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ABSTRACTS

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SECTION 7. OPTIMIZATION AND CONTROL THEORY

APPLICATION OF INTERVAL MATHEMATICS IN IAS "SOTSIUM-K"

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The methodology of mathematical modeling has gained a strong position in the technological and natural science fields. In [1] J. Forrester first proposed model of world dynamics. Large teams of mathematicians, economists participated in the development of the fundamental concept of the development of Russia.[2] Therefore unquestionable relevance of mathematical modeling of social processes and the development of information-analytical systems to monitor indicators characterizing socio-economic situation in the Republic of Kazakhstan by regions.

This paper describes the capabilities of information-analytical system (IAS) "SOTSIUM-K". Input data to the system are defined as economic, social and demographic parameters. Economic parameters - it's gross domestic product, industrial production, consumer price index. Demographic parameters include: the number of births, the number of deaths, the number of citizens who have emigrated, the number of immigrant citizens. Social parametry - is unemployment, the number of crimes, the level of health care, social tension index.

Numerical parameter data for previous years are taken from the statistical abstracts and yearbooks of Kazakhstan Agency for Statistics. IAS allows using correlation analysis methods to find the degree of dependence (correlation) between the parameters (in this case it is possible to consider the effect of the delay). For any selected parameter can be classified into groups regions of Kazakhstan. As control parameters directives and events of republic and regional level events are defined. Using methods of mathematical theory of identification mathematical model that describes the interconnection between input and control parameters is defined. IAS allows to forecast the behavior (dynamics) of input parameters under different (defined in special way) control actions.

Interval analysis is currently being actively developed in many countries. Originally interval methods have emerged as a means of automatic control of rounding errors on the computer and later turned into one of the branches of modern applied mathematics. Interval methods have long gone beyond the purely theoretical research and are widely used in practice with the appropriate software. The result was the interval arithmetic, interval algebra, interval topology, interval methods for solving problems in computational mathematics, optimal control, sustainability, etc.

Based on the use of interval mathematics effectively verifiable criterion for controllability of dynamic systems described by ordinary differential equations with limited control is obtained. Based on regularization method a software for a procedure for finding the optimal solution of optimal control with quadratic criterion of quality with limited control is implemented.

REFERENCES

[1] Forrester J.(1978) World Dynamics. "Nauka", Moscow,384 .
[2] Koptyug V.A., MatrosovV.M., LevashovaV.K.(2004) New development paradigm Russia. "Academia", Moscow,460

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CERTIFICATE

This is to certify that   Prof.

Jomartova

participated and presented a report entitled
Application of interval mathematics in IAS "SOTSIUM-K"

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