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Review
of the thesis "The methodology for reducing the impact of the human factor on flight safety" submitted by R. K. Anayatova to fulfill requirements for the Doctor of Philosophy (Ph.D.) degree in the specialty Aviation Technique and Technology (6D071400)

At present, with the increasing of the air traffic volumes, flight safety requirements are increasing significantly. In all cases related to studies in the provision of flight safety, there is a clear and implicit effect of the human factor, because in the aviation, human errors frequently lead to tragic consequences.

Studies of the impact of a human factor on flight safety has an international character. In particular, ICAO's training manual, the impact of the human factor on the safety and efficiency of the aviation and transport system is emphasized as a separate standard and is considered as a new scientific field of study.

The human factor refers to the combination of ideological, moral, social, psychological, physical, professional, and other qualities that influence the result of human activity.

Current advances in information and intelligence and information processing techniques can significantly reduce the impact of the human factor on the flight safety.

In this thesis R. K. Anayatova investigates the problem of improving flight safety based on the assessment of the psycho-emotional state of aviation personnel evaluated using intellectual digital processing of the verbal communications, analyzing standard phraseological rules of English language used in aviation. A significant advantage of this work is a speaker-dependent recognition - without considering a gender difference.

The methods of processing and analysing the representative sets of the speech signals for the seven archetypical types of emotions of English-speaking speakers are distinguished by the variety of topics have a great value. Based on that fact, I can conclude that the results from the comprehensive study of the intellectual automatic recognition of the speaker's emotional level from verbal communications, presented in this thesis can be applied to other areas of human activity related to the operation of complex technical systems with human-machine interfaces.

This thesis structurally consists of the introduction, four sections, conclusion, list of used sources, and applications.

In the introduction, the author determines the relevance of the study on the impact of the human factors to flight safety, formulates the purpose and objectives of the thesis, presents the scientific novelty of the work, discusses the practical significance of the work, demonstrates the author's personal contribution to the presented research, and provides information about published articles.

In the main part of the work, the results of the author are described and analyzed in accordance with the objectives of the research. In particular, the following main points should be emphasized:

- Proposed a robust method of recognition of speech signals, allowing to assess the psycho-emotional state of aviation personnel, such as flight and dispatch staff based on the analysis of standard phrases in radio exchange, as well as, phrases from a professional aviation English.
- Developed a structure of a deep neural network for speech recognition.
- Suggested a novel approach for solution of a complex intellectual problems on the basis of modern technologies, techniques, and data sets including The Ryerson Audio-Visual Database of Emotional Speech and Song (RAVDESS), Surrey Audio-Visual Expressed Emotion (SAVEE), and Toronto Emotional Speech Set (TESS) data sets for training neural networks,
- Discussed modern technology for the development of neural networks, applications of computer modeling, estimated efficiency of the developed algorithms and methods for signal processing.

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Each section of the thesis contains a reasonable conclusion based on the data obtained during the study. The work is characterized by a combination of established theoretical methods and practical results obtained during practical studies.

The thesis meets the requirement of the internal clarity and integrity. The results and recommendations are in line with the formulated goals and objectives.

Particularly, I would like to emphasize the following scientific results demonstrating significant personal contribution of the author to the research described in the thesis:

- The impact of the human factors on the flight safety and the increased risk of air traffic accidents have been thoroughly investigated.
- The phraseology of the radio exchange has been studied and a list of phrases for assessing the psycho-emotional state of aviation personnel has been identified.
- A comprehensive approach for intelligent automatic voice recognition is developed.
- The process of pre-processing speech signals at the stage of extraction of informative signs for the automatic classification of the emotional state of human is developed.
- The method of using informative traits and the form of their presentation to build a model of a multi-class voice signal classifier for the recognizing emotions by speech signals is proposed.
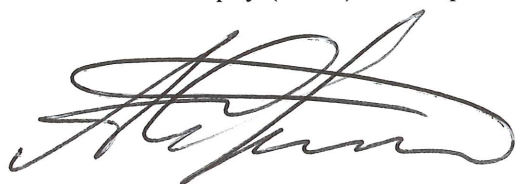
The author's scientific results are published in sufficient volume.

At the same time, some concerns raised by the reviewers of the author's papers should be addressed. In particular, the reviewers indicate that some results from the reported experiments were not disclosed directly by the flight control crew.

Despite of these minor comments, the thesis presented by R. K. Anayatova demonstrates results from a comprehensive research work performed at a high scientific and technological level.
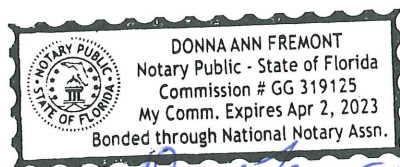
In conclusion, the thesis "The methodology for reducing the impact of the human factor on flight" by R. K. Anayatova has significant practical and theoretical value and meets all the requirements for the Ph.D. level thesis.

Based on the above, I found that the thesis submitted by R. K. Anayatova satisfies the requirements for the Doctor of Philosophy (Ph.D.) in the specialty Aviation Technique and Technology (6D071400).

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Dr. A.V. Streltsov's signature is confirmed:

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