REVIEW

by Prof. Radoslav Dimov Pavlov

Institute of Mathematics and Informatics –BAS

for the doctoral thesis of Atanas Petrov Ouzounov

on the topic "SPEECH DETECTION IN SPEAKER RECOGNITION SYSTEMS"

for the acquisition of the educational and scientific degree "doctor" in the scientific specialty "Informatics", the professional field 4.6 "Informatics and Computer Sciences" in 4. "Natural Sciences, Mathematics and Informatics"

This review is prepared in accordance of the order of the Director of IICT №55/19.03.2020 as a member of the Scientific jury and the decision of the scientific jury.

It is made according to the Act of the Development of the Academic Staff in the Republic of Bulgaria, the Rules for its implementation and the rules on the Terms and Conditions for Acquisition of Academic Degrees and Occupation of Academic Positions at Bulgarian Academy of Sciences and IICT-BAS. As a member of the Scientific jury, I have received all the required administrative and scientific documents from the candidate.

The presented dissertation consists of 164 pages, 48 figures and 27 tables are included. The table of content includes five chapters. The first chapter is entitled *"Speech Detection: A Review"*, chapter two -*"Speech detection features based on the properties of SACF and GDS*, chapter three -*"Algorithms for endpoint detection in fixed-phrase speaker verification. The experimental study"*, fourth -*"VAD algorithms in text-*

independent speaker identification. The experimental study" and fifth -*"BG-SRDat – Telephone speech corpus intended for speaker recognition"*, contributions, and dissertation publications – 6, citations, related to the thesis – 1, total citations – 25, and references – 151 titles.

General description of the thesis

The thesis is dedicated to a current research topic - research and application of models and algorithms for recognizing the speaker in the context of modern biometric systems. The research is focused on the recognition of speakers during a speech signal in a noisy sound environment recorded on a telephone channel. The great interest in the world in research in this field stems from their real practical significance due to the widespread use of mobile phones and Voice over the Internet (VoIP), which set a number of tasks for verification and identification of speakers.

Comprehensive analysis of the scientific and applied achievements in the thesis

Chapter 1 presents an analytical literature review of the approaches to speech detection – localization and segmentation of speech segments in audio signals.

Chapter 2 is dedicated to problems of forming properties of speech detection by time contour analysis. The author proposes five speech detection features and two approaches for their computation.

Under consideration are application of delta filter on the spectral autocorrelation function as well as combination of the delta spectral autocorrelation function with features of modified group delay spectrum due to passing the audio signal through a device.

Chapter 3 describes an experimental study of the efficiency of the features proposed in Chapter 2 for fixed-phrase speaker verification. The experiments were performed with short phrases from Bulgarian and English corpora and were accomplished with proposed by the author algorithms for localization of endpoints in a speech message.

Chapter 4 describes an experimental study of the efficiency of the features proposed in Chapter 2 for text-independent speaker identification. The experiments were performed with two different algorithms for speech detection on speech data from from Bulgarian and English corpora. The developed algorithms for identifying speech fragments in the speech message were applied.

The actions for planning and performing the experiments, described in Chapters 3 and 4, make an impression of well thought out and methodologically sound. The experiments compare the efficiency of speech detectors, built on algorithms developed by the author, with the efficiency of detectors, using algorithms with referent features. Subject of comparison are the accuracy of localization of endpoints and speech fragments as well as the errors in speaker identification. Comparisons allow conclusions for better results when using certain features and models applied in speech detectors.

Chapter 5 describes a corpus with speech data recorded over telephone lines. It is developed by the author and was used for the experiments, described in Chapters 3 and 4. The corpus contains separate phrases and conversations in Bulgarian and only separate phrases in English.

The conclusion summarizes correctly the scientific and applied contributions of the dissertation, listing the results presented in the dissertation. The abstract correctly reflects the content of the work. The publications on the topic fully reflect the essential aspects in the dissertation. All publications are written by the candidate in English, 4 of them are in Scopus and Web of Science, 3 have SJR. The extremely detailed bibliography confirms the detailed knowledge of the dissertation of the researched field.

The candidate has sustainable and long-term research interests in models and methods for processing voice messages in order to recognize speakers. It is driven by well-thought-out productions and seriously analyzed existing results. In defining and solving the set research tasks, the author shows creative thinking, good insight into the research problems and significant depth in their definition and solution.

Conclusion: On the basis of the above, concerning the presented dissertation, the scientific works, their significance and the scientific and practical contributions contained in them, I consider that the dissertation work of Atanas Petrov Uzunov satisfies all the requirements of Act of the Development of the Academic Staff in the Republic of Bulgaria, the Rules for its implementation and the rules on the Terms and

Conditions for Acquisition of Academic Degrees and Occupation of Academic Positions at Bulgarian Academy of Sciences and IICT-BAS for the acquisition of the educational and scientific degree "doctor" in the scientific specialty "Informatics", the professional field 4.6 "Informatics and Computer Sciences" in 4. "Natural Sciences, Mathematics and Informatics" **and I give my positive evaluation** of the PhD thesis. I will vote for Atanas Petrov Uzunov to give the educational and scientific degree "doctor" in the scientific specialty "Informatics".

Sofia, 11.06.2020

Prepared the review:

Prof. Dr. Radoslav Pavlov