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FORMAL MODELS OF LANGUAGE SYSTEMS

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Abstract. *The basic construction concepts of unifying two-digit and multi-valued means of processing symbolic data are considered. The present approach is based upon a single methodological and special purpose principle by applying the proposed methods of the intelligence theory for mathematical input/output data and their intermediate transformations by an appropriate AFP-structure of the third grade.*

Key words: *multivalued intellectual system, language systems, parallelism (spatial), AFP (algebra of finite predicates), AFP-structures, knowledge base, multiplevalued logic.*

ФОРМАЛЬНІ МОДЕЛІ МОВНИХ СИСТЕМ

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Анотація. *Розглянуто концепцію уніфікації двозначно-багатозначних аналого-дискретних засобів обробки символьних даних. Підхід базується на єдиній методологічній та цільовій основі шляхом застосування запропонованих методів теорії інтелекту для математичного опису вхідних/вихідних даних та їх проміжних перетворень відповідною АКП-структурою третього роду.*

Ключові слова: *багатозначна інтелектуальна система, мовна система, паралелізм (просторовий), АСП (алгебра скінченних предикатів), АСП-структури, база знань, багатозначна логіка.*

ФОРМАЛЬНЫЕ МОДЕЛИ ЯЗЫКОВЫХ СИСТЕМ

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Аннотация. *Рассмотрена концепция унификации двузначно-многозначных аналого-дискретных средств обработки символьных данных. Подход базируется на единой методологической и целевой основе путем применения предложенных методов теории интеллекта для математического описания входных/выходных данных и их промежуточных преобразований соответствующей АКП-структурой третьего рода.*

Ключевые слова: *многозначная интеллектуальная система, языковая система, параллелизм (пространственный), АКП (алгебра конечных предикатов), АКП-структуры, база знаний, многозначная логика.*

Introduction

Developing and improving computer facilities underline the process of automatizing mental activity, which was the starting - point of emergence of concept of artificial intelligence. However, the successes in the field of

intellectualizing computer machines are
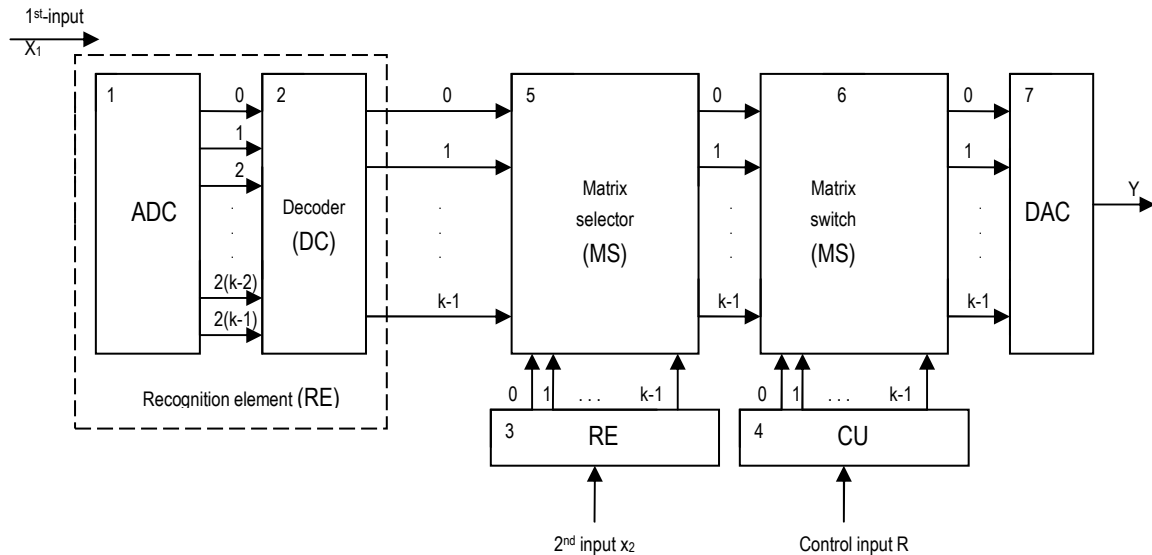insignificant   especially

Fig. l. Two-input AFP-structure of the third sor

if one compares the achieved results with anticipated ones and forecast. The orientation on the attain of qualitatively new technologies of information processing manifest itself in attempts to realize systems of artificial intelligence (AI) on Neumann computers. Therefore, new requirement of the technology of information processing are caused by need for solving problems which are badly formalized and the availability of user who is not a profess sional programmer. Thus, we came to realizing one of the variants of developing AI systems – this is the way of analyzing modeling and synthesizing a natural language intelligent interface by means multiple-valued logical systems, in particular by the algebra finite predicates as well as the theory of multiple-valued structures and coding [1–3].

The analysis of publications and the problem statement

The availability of algebra of finite predicates provides an interesting opportunity of realizing a transition from algebraic description of information processes to their description in the form of equation in the language of given algebra and the equations specify relations between its variables [2]. The algebra of finite predicates is used as the body of mathematics of the research. AFP-structure of the third sort (fig. l) is proposed on the basis of the sdf architectural studies presented in the works [2, 3], as well as proceeding from the need for structurizing problems in developing the intuitive and constructivistical theory of

constructing multiple-valued structures of spatial type for language systems.

The final result of the universal conversion can be formally represented in the form of the following operator picture:

$$F(z_i) = \max_{i=0}^{k-1}\left(\min_{i=0}^{k-1} z_i t_i \right),$$

where $i = \overline{1, k-1}, (t_0, t_1, \ldots, t_{k-1})$ are sets of signals of adjusting (selecting) the output functions of the universal AFP-structure of the third sort. Thus, the aim of this approach is achieved by decompiling multiple-valued hardware means (AFP-structures of the third sort) into multiple-valued and two-value discrete and analogous subunits, especially in the part of their intermediate spatial information transformation.

The research has shown that the application of traditional methods of combinational synthesis in functionally complete bases as disjunction (conjunction) normal forms to multiple-valued structures of spatial type is ineffective from the point of view of retaining the properties of uniformity and parallelism of structural formations. There is a need for seeking objects of research which are the most natural and closest to the inner logic of functioning for a natural language particulary of corresponding structures a variety of algebraic and logical means of modeling and new methods of synthesis of corresponding structures [2, 3]. Thus, the purpose of state is effectiveness increase of information processing in AI-

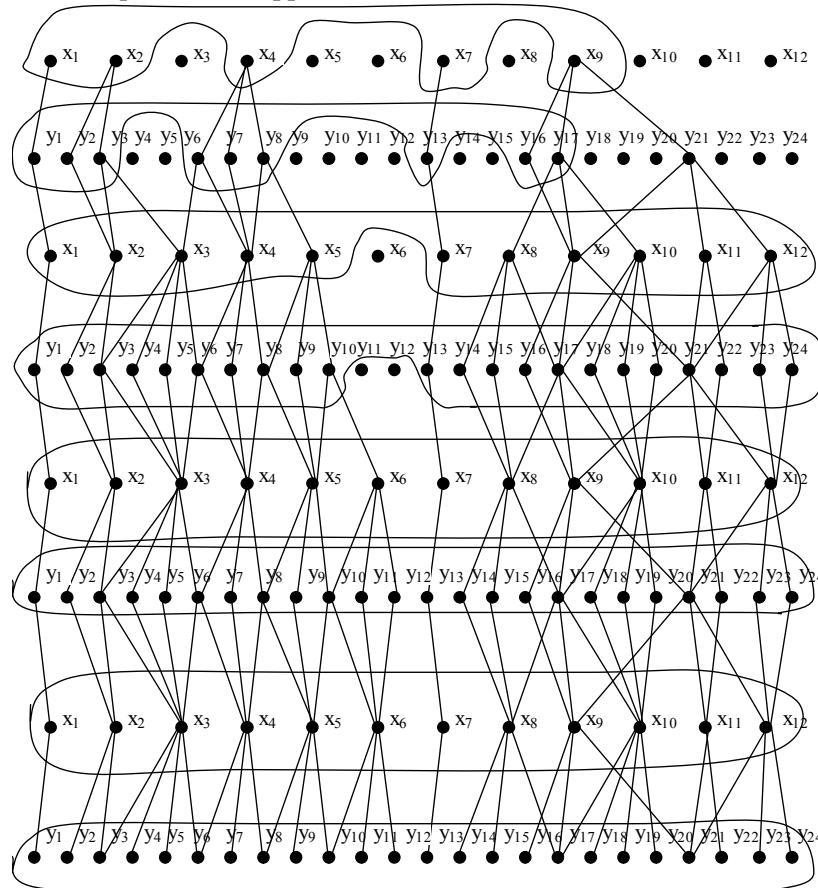systems owing to development and application   of AFP-structures.

Fig. 2. Finding of the hypothetically connected subscribers

Let variables, x_i, $i = 1,2,...,12,...$ – are the telephone numbers of city Kharkiv and Kharkiv area. The task consists of finding all telephone numbers of subscribers, with which can be connected subscribers numbers x_1, x_2, x_4, x_7, x_9. The numbers set of subscribers, on which entrance rings are fixed will designate y_j. On fig.

2 evidently, that subscribers, x_1, x_2, x_4, x_7, x_9 hypothetically connected with subscribers $y_1 - y_{24}$, a decision is found for 3 steps. The using the developed method of finding the degree of linear logical transformation allow to minimize time to search decisions of this task. Variable x_i, $i = 1,2,...,12,...$ – are the telephone numbers of Kharkiv and Kharkiv area. It is necessary to find the telephone numbers of subscribers, with which can be connected subscribers with numbers

$x_1 = 0572230508$, $x_2 = 0572945376$,

$x_4 = 0577124387$, $x_7 = 0577774004$,

$x_9 = 0577711691$. The numbers set of subscribers, where rings acted is presented in [4].

Solution process of the task of hypothetically connected subscribers

This part of article is devoted to building of formalization methods of the relation with linear logical transformation. It is a main tools for realization of logic network which focused on parallel information processing and its program realization. The received methods of logic networks construction [4] are applied at a computer complex construction for automated firm management. Thus, the followings numbers of subscribers Kharkiv and Kharkiv area were found:

$x_3 = 0577153256$, $x_5 = 0577356578$,

$x_6 = 0572995633$, $x_8 = 0577332376$,

$x_{10} = 0572278745$, $x_{11} = 0577126534$,

$x_{12} = 0572937694$.

Conclusion

Thus, the above listed results make it possible to make the following important conclusion: using new algebraic and logical means of modeling of natural language constructions in the form of a system of equations based on the AFP-language and explicit way of specifying a finite alphabet operator which underlies method of solving these equations, ensures realization the property of reversibility of AFP-structures and a wide paralleling of symbolical information processing. Fundamental research of the algebraic and logical structure of an natural language as well as algebraic and logical means of its modeling in the form of AFP-structures of the first, second and the third sort permits to come close to the solution of the important scientific problem.

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