Experimental FFT-Vokoder For VoIP

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Abstract - **In this paper the algorithm for speech compration are described.**

Keywords - **MOS, PESQ, G.729.**

I. INTRODUCTION

Low speed codecs for communication of speech data in IP networks which attained the often use are commercial coders G.729 and G.723.1. Offered in [3] experimental vocoder based on DFT needs more detailed research, but for the first approaching even in such kind can be compared to coders mentioned above for verification of fast-acting and quality of compression of speech information.

II. COMPARISION OF ALGORITHMS

Purpose - experimentally estimate the efficiency and possibility of the use of vocoder based on a DFT in VOIP additions. Consist in objective estimation of legibility of speech after compression. For this purpose used PESQ - PSQM, and also relative comparison of their fast-acting.

Chart of experiment is presented on fig. 1. Research of speech information consists their subsequent code in first case used coder G.729, in second vocoder based on a DFT, the farther got signals are compared to original information by the algoritm of PESQ.

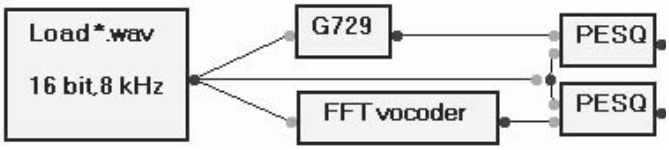

Fig.1. Block diagram of experiment

In an experiment 26 speech fragments are used, which have long to 8 seconds (preliminary cleared from the noise influencing). As an example, two test signals are presented (fig. 2).

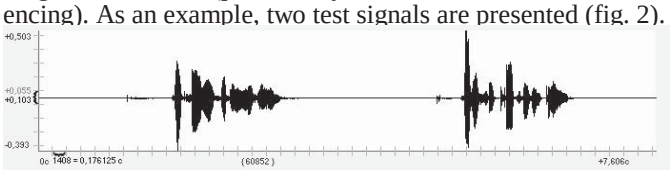

Fig.2. Test signal

Principle of work of DFT-coder:

An algorithm consists in laying out of signal on packages, calculation their spectrum of amplitudes and phases, location position of maximums and transfer necessary information on a receiving side.

In current modeling selected 10th spectral constituents (amplitudes and phases) with max power, at length of packages – 128 samples (that respond 16 millisecond of speech) from which a 10 samples is overlapping (that respond 1,25 millisecond of speech).

After comparison of values of middling quadratic rejection and estimating quality of initial signal, it was selected 4 digits on the quantum of spectrum of phases and 5 on spectrums of amplitudes. The quantum of amplitudes passed in limits from 0 to 0,25; and phases – from -3,14 to 3,14.

Principle of work of G.729-coder:

G.729 is an 8 Kbps coder that encodes/decodes speech signals using the Conjugate-Structure Algebraic-Code-Excited-Linear-Prediction (CS-ACELP) algorithm. Used G.729 is a reduced complexity version of G.729 and is bit stream interoperable with the full version.

The coder operates on speech frames of 10 ms, corresponding to 80 samples at a sampling rate of 8000 samples/sec. In addition to the 10 ms speech frame duration, there is also a look-ahead delay of near 5 ms, resulting in a total initial algorithmic delay of near 15ms.

For codec G.729 the value of PESQ changed from 3,37 to 3,97 (middle estimation 3,67). Time outlays on a compression and decompression of fragments (longs near 8 seconds) take from 400ms to 500ms, that in the real terms can be interpreted as a delay of code processing.

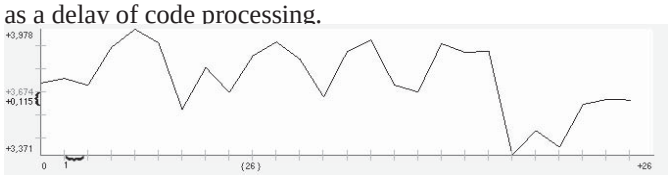

Fig.3. PESQ – coder G.729

In the case of the use of vocoder based on a DFT the value of PESQ hesitated from 2,57 to 3,23 (middle estimation 2,9). Approximate time outlays on a compression and decompression of speech's fragments longs 8 seconds take from 1000ms to 1200ms.

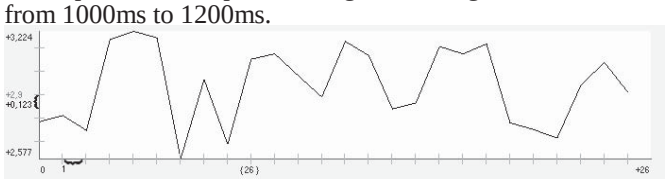

Fig.4. PESQ – DFT-vocoder

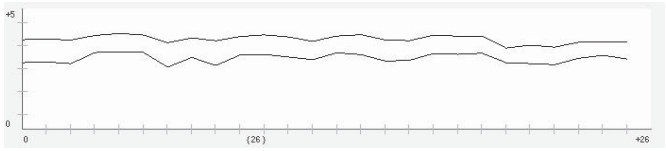

Fig.5. Comparison of PESQ, both coders

III. CONCLUSION

According to the got results without regard to simplicity of idea of proposed method and even at application of DFT, comparizen to codec G.729 shows: our method brings only in 2 times a greater delay. Consequently, this algorithm has a worse estimation of MOS on an order, but it value is near 3, that fully assumes his use in VoIP. Similarity of descriptions of PESQ is also traced in both cases (fig. 5), that is why it is possible to say with a confidence, that these methods bring in alike distortions during coding of sppech fragments.

REFERENCES

[1] Тимченко О.В., Заярнюк М.В., Стрихалюк Б.М. Алгоритм PSQM та область його застосування // Моделювання та інформаційні технології. Зб. наук. пр. ІПМЕ НАН України. – Вип.42. – К.: 2007. – С.3-14.

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