AUDIOWATERMARKING

DSP MINI PROJECT

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IV Semester , 2016-17

ECE Dept.

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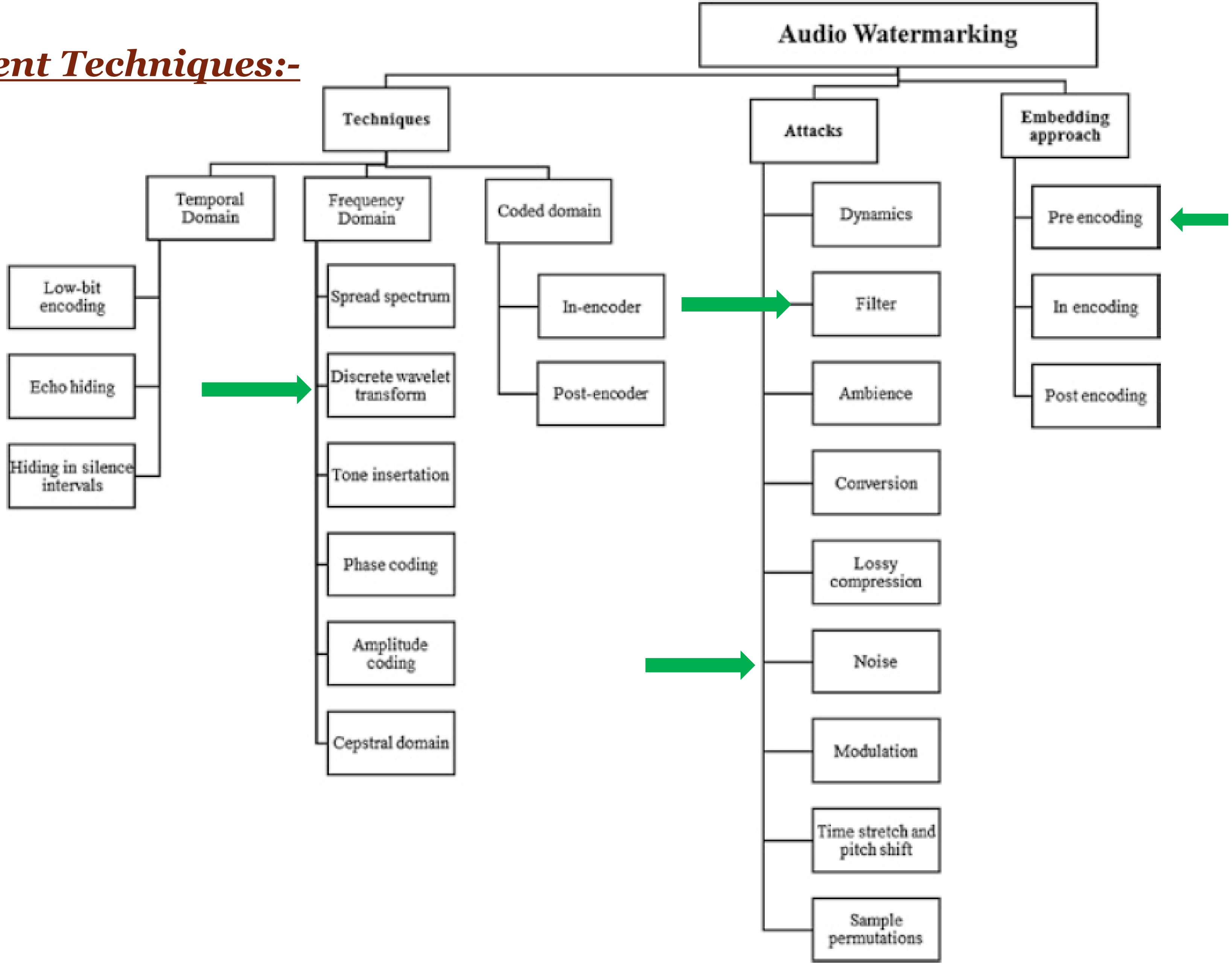
PROBLEM STATEMENT :

*The aim of the project is to **encrypt** the data (for example Image) i.e., hide the data over an audio signal using forward and inverse transform algorithms and to compare the results in the context of quality of concealing , the use of watermarks and to describe their functionality in data security.*

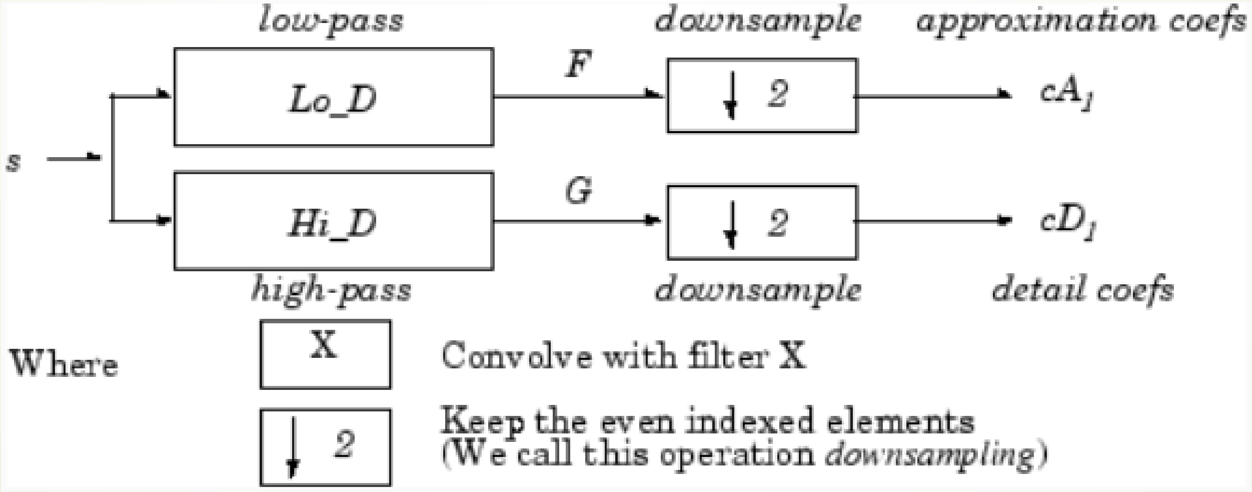
Different Techniques:-



Discrete wavelet transform

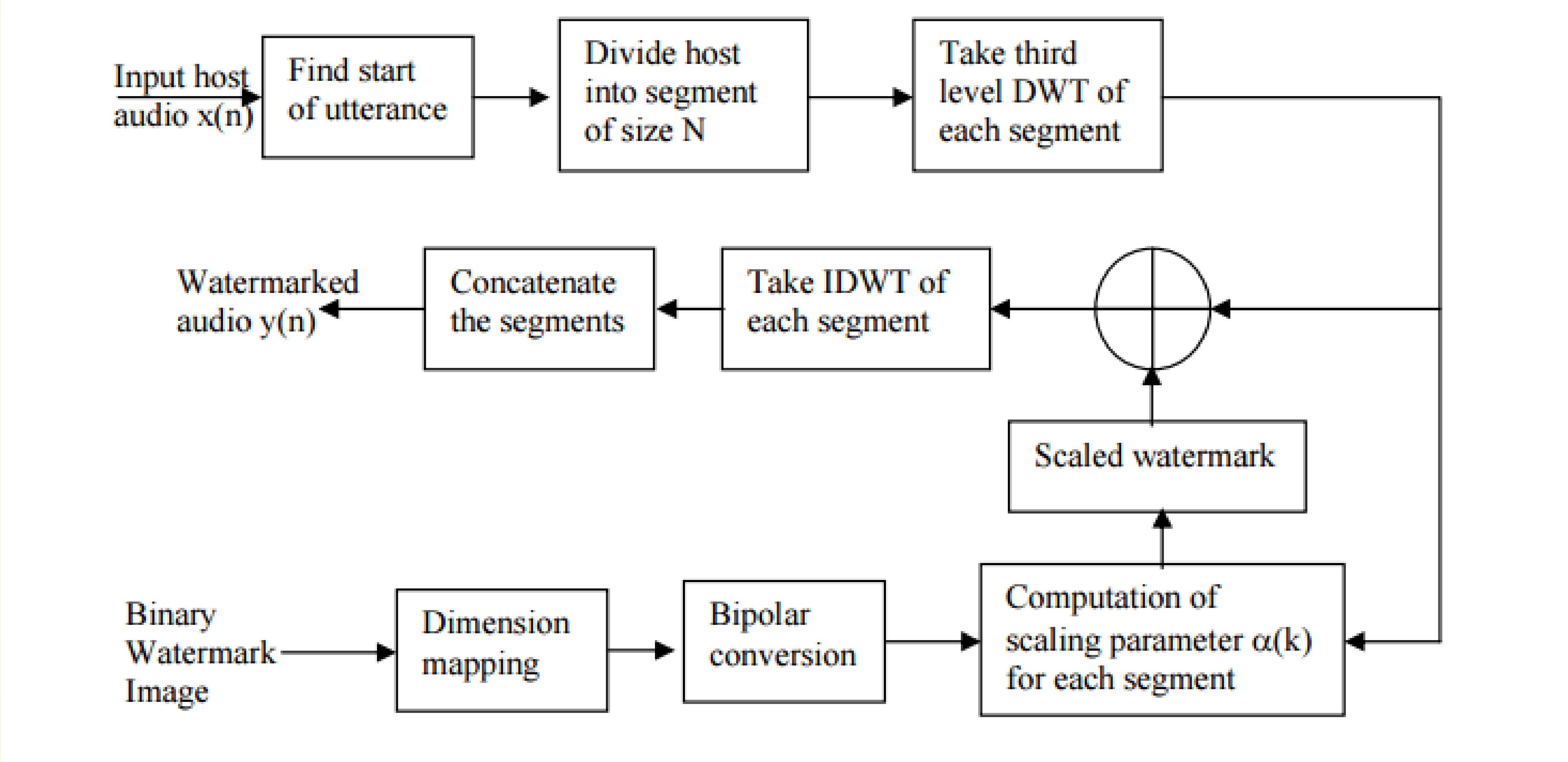
- In audio watermarking using DWT, the audio signal is decomposed into several frequency sub-bands.
- Then the digital watermark bits are inserted into the coefficients of one or more sub-bands
- In DWT, each level is called an octave, which at least in a 1-D case, can be constructed as a pair of finite impulse response (FIR) filters; a low pass filter (LPF) and a high pass filter (HPF).
- Inside an octave, two down sampling blocks operate, each after a filter. These two halve the output samples of the octave and resulting in a minimized calculation load.

- In multiresolution analysis of the signals, the mean signal from the first octave is applied to a pair of LPF/HPF filters in the second octave. This results in a new pair of mean/detailed signals in the second octave. However, from this point onwards, in every octave (except the last one), only the detailed signals are kept and the mean signals are discarded.



Source: MATLAB

Algorithm

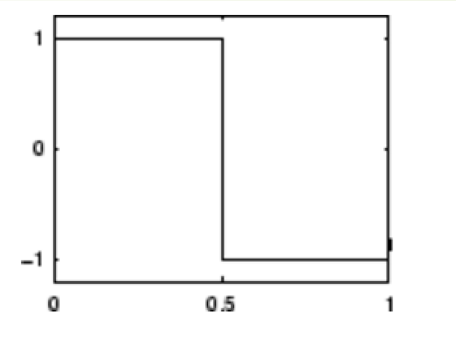


Source:-
http://shodhganga.inflibnet.ac.in/bitstream/10603/4352/14/14_chapter%205.pdf

Example Taken

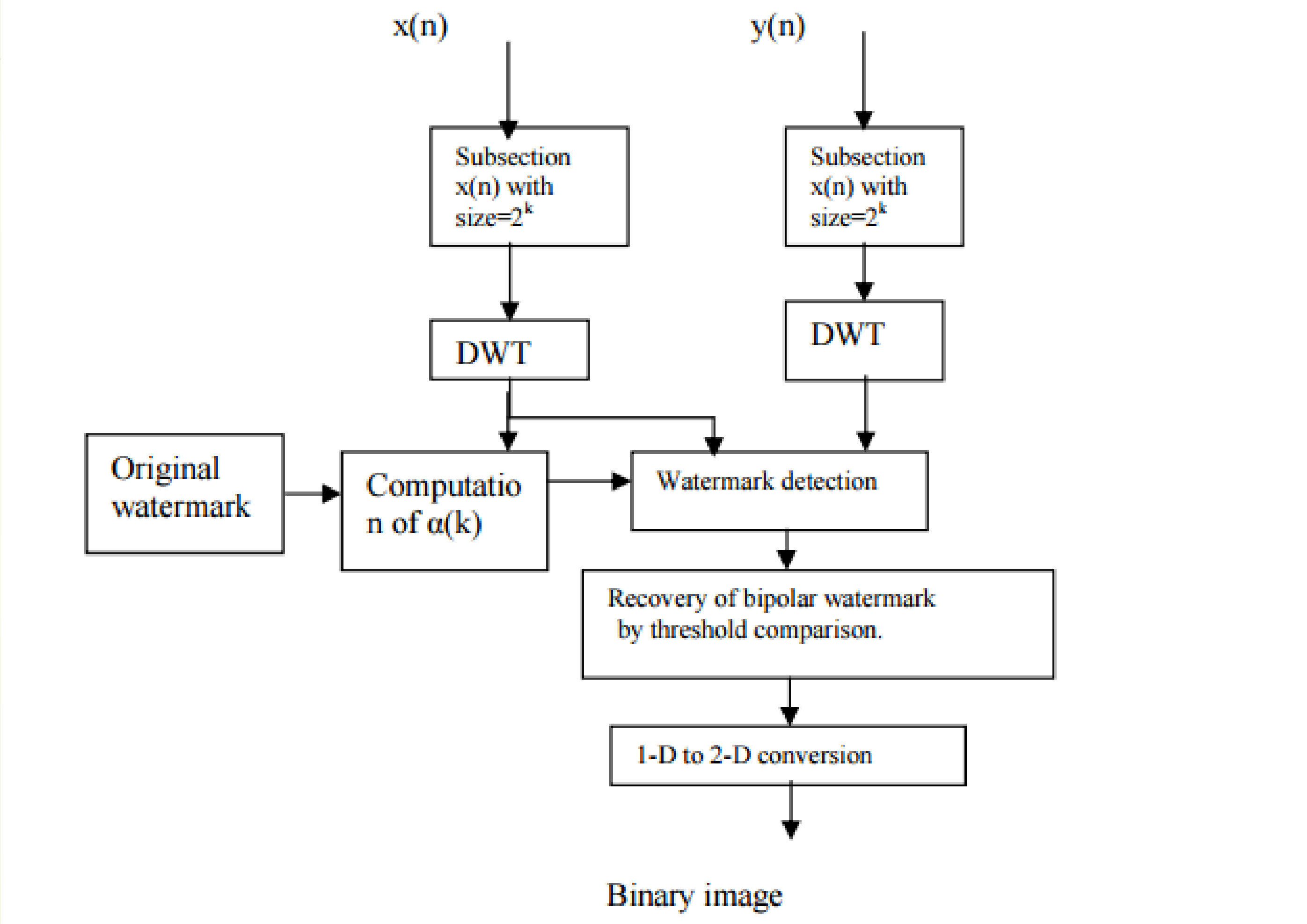
- Sampling Frequency of Audio Sample 1 = 22050
- Sampling Frequency of Audio Sample 2 = 48000
- Number of samples (1) = 4814784
- Number of samples (2) = 10430345
- Size of Image = 64 X 64
- Type of Image = Grayscale
- Type of Wavelet used = ‘Haar’

Sample Image



Haar Wavelet

Algorithm continued…



Source:-
http://shodhganga.inflibnet.ac.in/bitstream/10603/4352/14/14_chapter%205.pdf

Results

Sampling Frequency (Fs)	SNR
22050	65.05 dB
48000	69.49 dB

Case I => Fs =22050

Type of Attack	Similarity between Retrieved and Embedded Image
No Attack	0.9875
Lowpass filter with cutoff = 5 kHz	0.6823
AWGN	0.7567
AWGN+LowPass Filter with f_c=5kHz	0.5975
AWGN+LowPass Filter with f_c=10kHz	0.7692

Case II => Fs =48000

Type of attack	Similarity between Retrieved and Embedded Image
AWGN	0.9363
Lowpass filter with cutoff = 5 kHz	0.6572

Results


Original Image


No Attack (0.9875)


Lowpass Filter (0.6823)


AWGN+Lowpass Filter (10 kHz) (0.7692)


AWGN + Lowpass Filter (0.5975)


AWGN (0.7567

Audio Sample with Fs=48000

No Attack (0.9824)

AWGN (0.9363)

Lowpass Filter (0.6572)

Conclusion

- The Algorithm implemented ensures that the watermark embedded is detected with a minimum of **55%** similarity.
- This result is enough to indicate the presence of a watermark.
- More importantly , we observe that **SNR** of the watermarked audio signal is more than **60 dB** which is much greater than the standard value of inaudibility of noise, i.e. 20 dB.
- Secondly, we also observe that as the Sampling frequency of an audio signal increases better are the results of the extracted image.

Bibliography

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