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Marine Signal Denoising Based on Discrete Wavelet Transform

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Abstract: This study presents a novel audio denoising scheme in a given speech signal. The recovery of original from the communication channel without any noise is a difficult task. Many denoising techniques have been proposed for the removal of noises from a digital signal. In this study, an audio denoising technique based on Discrete Wavelet Transform (DWT) is proposed. The proposed architecture uses a novel approach to estimate environmental noise from speech adaptively. Here original speech signals are given as input signal. Using AWGN, noises are added to the signal. Then noised signals are denoised using DWT techniques. Finally Signal to Noise Ratio (SNR), Peak Signal to Noise Ratio (PSNR) values for noised and denoised signals are obtained.

Key words: Audio denoising, DWT, AWGN, SNR, PSNR, signal

INTRODUCTION

Speech dereverberation and denoising using learning spectral mapping is presented by Han *et al*. (2015). Spectral mapping is learned directly using the training of deep neural networks from the magnitude spectrogram of contaminated speech to that of hygienic speech. This approach considerably attenuates the twist caused by reverberation as well as background noise.

Spectral sparsity based multichannel audio denoising formulation is described by Bayram. (2015). Two stage methods are used for this evaluation problem. It does not need any details about noise. There are two stages are involved: first stage is used to obtain linear combination using this assumption and second stage estimates the number of remaining noise. Greedy time-frequency shrinkage based sparse audio denoising is discussed by Bhattacharya and Depalle (2014). Matching pursuit in the background of audio denoising is analysed. Factors critical to its success is identified using interpreting the algorithm like easy shrinkage approach (Fig. 1).

Spectral subtraction technique based audio de-noising is explained by Biswas *et al*. (2014). An efficient architecture in hardware for the algorithm of spectral subtraction is applied to speech improvement is used. Environmental noise is estimated from speech adaptively. Noise samples are subtracted in the input speech after the noise estimation. There are two principal blocks are followed like phase block and noise estimation-subtraction block which are executed simultaneously exploiting the parallel logic blocks of field programmable gate array.

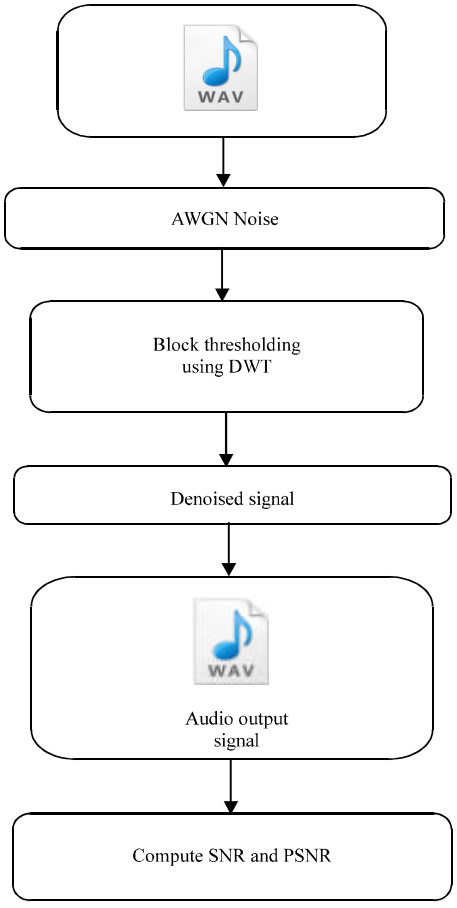

Fig. 1: Block diagram of the proposed audio denoising system

Denoising approach based on statistical Empirical Mode Decomposition (EMD) for multi rate high-resolution

signal reconstruction is presented by Ukte *et al*. (2014). Denoising procedure is applied based on EMD interval-thresholding to every noisy low resolution measurement. Then only can filter the AWGN.

STFT and wavelet denoising based Linear Frequency Modulated (LFM) Signals Detection in low SNR is explained by Yu *et al*. (2014). Input signals are short-time Fourier transformed into coherent integration of frequency-shift model sequences with compound envelopes, achieving a time-frequency curve which is to be processed by wavelet in order to weaken the noise and to detect LFM signals effectively. This is described in Isolation, Optimization and Extraction of Microbial Pigments from Marine Yeast *Rhodotorula* Sp., (Amby109) As Food Colourants is discussed by Muthezhilan *et al*.

Proposed system: The proposed system uses the DWT method. It is used to denoising the audio signal effectively. First the given input signals are read then AWGN noise is used to add some noise to the input audio signals. Horizontal Transfer of Chloramphenicol resistance plasmids from marine associated *Pseudomonas* spp., is discussed by Jayaprakashvel *et al*. Then the noised signals are denoised using this novel DWT technique. Finally, SNR and PSNR of the original and denoised signals value are calculated. Figure 1 shows the block diagram of the proposed audio denoising technique.

MATERIALS AND METHODS

DWT method is used in this proposed method to denoise the given input signal using decompositions. The DWT features will be having discrete level of wavelet transform features. This feature extraction is done for various levels of decomposition process.

RESULTS AND DISCUSSION

The performance of the proposed system for digital audio denoising using STFT method has done. The proposed architecture uses a novel approach to estimate environmental noise from speech adaptively. Here original speech signals are given as input signal. Using AWGN, noises are added to the signal. Then, noised signals are denoised using DWT techniques. Finally SNR, PSNR values for noised and denoised signals are obtained.

Figure 2 shows the noised signal using AWGN channel. Here, the noises were added using add white Gaussian noise method with SNR rate. Figure 3 shows the denoised output audio signal using proposed DWT technique. The denoising is based on DWT with block thresholding method and hanning window.

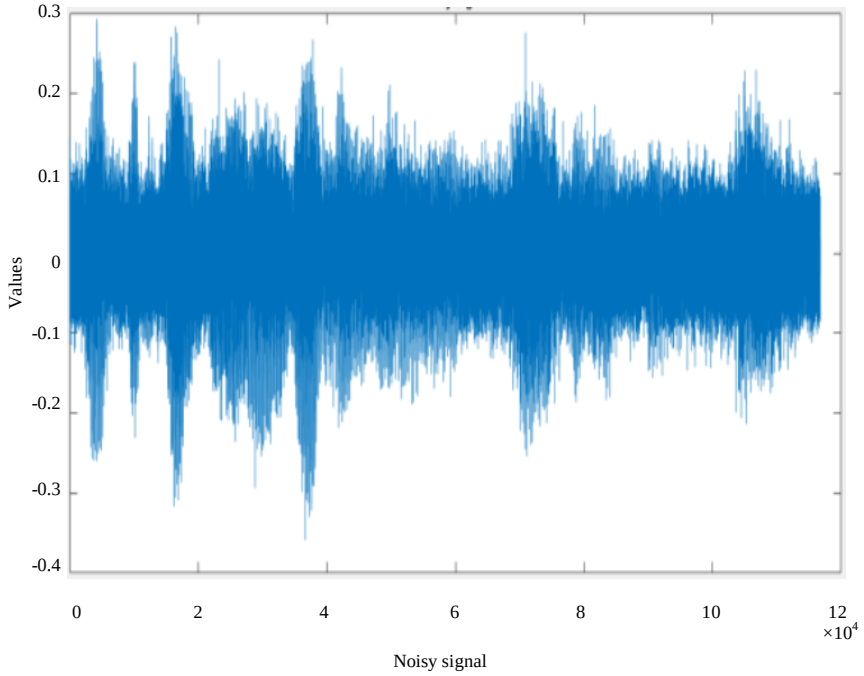

Fig. 2: Noisy signal using AWGN

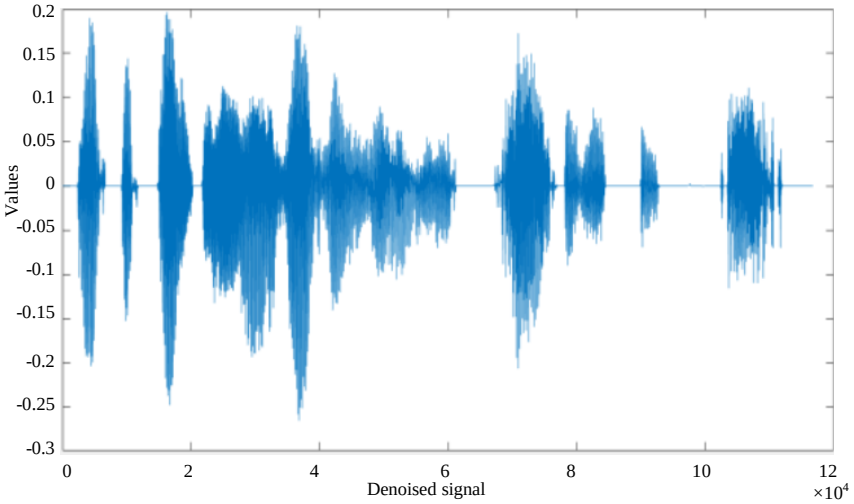

Fig. 3: Denoised audio signal using DWT

CONCLUSION

In this study, DWT has been proposed to denoise an audio signal from the given input signal. Figure 3 shows the denoised audio signal using DWT method. Finally PSNR of this proposed method is better while compared to existing method. The results indicate that this performs better than the other distributions. The future scope of this study is designing a better algorithm with better features.

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