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SYNTHESIS OF SPEECHLIKE NOISE FOR DECREASING THE INTELLIGIBILITY OF THE MASKING SPEECH

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Information security system is discussed. The system is used for active masking of the secret conversation by the speechlike noise formed from this conversation but with no any semantic load. The main aim of the systems is to decrease the intelligibility of the speech that can be intercepted. Proposed system is based on the compilation of parts of the speech of the participants of the secret conversation in real time according to phonemic text that is generated on the base of statistical characteristics of a language in order to get a speechlike signal that will be mixed with the speech of the conversation participants.

Key words: speechlike signal, information security, speech information, acoustic channels, speech intelligibility.

The task of information protection from a leakage via acoustic channels occupies one of the main obstacles in the sphere of information security. In fact that it is the key element in the life of modern world and the substantial part of the threats realizes through it. The protection of speech information is the most important task since the speech is the most natural form of the interaction for the man. There are many methods of interception of speech information with the use of the directed or laser microphones, miniature Dictaphones and so on. The protection of speech information from all possible threats is a complex and expensive task.

One of the approaches to its solution is active masking of conversation, which is based on the creation of acoustic noise on the perimeter of the protected accommodations or directly in the accommodation itself, where a secret conversation is conducted in order to reduce the speech intelligibility for interception means. Analysis of the existing systems for active acoustic masking revealed the fact that in the majority of such systems «white» or «painted» noise is used. However, it should be noted that with the use of «white» noise the signal level necessary for the reliable protection of accommodation can exceed comfortable level and sometimes can reach permissible sanitary standards. On this basis it is possible to make a conclusion about the expedience of applying speechlike noise. This form of noise is oriented not to the creation of random signal but to change real speech signal in such a way that its sense would become incomprehensible.

In this work we examined questions of synthesis of speechlike signals for the protection of speech from a leakage via technical channels. The possibility of forming speechlike signals for the protection of negotiations simultaneously for several languages is discussed, which makes it possible to substantially hinder the interception of the speech of participants in the international negotiations.

The synthesis of speechlike signals for the protection of negotiations in different languages is based on the compilation of the sections of the records of the speech of announcers according to the phonemic text, generated by probabilistic methods taking into account the statistics of language. The proposed synthesis uses allophones as the sections of the records of the speech of announcers, which either previously are separated from the speech of arbitrary announcers and form the data bases, or they are separated directly from the speech of partici-

pants of the negotiations. Phonemic text is formed from the phonemes on the basis of the probabilities of their appearance in the text in accordance with the statistics of the language.

The realization of speechlike signals synthesis system for the protection of acoustic information from a leakage via technical channels deserves attention in following tasks:

1. Automatic switching on the system at the moment of the beginning of the protected conversation on the basis of the analysis of the surrounding acoustic situation for the presence of speech.

2. Forming the phonemic text in accordance with the statistical special features of the language that carries no semantic load.

4. Segmentation of the speech of participants of the conversation per phonetic units in real time.

5. Classification of the chosen phonetic units.

6. Synthesis of speechlike signals according to the phonemic text directly on the basis of the voices of participants of the private talk.

The proposed synthesis of speechlike signals must ensure generation of the noise on the basis of the voices of participants in the negotiations in such a way that it is not possible to divide their speech and generated noise. This noise is formed from the sections of the spoken speech. This process realizes in the modules of the segmentation of speech, classification of speech and synthesis of speech.

Segmentation is the process of the partition of speech in the sections of homogeneous fluctuations, which correspond to the different types of the phonemes: nasal, fricative, occlusive.

After speech is segmented into the phonetic elements it is necessary to separate them into the classes. This is achieved in the module of the classification of speech. The task of classification requires for its solution special classifying characteristics. Each obtained segment is characterized by specific spectral-temporary parameters, which can be divided beside the classes on the form of spectrum, change in the energy, on the periodicity and other conducted investigations. But there is no any parameter which makes it possible to accurately recognize all types of segments. Each type possesses its specific special features, which distinguish it, for example, from the second type, but not distinguishing it from the third type, for which it is necessary to use other special features. Thus, it is necessary to use a set of the parameters and to solve the problem of classification separately for each type of segments. However, since the problem of classification are included into the generation of signal, on its fundamental temporary, spectral characteristics and perception that is similar to speech, the high accuracy of the recognition of phonemes is not required.

Direct synthesis of speechlike signal formed by the random law and with all formal signs (splash nature, the presence of words, spaces between the words, frequency range), maximally similar to real speech, but not containing semantic information, is achieved by a module of the synthesis of speech. It is formed taking into account statistical laws of the selected language of phonemic text beside the acoustic fluctuations of sonic frequency band. The allophone model of the synthesizer of the speech and the bases of the allophones of announcers are used for this process.

Thus, the developed system for the active protection of speech information is automatically switched on with the beginning of secret conversation, provides protection of the secret conversation, since the disguising signal is formed on the basis of the voices of participants of the conversation and does not bear any semantic load, and therefore it makes it possible to substantially hinder interception of speech information be reducing the speech intelligibility. This system can be used when it is not possible to guarantee the complete safety of accommodation, including the cases of negotiating in the car and on the street.