Original Signal Components	Quantized Components	Dequantized Components
10101010	101	10100000
00000100	000	00000000
00000010	000	00000000
00000001	000	00000000
00011111	000	00000000
00010101	000	00000000
00001111	000	00000000
01010101	010	01000000
11110000	111	11100000

Table 1

The first column of the table shows a set of unsigned binary numbers representing spectral components in the original audio signal that are grouped into a single band. The second column shows a representation of the spectral components quantized to three bits. For this example, the portion of each spectral component below the 3-bit resolution has been removed by truncation. The quantized spectral components are transmitted to the decoder and subsequently dequantized by appending zero bits to restore the original spectral component length. The dequantized spectral components are shown in the third column. Because a majority of the spectral components have been quantized to zero, the band of dequantized spectral components contains less energy than the band of original spectral components and that energy is concentrated in a few non-zero spectral components. This reduction in energy can degrade the perceived quality of the decoded signal as explained above.

DISCLOSURE OF INVENTION

Embodiments~~It is an object~~ of the present invention seek to improve the perceived quality of audio signals obtained from audio coding systems by avoiding or reducing degradation related to zero-valued quantized spectral components.

An aspect of the present invention provides a method for generating audio information, wherein the method comprises: receiving an input signal that conveys an encoded representation of quantized subband signals, wherein spectral components that had a magnitude less than a threshold were quantized to a zero value; decoding the encoded and identifying a particular subband signal in which one or more spectral components have non-zero values and a plurality of spectral components have a zero

value; establishing a scaling envelope that is less than or equal to the threshold using different ways adapted or selected as a function of frequency; generating synthesized spectral components that correspond to the zero-valued spectral components that are scaled according to the scaling envelope; generating a modified set of subband signals by substituting the synthesized spectral components for corresponding zero-valued spectral components in the particular subband signal; and generating the audio information by applying a synthesis filterbank to the set of subband signals.

There is also provided an apparatus for generating audio information, the apparatus having means for performing all of the steps in the method as described.

There is also provided a medium that conveys a program of instructions and is readable by a device for executing the program of instructions to perform all of the steps in the method as described.

As disclosed~~In one aspect of the present invention~~, audio information is provided by receiving an input signal and obtaining therefrom a set of subband signals each having one or more spectral components representing spectral content of an audio signal; identifying within the set of subband signals a particular subband signal in which one or more spectral components have a non-zero value and are quantized by a quantizer having a minimum quantizing level that corresponds to a threshold, and in which a

plurality of spectral components have a zero value; generating synthesized spectral components that correspond to respective zero-valued spectral components in the particular subband signal and that are scaled according to a scaling envelope less than or equal to the threshold; generating a modified set of subband signals by substituting the synthesized spectral components for corresponding zero-valued spectral components in the particular subband signal; and generating the audio information by applying a synthesis filterbank to the modified set of subband signals.

As disclosed~~In another aspect of the present invention~~, an output signal, preferably an encoded output signal, is provided by generating a set of subband signals each having one or more spectral components representing spectral content of an audio signal by quantizing information that is obtained by applying an analysis filterbank to audio information; identifying within the set of subband signals a particular subband signal in which one or more spectral components have a non-zero value and are quantized by a quantizer having a minimum quantizing level that corresponds to a threshold, and in which a plurality of spectral components have a zero value; deriving scaling control information from the spectral content of the audio signal, wherein the scaling control information controls scaling of synthesized spectral components to be synthesized and substituted for the spectral components having a zero value in a receiver that generates audio information in response to the output signal; and generating the output signal by assembling the scaling control information and information representing the set of subband signals.

The various features of the present invention and its preferred embodiments may be better understood by referring to the following discussion and the accompanying drawings in which like reference numerals refer to like elements in the several figures. The contents of the following discussion and the drawings are set forth as examples only and should not be understood to represent limitations upon the scope of the present invention.

BRIEF DESCRIPTION OF DRAWINGS

Fig. 1a is a schematic block diagram of an audio encoder.

Fig. 1b is a schematic block diagram of an audio decoder.

Figs. 2a-2c are graphical illustrations of quantization functions.