

ABSTRACT

The thesis is presented in 96 pages. It contains 2 appendixes and bibliography of 31 references. 19 figures and 15 table are given in the thesis.

Topic relevance. Talking about the demographic situation in Ukraine, it should be noted that it is in a critical situation. Mortality significantly exceeds fertility at present, there is no natural population growth, there is a significant deterioration of health and living standards of the population, so-called aging of the nation, a significant part of able-bodied population migrates abroad. In order to ensure that the crisis situation in Ukraine does not overcome into the demographic catastrophe, it is necessary to forecast it in time and take a number of measures to improve the living standards of the population in Ukraine. This topic is also relevant due to the fact that demographic forecasts are needed in various economic sectors - in order to determine the required number of workplaces, as well as to find out the necessity to build houses, schools, kindergartens, hospitals, it is useful to predict the sex-age structure of the population. Since the existing projections of the population of Ukraine are based on methods that use the constant initial indicators of fertility and mortality rates, the task of developing a model that consider changes of these indicators over time is relevant. This would allow a long-term forecast with a better accuracy.

Thesis connection to scientific programs, plans, and topics. The thesis was prepared according to the scientific research plan of the Applied Mathematics Department of the National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute.”

Research goal and objectives. The goal of this thesis is to obtain a more accurate forecast of the number and sex-age structure of the population of Ukraine in comparison with the existing forecasts.

To accomplish this goal, the following objectives were reached:

- carry out an analysis of the existing methods of forecasting the population;

- to construct a mathematical model for forecasting the population using existing models and considering changes in fertility and mortality rates over time;
- to design an automated system for a modified model;
- to implement the program realization of the developed system, carry out its research;
- carry out the forecasting of the population of Ukraine, estimate the accuracy of the forecast;
- compare the accuracy of the forecast with the accuracy of the existing forecasts.

Object of research is methods for predicting fertility and mortality rates, methods for predicting the number and sex-age structure of the population.

Subject of research is the number and sex-age structure of the population of Ukraine.

Methods of research. To solve the task, the following methods were used: methods of mass service theory (for the development of a forecasting model); analytical methods of decision making theory (for the forecasting fertility and mortality rates); methods of the theory of algorithms and programming (for implementing the developed algorithms); methods of probability theory and mathematical statistics (for carrying out experiments and calculating accuracy).

Scientific contribution consists of the following:

- mathematical model of demographic forecast improved, which, unlike existing ones, consider changes of fertility and mortality rates over time and allows for a more accurate and long-term prediction;
- For the first time, the classical and modified models were used to predict the number and sex-age structure of the population in Ukraine.

Practical value of obtained results.

The model and method that can be used to predict the number and sex-age structure of the population, in particular, in Ukraine, is proposed. The developed method, mathematical approach and software allow to predict the population over a long period of time with high accuracy, since they consider the changes in the birth and mortality rates over time.

Approbation of the thesis results.

Basic ideas and results of the research were presented at the Scientific Conference "Applied Mathematics and Computing" (2018).

Publications. Thesis results are published in 2 scientific works:

- in 1 paper in the publication of the materials of the international scientific conference (personally);
- in 1 paper of in the collection of materials of the scientific conference PMK-2018.

Keywords: population, demographic forecast, sex-age structure of population, autonomous mass service system, multi-phased system of mass service, extrapolation methods.