

ABSTRACT

The thesis is presented in 118 pages. It contains 3 appendixes and bibliography of 28 references. Twenty one figures and 5 table are given in the thesis.

Topic relevance. One way to improve safety management of systems ergative systems is a continuous monitoring of the actions of the operators as subjects of ergative systems in the course of their activity during the work shift, which can significantly reduce the percentage of accidents and incidents due to human factors.

Therefore, it is urgent to develop an access control systems of operators to control systems of ergative system that provides a solution to such problems as authentication of operators (to prevent unauthorized access to systems management) and monitoring their psychophysiological state.

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 “Kyiv Polytechnic Institute.”

Research goal and objectives. The goal of this thesis is development an automated system for monitoring of air traffic controllers with considering voice emotional state.

To accomplish this goal, the following objectives were reached:

- estimate of the current state of the problem, analyzed and justified the choice of methods;
- prepare of sound material for further processing;
- apply methods of pretreatment signal;
- describe the methods of parameterization, through the use of artificial neural networks for problems authentication;
- determine which of parameters characterizing speech person;
- define as an emotional state affects the voice settings;
- analyze the emotional states of speakers by chosen method.

Object of research is processes occurring in the digital processing of speech signals in problems of voice authentication.

Subject of research is the methods and means of processing and analysis of the speech signal and the selection of signal parameters can characterize informative person and her emotional state, and methods of pattern recognition and classification.

Methods of research. To solve the task, the following methods were used: digital signal processing, optimization techniques, the theory of pattern recognition.

Scientific contribution consists of the following:

- developed a parameterization system based cepstral coefficients of linear prediction, that significantly reduces the time signal processing;
- improve methods for comparison of controlled characteristics (voice recordings) with the standards of database space by thinning feature vectors that provides system performance and allows control in real time;
- propose methods for determining the emotional state air traffic controllers by voice that will reduce the probability of errors which may have introduced air traffic controllers that are undue emotional state.

Practical value of obtained results. The system makes possible to effectively carry out authentication of identity and determine its emotional state during the execution of professional duties in real time.

Approbation of the thesis results. Basic ideas and results of the research were presented at the XV International scientific conference of young scientists and students "Polit. Challenges of Science" (Kyiv, April 8-9, 2015.), XVI International scientific conference of young scientists and students "Polit . Challenges of Science "(Kyiv, April 6-8, 2016.), the VIII scientific conference of graduate and post-graduate "Applied mathematics and computing" AMC-2016 (Kyiv, 20-22 April 2016), in 53d student conference academia University of Science and Technology "AGH" (Krakow, Poland, May 5, 2016.).

Publications. Thesis results are contained in the festschrifts of four conferences that are listed in the preceding paragraph (3 of them personally).

Keywords: speech signal, digital signal processing, artificial neural networks, cepstr, cepstral coefficients of linear prediction, thinning, phoneme, the frequency of the fundamental tone, emotional state.

