

## Chapter 9

# A High Quality Audio Coder Using Proposed Psychoacoustic Model

In order to show the application of the previous proposed psychoacoustic model in audio coding, we will develop in this chapter a high quality audio coder using the proposed psychoacoustic model from the previous chapter and compare this audio coder with the standard MP3 audio coder. As can be seen later in the experiment section, the proposed audio codec is preferred over the MP3 codec at the same compression bit rate, thus providing a potential usage for many audio applications.

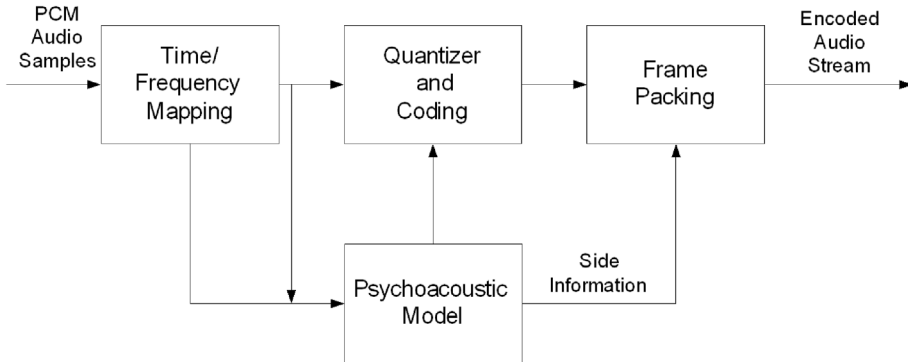
### **9.1. STRUCTURE OF PROPOSED PERCEPTUAL AUDIO CODER**

The structure of the proposed high quality perceptual audio encoder is shown in Figure 1 (He et al., 2008b). Input PCM audio samples are fed into the encoder. The time to frequency mapping creates a sub-sampled representation of the audio samples

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Figure 1. Structure of perceptual audio encoder



using the DWPT. The psychoacoustic model calculates the masking thresholds, which are later employed to control the quantizer and coding. Bit allocation strategy is utilized to allocate bits to each sub-band sample according to its perceptual importance. Typically, more bits are reserved for low frequency samples, which are perceptually more important. Quantization is performed in a way to keep the quantization noise below the audible threshold for transparent audio coding. The bit allocation information is transmitted together with the encoded audio as ancillary data or side information, which are used in the audio decoder to reconstruct the PCM audio samples. Lossless coding, which is usually Huffman coding, is employed to further remove the redundancy of the quantized value. The frame packing block packs the output of quantizer and coding block as well as the side information and yields the encoded audio stream.

Figure 2 shows the decoder of the proposed audio coding scheme. The encoded audio stream is fed into the frame unpacking block, which unpacks the compressed audio stream into the quantized samples as well as the side information. In the de-quantization and decoding block, Huffman decoding is performed first followed by de-quantization, using the side information extracted from the frame-unpacking block. The output is the audio samples in the wavelet domain, which are later transformed in time domain by the inverse time/frequency mapping block to form the decoded PCM audio samples.

Time/frequency mapping block and psychoacoustic model block are illustrated in chapter 7 as the proposed psychoacoustic model, so only quantizer and coding block is explained in the following section.

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