ANALYSIS OF UNCERTAINTIES IN ADMINISTRATIVE ACTIVITY AND OPTIMIZING PROBLEMS

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The decision-making problem is directed at definition of an optimal path to goal achievement. The problem takes place if the actual state of investigated process does not correspond to what we wish. Each problem situation is not defined completely under uncertainty. Uncertainty can be caused by various factors, for example by uncertainty of demand for production (random-effects models), by uninvestigated natural processes or magnitudes (model with inexact factors, concerning which, only the area of their change is known) and by other reasons.

It is known that for decision-making problems formalization under over identification is used the probability theory, and also theories developed on the basis of the theory of statistical decisions and queuing theory. Successful mathematical technique in operation of the analysis of problems with inexact parameters is carried out by application of interval analytical methods.

Decision-making problems under uncertainty are very various and considerably more difficult than similar problems in determined situation.

In administrative activity the decision maker often faces set of cases when not probably to avoid an account problem other sort – the uncertainty, caused by an illegibility (fuzzy) the purposes and (or) restrictions.

Let, for example, it is required to disassemble algorithm of management of the robot rejecting preparations of models of the cylindrical form which length essentially is more (or less) than the set. In this example uncertainty is caused by an illegibility of concepts «essentially more», «it is essential less».

Other example. There are available K workplaces and k workers. It is required to distribute workers on workplaces so that total efficiency has to be as much as possible maximum. At the decision of this problem initial information is the overall performance of i - th worker (i = 1,2,3 … K) on j - th place (j=1,2,3 … k). However, it is impossible to find exact efficiency estimations . They are solved on the basis of expert's decision making and often have indistinct character, sometimes in general are defined by a subjective way.

In the present work the comparative analysis of uncertainties are carrying out with which the person operates at the description of the representations about real system of the desires. It is possible to find such management problems where the indistinct guaranteed result is better (in sense of optimization) than usual.

The method used by us – the theory of indistinct sets. Concepts of indistinct set are offered as means of mathematical modeling of uncertain concepts with indistinct borders.

Let's consider an example. For definition of a quantity of water. A concrete agricultural crop necessary for an irrigation, the agriculturist meets the natural equation x + a + b = c. Here x – required irrigating norm; a – an amount of precipitation of the vegetative period of culture; b – used water-supplies from earth; c – total of consumption of water by one hectare of the given culture. Concrete values of parameters a and b are unknown to the agriculturist. However he in a condition to specify intervals A and B in which there will be values of these parameters. The agriculturist knows also extreme values for a total water consumption at which the plant develops normally. In other words, to it interval C to which the sum x + a + b should get at every possible admissible values x, a and b is known. As a result we come to the following problem of the interval analysis: to find such value of irrigating norm x that at any values $a \in A$ and $b \in B$ the sum $x + a + b \in C$. Defining the sum of two materials as $A + B = \{a + b | a \in A, b \in B\}$, we have received interval equation $X + A + B \subseteq C$.

It is obvious that the maximum decision on inclusion of this equation is set of all x where $a \in A$ and $b \in B$: $x + a + b \in C$. If we pass from an interval with clear boundary A, B and C to intervals with indistinct borders $\tilde{A}$, $\tilde{B}$ and $\tilde{C}$ we will receive the indistinct equation $\tilde{X} + \tilde{A} + \tilde{B} = \tilde{C}$ with indistinct parameters. Basic work of the visible mathematician of the present of L.A. Zadeh «Fuzzy Sets» has been published in 1965. By this time the works devoted to diverse aspects of this theory and its appendices, are estimated in thousand. The English term «Fuzzy Sets», offered by L.A. Zadeh and got accustomed in the scientific literature as "washed away", "indistinct" etc. sets, is visually illustrated by language examples (almost, not quite, etc.) has interesting appendices in the field of an artificial intellect, in processes of construction of economic-mathematical models of real situations. The certificate of growing interest to this direction in the applied mathematics can serve and the organization in 1978 of special international magazine «Int. Journal of Fuzzy Sets and systems».

Among areas of wide application of the theory of indistinct sets the special place is occupied with problems of mathematical programming with indistinct values of parameters and (or) restrictions.

Let's consider optimizing model of the production program of association with final number of industrial structures taking into account the ecological factor (i.e. the output part is spent for nature protection activity):

$$(C, Y) \rightarrow max,$$
$$(Q, Y) \leq R,$$
$$Y \geq 0.$$

In this model
Y – the Vector a variant of the ecological program;
C – the Vector of efficiency of variants;
Q – the Matrix of specific expenses of variants of the program;
R – a limit Vector on nature protection expenses.

At forward planning, probably the components of vectors C, Q and R are appointed the coordinating centre and some deviations from "directive" value are supposed. As a result values of components of these vectors depend on admissibility degree.

It is obvious that the treating components of the above-stated vectors will represent indistinct sets of allowed values of each variant of efficiency, remote expenses and a limit on nature protection expenses.

This problem of indistinct linear programming can be solved by methods of the theory of indistinct sets.

In the conclusion we notice that indistinct guaranteed result of the majority of problems becomes better in sense of optimization than usual (usual sets are subsets of corresponding indistinct sets).

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