Wireless Network Security via Per Hop Data Encryption through ECC and Secure Authentication with DSA

Prajakta Devidas Pagar[1] Dr.V.A.Wankhede[2]
[1,2]Department of Electronics & Telecommunication Engineering
[1,2]Savitribai Phule Pune University

Abstract— In case of multi component samples, it is absolutely essential to include appropriate data processing tools to find relationship between the biosensor responses and the measured data. It is necessary a first data pretreatment step in order to explore and validate obtained information. Discrete wavelet Transform is the data processing strategy proposed in order to achieve better interpretation models and discard irrelevant content coming from original data.

Key words: Discrete Wavelet Transform, PSNR, MSE, High–Pass Filter, Low-Pass Filter

I. INTRODUCTION

To introduce a discrete Wavelet Transform (DWT) as a data Processing method using FPGA is the aim. Discrete Wavelet Transform is propose in order to achieve better interpretation models and discard irrelevant content coming from original data. Many applications related with the use of biosensor responses entail data interpretation problem related: (1) noisy records due to temperature changes; (2) data acquisition noise present in records; (3) presence of interference signals in the biosensor response mainly contaminated by signals coming for the electrochemical equipment i.e. potentiostats, magnetic stirrings and thermostat; (4) according with the inhibition method the responses can be slow which implies signals with information in low frequencies and a large number of samples per essay.

II. BASICS OF WAVELET TRANSFORM

Morlet et al. (Morlet et al., 1982) described the concept wavelets which used to decomposition signals without the necessity of windowed them as Gabor suggested before (Gabor, 1946). In wavelet treatment all basis functions ψs,t(x) can be derived from a mother wavelet Ψ(x) (eq. (1) through the following translation and dilation process.

$$\varphi_{s,t}(x) = \frac{1}{\sqrt{|s|}}\varphi\left(\frac{x-t}{s}\right) \quad (1)$$

Where s and t, are respectively, the scale and translation parameter expressed in real numbers R. 1/√|2| is an energy normalization factor for all sub wavelets functions. The basic idea of WT is to represent any arbitrary function f(x) as a superposition of wavelets. The continuous wavelet transform is given by eq. (2).

$$W_f(s,t) = \frac{1}{\sqrt{|s|}}\int_{-\infty}^{\infty} f(x)\overline{\varphi}\left(\frac{x-t}{s}\right)dx \quad (2)$$

Where s>0 and t having arbitrary values.

III. DISCRETE WAVELET TRANSFORM

The discrete wavelet transform is an orthogonal function which can be applied to an infinite group of data. Functionally, it is like the discrete Fourier Transform, which is based on a orthogonal function to apply the transformation. A signal passed twice through the transformation which is unchanged, and the input signal is assumed to be a set of discrete-time samples. Both transforms are convolutions. Whereas the transform function of DFT is a sinusoid.

The data are passed through two convolutions functions; each creates an output stream that is half the length of the original input. These convolutions functions are filters; one half of the output is produced by the low-pass filter function

$$Y_{low-pass}[k] = \sum_n x[n]h_0[2k-n] \quad (3)$$

And the other half is produced by the high-pass filter function

$$Y_{high-pass}[k] = \sum_n x[n]h_1[2k-n] \quad (4)$$

Where

N is the input block size,

h0or1 is the wavelet function with well-chosen coefficients(filters)

x(n) is the input function and ylow-pass, yhigh-pass are respectively the low-pass and the high-pass outputs.

In many situations, the low-pass output contains most of the information content of the original input signal. In general, higher-order wavelets (those with more nonzero coefficients) tend to put more information into the low-pass output and less into the high-pass output. If the average amplitude of the high output is low enough, then the high output may be discarded without greatly affecting the quality of the reconstructed signal. The high output is named also as detail output and the low output is know as approximation output, with this is logical to work with the approximation of the signal than with the details of the signal.

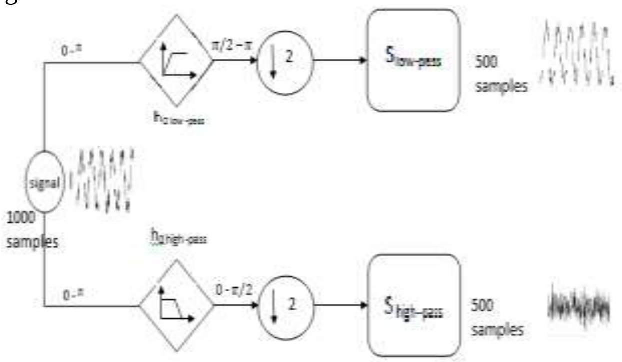

Fig. 1: Decomposition of Signal by the Pass Of The Signal Through Two Filters.

IV. FLOW CHART OF DISCRETE WAVELET TRANSFORM

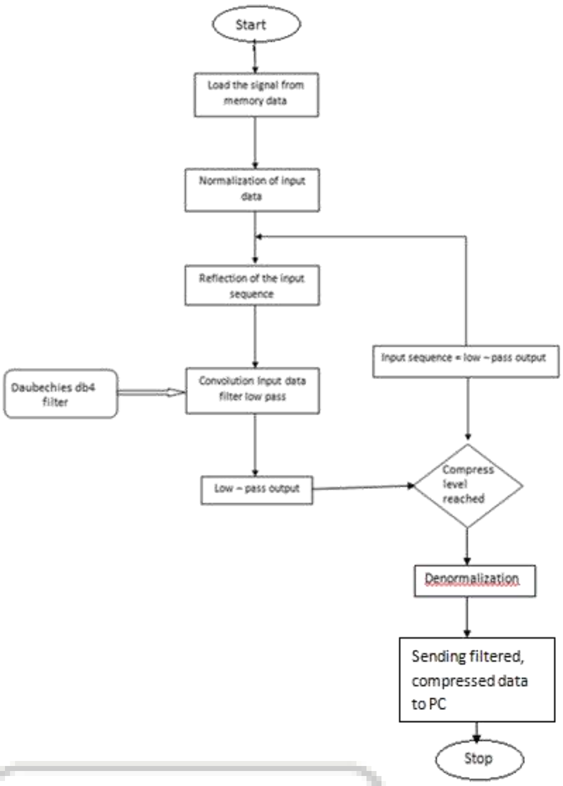

Fig. 2: Flow Chart of Discrete Wavelet Transform

V. RESULTS

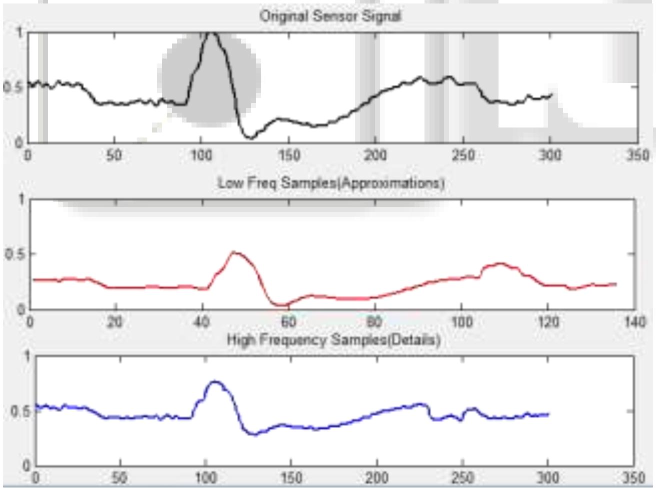

Fig. 3: PSNR: 61.8729 MSE: 0.042246

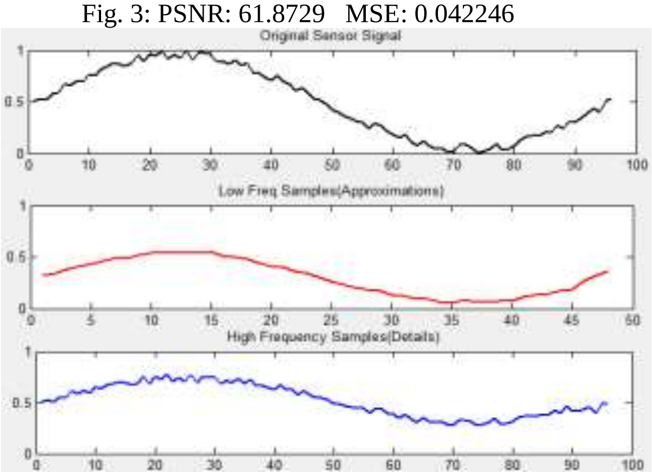

Fig. 4: PSNR: 60.2056 MSE : 0.062019

VI. CONCLUSION

Using this system, DWT data processing tool removes the noise and irrelevant data from original signal & gives better results for further processing. Implementation of DWT achieved successfully employing as a pre-treatment tool to denoise and compress the original signal.

ACKNOWLEDGEMENT

I express my sincere gratitude to Dr.V.A.Wankhede of Electronics and Telecommuniacation Department and Computer Science , for his guidance and support to shape this project in systematic way.

I am also greatly indebted to Dr. J.J.chopade, Head of Department of Electronics and Telecommunication for their valuable suggestions for the project.

In addition I would like to thank all staff members of Electronics and Telecommunication department for their suggestions and constrictive criticism.

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