

## SUMMARY

Structure (Latin word *structura* – (inner)building) is generally defined as a *connection-, (usually permanent) relationship or a manner of organization* of system's elements. The usage of the term “structure” has evolved over time in different languages and societies where it refers to different and sometimes vague concepts. Structure semiotics assign to the concept of “structure” its inherent (intrinsic, specific) meaning and content: Structure is the ***complete invariant of isomorphic graphs***, i. e. a system of invariant attributes of structure. It is represented canonically as a *text* of structure in the form of its *semiotic model SM*.

Here deal with a rather delicate topic. Firstly, nowadays no exist an adopted for all definition of the structure, secondly, some mathematicians do not accept the using of elements of semiotics, and thirdly, semioticians can not understand the relations with the graphs.

Nevertheless, structure semiotics reveals the “hidden sides” of the structure and to solve some of the classic problems in non-classical manner, and to set and solve the new ones. The main problems are *complete canonical representation of the structure* and constructing their *system* which is associated with the *Reconstruction Problem*.

Time complexity of structure's recognition and structural equivalence depends only at the number of vertex pairs. It is not comparable with isomorphism detection techniques. Structure semiotics constitutes a complex of heuristic methods for studying the structure and its properties.

To “hidden sides” of a graph is here considered that in its diagram or adjacency matrix do not manifest, such as orbits, parts, cliques, girths and others. Their “opening” takes place on the ground of the *semiotic model*, what constitute a ***canonical representation of the graph structure***, its “*text*” with exactness up to isomorphism. All this constitutes a purposeful activity in the field of *formalized heuristic methods*.

On the ground of sign matrix as a result of identification operations can also to recognize up to present unknown structural attributes, such as *girth- and clique regularity, bisymmetry, n-m-cliques, sign-, orbit- and adjacent structures, to measure symmetry, etc. Graphs isomorphism or non-isomorphism is an equivalence or non-equivalence of structures* that is recognizable by simple comparison of the sign matrices. On the ground of sign matrices it is possible to identify various *relationships* between symmetry properties, orbit- and sign graphs, regularities, parts and others. The graphs can be better *to systematize* and to discover “white spots” among them. It has been found that *non-reconstructable* graphs do not exist. The latter is characterized by the *constructive system of reconstructions* of graphs as a formation of adjacent structures. This may add that almost all the structures are recognizable in the level of semiotic identification mode (*SIA*). Almost all graphs are *0-symmetric* – this is why an interest in this particular non-*0-symmetric*. It is set up the importance of mutual treatment the structure and its complement.

An important role have here the ***symmetry properties*** and ***position structures***. The essence of *orbit* is interpreted as a (sub) set whose elements have the *same position* in the structure, i.e. form a *position-class*, which appear in the form of the *local isomorphism-class*. It is avoid from traditional combinatorial, group theoretical identification of orbits, and showed that structural method is more simply and the result is same, but expressed more compact. On the basis of orbit- and sign structures have shown that the *associations* of structural elements appear on the form of an orbit, part, girth or clique.

Another is the story of the *adjacent structures*. There is no doubt that each structure is decomposable to its adjacent structures. It is shown that an *union* of adjacent sub-structures reconstruct the initial structure, and, an *intersection* of adjacent super-structures also reconstruct the initial structure. Here we have shamelessly avoids from wording of Ulam's Conjecture, but not its essence. For each complex of the  $n$ -vertex graphs can be constructed a *constructive system of structures*. It is currently carried out for 5- and 6-vertex graphs term, 7-vertex system (1044 structures) is half done. The algorithm exists, but a programmer have not found.

Are these the "hidden sides" more interested in someone besides me? I do not know, but everything I've done has been of interest and joy. Some bystanders can be reserved for acceptance of the fact that the sign matrix is a complete invariant of isomorphic graphs; that non group-theoretical orbit identification is possible; that can be circumvent from Ulam's ideology of reconstructivity, even the being of the clique regularity abides for many incomprehensible, and so on.

Require further investigation the problem of multiplication (involution) the adjacency matrices. It seems that this is not done, no one has yet expressed interest why the increase in the number of differences of signs, why this increase ends a certain degree, why these sign-values in sometime become zeros, and so on.

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