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MANAGEMENT OF DEMOGRAPHIC SYSTEMS ON THE BASIS OF THE LINGUO-COMBINATORIAL SIMULATION OF THE FAMILY AND OF THE FAMILY PASSPORT

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Abstract: Discusses the family as the fundamental unit of society. Synthesized linguo-combinatorial family model that can be used for her research and demographic systems management by means of family passport.

Key words: family as a complex system, self-organization, adaptive capacity, linguo-combinatorial simulation.

1. Preliminaries

The family is the basic cell of society, which ensures the reproduction of members of society. Only for a small number of real systems are mathematical models. First of all, systems are described using natural language. We propose a method of transition from a description in natural language to mathematical equations. For example, suppose you have a phrase

$$(1) \quad \text{WORD1} + \text{WORD2} + \text{WORD3},$$

In this phrase, we label the words and only the implied meaning of words. The meaning structure of natural language is not indicated. It is proposed to introduce the concept of meaning in the following form:

$$(2) \quad (\text{WORD1}) \times (\text{SENSE1}) + (\text{WORD2}) \times (\text{SENSE2}) + (\text{WORD3}) \times (\text{SENSE3}) = 0,$$

We denote AI as the words from English Appearance and meaning – as Ei from English Essence. Then the equation (2) can be represented as

$$(3) \quad A1 \times E1 + A2 \times E2 + A3 \times E3 = 0,$$

Equations (2) and (3) are models of the sentence (1). The formation of these equations, and equating them to zero is, the operation of polarization.

Linguo-combinatorial model is an algebraic ring (ring operator), we can solve equation (3) or with respect to AI, or with respect to Ei by introducing a third group of variables – the arbitrary coefficients of the Us [1]:

$$(4) \quad \begin{aligned} A1 &= U1 \times E2 + U2 \times E3 \\ A2 &= -U1 \times E1 + U3 \times E3 \\ A3 &= -U2 \times E1 - U3 \times E2 \end{aligned}$$

or

$$(5) \quad \begin{aligned} E1 &= U1 \times A2 + U2 \times A3 \\ E2 &= -U1 \times A1 + U3 \times A3 \\ E3 &= -U2 \times A1 - U3 \times A2, \end{aligned}$$

where $U1, U2, U3$ are arbitrary coefficients, which can be used to solve different tasks on manifold (3).

In General, if we have n variables and m manifolds, restrictions, then the number of arbitrary coefficients S will be equal to the number of combinations of n by $m+1$ that has been proven in [1], Table 1:

$$(6) \quad S = C_n^{m+1}, n > m.$$

The number of arbitrary coefficients is the measure of uncertainty, adaptability and hospitality.

Table 1.

n / m	1	2	3	4	5	6	7	8
2	1							
3	3	1						
4	6	4	1					
5	10	10	5	1				
6	15	20	15	6	1			
7	21	35	35	21	7	1		
8	28	56	70	56	28	8	1	
9	36	84	126	126	84	36	9	1

Table 1, which illustrates the formula (6) is shifted Pascal's triangle. The table clearly shows an emergent property of complex systems – the number of arbitrary coefficients for number of variables equal to six or more, first increases, reaches a maximum and then begins to decrease, which determines the possibility of development of systems and their self-reproduction, and this matrix can be called matrix of hospitality[1, 2].

2. Modeling of the family and its environment

It is important to consider linguo-combinatorial simulation of socio-economic systems. As an example, consider the problem of modeling family and her environment. If the keywords to take family structure "population"; the aspiration of the family – "passion"; a place that is a family "territory"; as a family earns a living that it produces – goods, services - "manufacturing"; "ecology and safety" family; "Finance" family, savings, property, and earnings; "external relations" of the family, in accordance with the above method, the equation of the family will

$$(7) \quad A1 \times E1 + A2 \times E2 + \dots + A7 \times E7 = 0.$$

The equivalent equations will be

$$\begin{aligned}
 E1 &= U1 \times A2 + U2 \times A3 + U3 \times A4 + U4 \times A5 + U5 \times A6 + U6 \times A7 \\
 E2 &= -U1 \times A1 + U7 \times A3 + U8 \times A4 + U9 \times A5 + U10 \times A6 + U11 \times A7 \\
 E3 &= -U2 \times A1 - U7 \times A2 + U12 \times A4 + U13 \times A5 + U14 \times A6 + U15 \times A7 \\
 E4 &= -U3 \times A1 - U8 \times A2 - U12 \times A3 + U16 \times A5 + U17 \times A6 + U18 \times A7 \\
 E5 &= -U4 \times A1 - U9 \times A2 - U13 \times A3 - U16 \times A4 + U19 \times A6 + U20 \times A7 \\
 E6 &= -U5 \times A1 - U10 \times A2 - U14 \times A3 - U17 \times A4 - U19 \times A5 + U21 \times A7 \\
 E7 &= -U6 \times A1 - U11 \times A2 - U15 \times A3 - U18 \times A4 - U20 \times A5 - U21 \times A6,
 \end{aligned}
 \tag{8}$$

where A1 is a characteristic of the family structure of the population, which includes health characteristics, education, employment; E1 – change of this characteristic, A2 – characteristic of passionarity, of the aspirations of family members, the public, people have the freedom of choice when making decisions, and this choice is important, which is evaluated by sociological analysis; E2 – change of this characteristic, A3 – characteristic of territory of the family, including ground and underground buildings, this unit can be geographic information system, E3 – variation of this characteristics; A4 – characteristic of what can be a good family to the outside world, what products m services it can offer, how would the productive capacity of the family, including the assessment of different types of activities – scientific, industrial, transport, trade, etc.; E4 – change this characteristic; A5 – characteristic of ecology and safety of the family; E5 – variation of this characteristics; A6 – characteristic of the family Finance financial savings , earnings and property; E6 – variation of this characteristics; A7 – characteristic of external relations family, including the assessment of the incoming and outgoing flows of people, energy, materials, information, finances, E7 – variation of this characteristics, U1, U2,...,U21, arbitrary coefficients, which can be used for managing and solving various tasks on the manifold (7).

This model (Fig. 1) is used in systems for decision support by the city authorities [1] and can be used to analyze decision-making in the family.

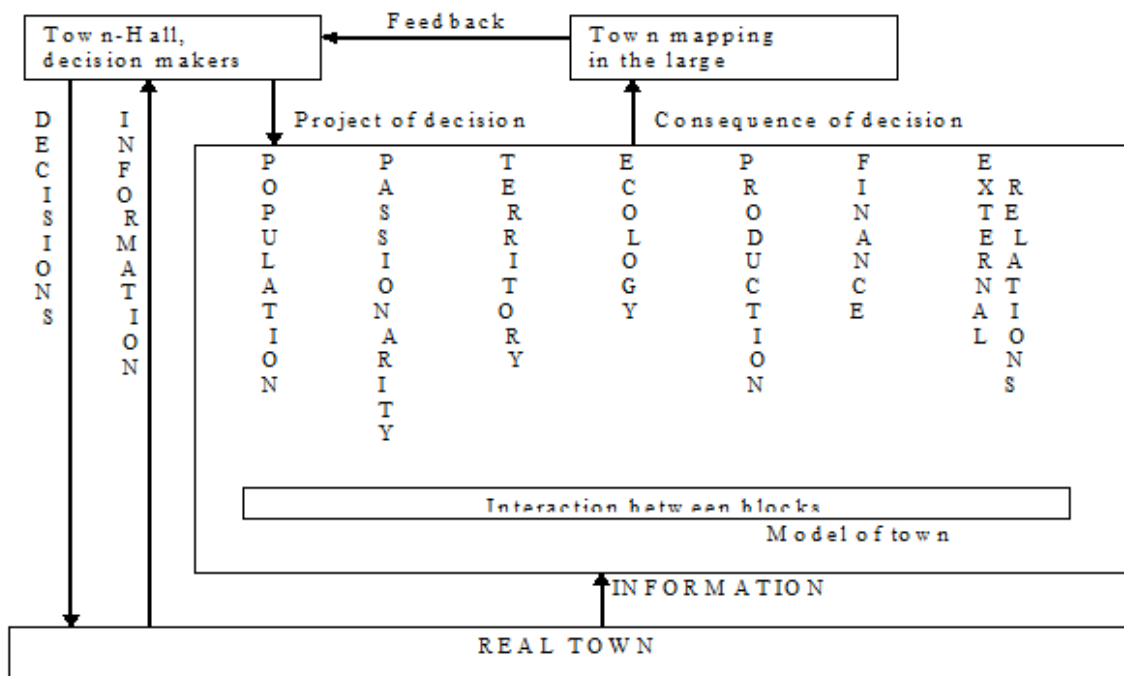


Fig. 1. City modelling to support management decisions.

The number of blocks in the linguo-combinatorial models may be different. From the point of view of accuracy of modeling the more blocks used, the better, but it deteriorates the

visibility of the model, its perception by decision-makers. For example, if the population is divided into three blocks – "children and adolescents", "adults" and "seniors", the number of variables will increase to nine, the equation of the family will contain nine variables

$$(9) \quad A1 \times E1 + A2 \times E2 + \dots + A9 \times E9 = 0.$$

In the simulation of the city it is important to consider the entire hierarchy of systems, of which this city is composed. The main cell of the city family, for the simulation which can also be used 7-block model, this will change the contents of individual blocks. Every family has its own household, the minimum family size was one person, but the family has all seven attributes. Similarly, it is possible to consider other family enterprises – family, teip, domain . The 7-block model can be used in modeling the various enterprises in which people work, the structure blocks for each of the types of businesses will be different. The uniformity of the model, which is the basis of modeling and family, and businesses and neighborhoods and the city as a whole makes it easier to make analysis and synthesis of such a complex system as a city.

The materials of the statistical office of the cities and regions and countries generally have almost all of the data required to run the model. Other data – to evaluate the drive as can be gleaned from opinion polls. The development of computing technique allows to put the issue of mandatory preliminary modeling of the consequences from decisions that will allow to avoid many wrong decisions.

Since ancient times evolved ways of managing the collective work, and communities of people. They are based on the regulation of relations between people (the rules of ethics, morals, commandments, laws, religion, later secular rules and regulations) and build a hierarchical control system using the administrative apparatus.

But as an individual and a group of people is a self-organizing system and various control methods various methods of internal and external control of self-organizing system. At the level of the individual and social groups there is goal setting, goal formation. The system's ability to self-organization depends on the ability of goal-setting that different people are different. There are conformists that are willing to do what others are doing and are even willing to obey the order of others, especially if these goals are developed by the team. Are personality with great independent thinking and resistance to impose their opinions. Depending on the type of person, mentality of the people can strive to formulate goals alone, either to develop goals collectively, which is typical for Russia, the Russian people have developed the desire for unity, to collective decision-making at all gatherings of villagers at meetings of labor staff.

Method of management based on participation in the goal formation of the active elements (human, enterprise, region, etc.) is promising despite its complexity. Not all people are able to the purpose, and strive to participate in formulating objectives. Some researchers claim that the active personalities in the countries of about 10%, and most are willing to accomplish goals set by the management.

There are the following levels] in relation to people – 1. material, determined by innate needs and programs person (self-preservation, to provide food, a minimum of clothing), – 2 emotional (the available entertainment, aesthetic perception of the world, the manifestation and realization of feelings of love, hatred, etc.), – 3. family public (implementation of the program of procreation, the creation of conditions for raising offspring), – 4. socially defined rules of community legislation, ethical norms, traditions, etc, – 5. intellectual, which is characterized by a system of values, focused on the development of creative abilities of the individual (an example is the atmosphere of the Akademgorodok in the initial period of their development). In connection with the development of information technology and virtual worlds begin to stand out two levels – the level of satisfaction of minimum needs of life in the real world and the level of satisfaction of the maximum needs in a virtual world where people can

realize their various fantasies. The implementation of these levels will mitigate the oppression of social inequality.

3. Modeling the family structure and interaction among its members

From the point of view of psychology [3] it is interesting to introduce in the model all household members individually to analysis of the functioning of the family. We consider the family consisting of the following members – father (the characteristic A1 and the change of this characteristics – E1), the mother (the characteristic A2 and the change of this characteristic E2); the eldest son (hisfeature A3, the change of this characteristic E3); daughter (her feature A4, the change of this characteristic E4); the younger son (his characterization of A5, the change of this characteristic s E5); grandfather (his characterization of the A6, the change of this characteristic E6); grandmother (her feature A7, changing the characteristics of E7). In this interpretation, the family will be described by equations (8) and (9). Changes in the composition of the family in the direction of reducing the structure of the equations will change accordingly. For example, if there is no father that is set by assigning arbitrary coefficients $U1 = U2 = U3 = U4 = U5 = U6 = 0$, the structure equations are transformed to the following form

$$\begin{aligned}
 E2 &= U7 \times A3 + U8 \times A4 + U9 \times A5 + U10 \times A6 + U11 \times A7 \\
 E3 &= -U7 \times A2 + U12 \times A4 + U13 \times A5 + U14 \times A6 + U15 \times A7 \\
 E4 &= -U8 \times A2 - U12 \times A3 + U16 \times A5 + U17 \times A6 + U18 \times A7 \\
 E5 &= -U9 \times A2 - U13 \times A3 - U16 \times A4 + U19 \times A6 + U20 \times A7 \\
 E6 &= -U10 \times A2 - U14 \times A3 - U17 \times A4 - U19 \times A5 + U21 \times A7 \\
 E7 &= -U11 \times A2 - U15 \times A3 - U18 \times A4 - U20 \times A5 - U21 \times A6.
 \end{aligned}
 \tag{10}$$

In this case the adaptive capacity of the family without a father decreased from 21 arbitrary coefficients to 15 arbitrary coefficients, but it is necessary to consider the characteristics of other family members, for example, could happen mobilization, growth characteristics A2, A3, A4, A5, A6, A7, and could occur and degradation – it all depends on family and environment... that was then, and the necessary psychological assistance [3].

There is another approach – using virtual reality systems to build a visual three-dimensional interactive model of the family and its environment [1, 4, 5], which play various instructive situation, clear, specific family members, with the participation of a psychologist [3].

4. Conclusions

So the report discussed some aspects of linguistic combinational modeling for the study of families, which opens up new possibilities for its investigation and demographic systems management.

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