mathrm{x}+1)\mathrm{y}(\imath+1)\mathrm{l}}}, \overline{\mathrm{e}^2_{(\mathrm{x}+1)\mathrm{y}\imath\mathrm{f}}}),$$

$$\left(\overline{\mathrm{h}^2_{\imath\mathrm{f}}}, \overline{\mathrm{h}^2_{\imath\mathrm{f}}}\right)\&\left(\overline{\mathrm{h}^2_{\imath\mathrm{l}}}, \overline{\mathrm{h}^2_{\imath\mathrm{f}}}\right) \rightarrow$$
$$\left(\overline{\mathrm{e}^2_{(\mathrm{x}+1)\mathrm{y}\imath\mathrm{f}}}, \overline{\mathrm{e}^2_{(\mathrm{x}+1)\mathrm{y}\imath\mathrm{f}}}\right)\&\left(\overline{\mathrm{e}^2_{(\mathrm{x}+1)\mathrm{y}(\imath+1)\mathrm{l}}}, \overline{\mathrm{e}^2_{\mathrm{su}\imath\mathrm{f}}}\right);$$

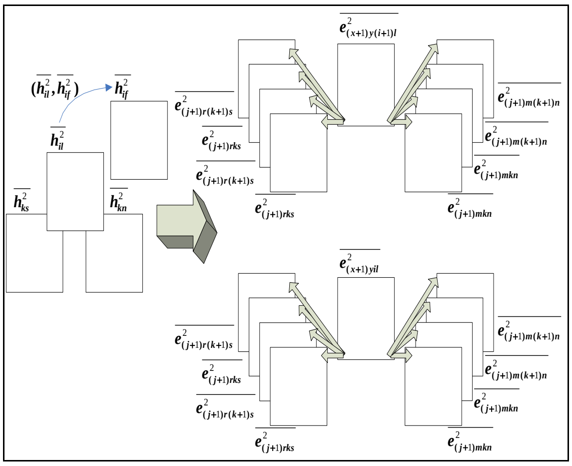

Fig. 6. Mapping of derived structures

- the composition of SC schemes determines the composition of NSE schemes (or nesting of complexity levels, depending on the degree of diversity of the semantic representation, determines the nesting of complexity levels taking into account the degree of diversity of the syntactical representation):

$$1)\left(\overline{h^2_{il}},\overline{h^2_{kn}}\right)\to\left(\overline{e^2_{(x+1)yil}},\overline{e^2_{(j+1)mkn}}\right),$$

$$2)\left(\overline{h^2_{il}},\overline{h^2_{kn}}\right)\to\left(\overline{e^2_{(x+1)y(i+1)l}},\overline{e^2_{(j+1)mkn}}\right),$$

$$3)\left(\overline{h^2_{il}},\overline{h^2_{kn}}\right)\to\left(\overline{e^2_{(x+1)yil}},\overline{e^2_{(j+1)m(k+1)n}}\right),$$

$$4)\left(\overline{h^2_{il}},\overline{h^2_{kn}}\right)\to\left(\overline{e^2_{(x+1)y(i+1)l}},\overline{e^2_{(j+1)m(k+1)n}}\right);$$

-the layout of schemes of subject categories determines the layout of schemes of named SU (or the layout of structures of the underlying levels of complexity within the framework of the construction of the higher complexity level), taking into account the variability of the composition of the schemes of elements (Fig. 6):

$$1)\left(\overline{h^2_{ks}},\overline{h^2_{kn}}\right)\&\left(\overline{h^2_{il}},\overline{h^2_{ks}}\right)\&\left(\overline{h^2_{il}},\overline{h^2_{kn}}\right)\to$$
$$\to\left(\overline{e^2_{(j+1)rks}},\overline{e^2_{(j+1)mkn}}\right)\&$$
$$\left(\overline{e^2_{(x+1)yil}},\overline{e^2_{(j+1)rks}}\right)\&$$
$$\left(\overline{e^2_{(x+1)yil}},\overline{e^2_{(j+1)mkn}}\right),$$

$$2)\left(\overline{h^2_{ks}},\overline{h^2_{kn}}\right)\&\left(\overline{h^2_{il}},\overline{h^2_{ks}}\right)\&\left(\overline{h^2_{il}},\overline{h^2_{kn}}\right)\to$$
$$\to\left(\overline{e^2_{(j+1)rks}},\overline{e^2_{(j+1)mkn}}\right)\&$$
$$\left(\overline{e^2_{(x+1)y(i+1)l}},\overline{e^2_{(j+1)rks}}\right)\&$$
$$\left(\overline{e^2_{(x+1)y(i+1)l}},\overline{e^2_{(j+1)mkn}}\right),$$

$$3)\left(\overline{h^2_{ks}},\overline{h^2_{kn}}\right)\&\left(\overline{h^2_{il}},\overline{h^2_{ks}}\right)\&\left(\overline{h^2_{il}},\overline{h^2_{kn}}\right)\to$$
$$\to\left(\overline{e^2_{(j+1)r(k+1)s}},\overline{e^2_{(j+1)mkn}}\right)\&$$
$$\left(\overline{e^2_{(x+1)yil}},\overline{e^2_{(j+1)r(k+1)s}}\right)\&$$
$$\left(\overline{e^2_{(x+1)yil}},\overline{e^2_{(j+1)mkn}}\right),$$

$$4)\left(\overline{h^2_{ks}},\overline{h^2_{kn}}\right)\&\left(\overline{h^2_{il}},\overline{h^2_{ks}}\right)\&\left(\overline{h^2_{il}},\overline{h^2_{kn}}\right)\to$$
$$\to\left(\overline{e^2_{(j+1)r(k+1)s}},\overline{e^2_{(j+1)mkn}}\right)\&$$
$$\left(\overline{e^2_{(x+1)y(i+1)l}},\overline{e^2_{(j+1)r(k+1)s}}\right)\&$$
$$\left(\overline{e^2_{(x+1)y(i+1)l}},\overline{e^2_{(j+1)mkn}}\right),$$

$$5)\left(\overline{h^2_{ks}},\overline{h^2_{kn}}\right)\&\left(\overline{h^2_{il}},\overline{h^2_{ks}}\right)\&\left(\overline{h^2_{il}},\overline{h^2_{kn}}\right)\to$$
$$\to\left(\overline{e^2_{(j+1)rks}},\overline{e^2_{(j+1)m(k+1)n}}\right)\&$$
$$\left(\overline{e^2_{(x+1)yil}},\overline{e^2_{(j+1)rks}}\right)\&$$
$$\left(\overline{e^2_{(x+1)yil}},\overline{e^2_{(j+1)m(k+1)n}}\right),$$

$$6)\left(\overline{h^2_{ks}},\overline{h^2_{kn}}\right)\&\left(\overline{h^2_{il}},\overline{h^2_{ks}}\right)\&\left(\overline{h^2_{il}},\overline{h^2_{kn}}\right)\to$$
$$\to\left(\overline{e^2_{(j+1)rks}},\overline{e^2_{(j+1)m(k+1)n}}\right)\&$$
$$\left(\overline{e^2_{(x+1)y(i+1)l}},\overline{e^2_{(j+1)rks}}\right)\&$$
$$\left(\overline{e^2_{(x+1)y(i+1)l}},\overline{e^2_{(j+1)m(k+1)n}}\right),$$

$$7)\left(\overline{h^2_{ks}},\overline{h^2_{kn}}\right)\&\left(\overline{h^2_{il}},\overline{h^2_{ks}}\right)\&\left(\overline{h^2_{il}},\overline{h^2_{kn}}\right)\to$$
$$\to\left(\overline{e^2_{(j+1)r(k+1)s}},\overline{e^2_{(j+1)m(k+1)n}}\right)\&$$
$$\left(\overline{e^2_{(x+1)yil}},\overline{e^2_{(j+1)r(k+1)s}}\right)\&$$
$$\left(\overline{e^2_{(x+1)yil}},\overline{e^2_{(j+1)m(k+1)n}}\right),$$

$$8)\left(\overline{h^2_{ks}},\overline{h^2_{kn}}\right)\&\left(\overline{h^2_{il}},\overline{h^2_{ks}}\right)\&\left(\overline{h^2_{il}},\overline{h^2_{kn}}\right)\to$$
$$\to\left(\overline{e^2_{(j+1)r(k+1)s}},\overline{e^2_{(j+1)m(k+1)n}}\right)\&$$
$$\left(\overline{e^2_{(x+1)y(i+1)l}},\overline{e^2_{(j+1)r(k+1)s}}\right)\&$$
$$\left(\overline{e^2_{(x+1)y(i+1)l}},\overline{e^2_{(j+1)m(k+1)n}}\right),$$

A graphic illustration of the mapping of conceptual structures into infological structures at the object level is shown in Fig. 7.

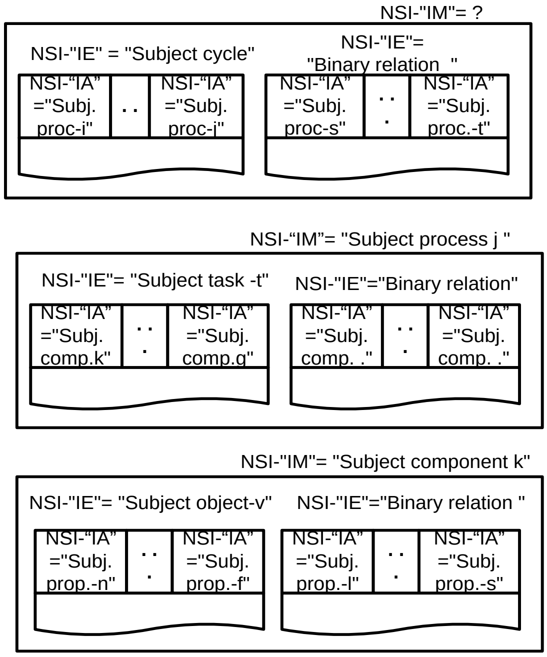

Fig. 7. Graphic illustration of the representation of static structures

Conclusion

The formal description of connections (mapping) of semantic (conceptual) and syntactic (infological) representations on the basis of the regularity of mapping allows:

1) limiting the set of possible relations and connections in verbal syntactical construtions for representation of subject tasks,

2) providing completeness of the formalized (syntactic) representations at the expense of their semantic addition.

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