CLAIMS

1. A speech decoder that decodes a coded sequence of encoded speech signal, comprising:

demultiplexing means for demultiplexing the coded sequence into a low frequency band coded sequence and a high frequency band coded sequence;

low frequency band decoding means for decoding the low frequency band coded sequence demultiplexed by the demultiplexing means and obtaining a low frequency band signal;

frequency transformation means for transforming the low frequency band signal, which is obtained by the low frequency band decoding means, into a frequency domain;

high frequency band coded sequence analysis means for analyzing the high frequency band coded sequence demultiplexed by the demultiplexing means and acquiring supplementary information for high frequency band generation and time envelope information;

coded sequence decoding and dequantization means for decoding and dequantizing the supplementary information for high frequency band generation and the time envelope information acquired by the high frequency band coded sequence analysis means;

high frequency band generation means for generating, using the supplementary information for high frequency band generation decoded by the coded sequence decoding and dequantization means, high frequency band components in the frequency domain of the speech signal from the low frequency band signal transformed into the frequency domain by the frequency transformation means;

first to Nth (N is an integer equal to or larger than two) low frequency band time envelope calculation means for analyzing the low frequency band signal transformed into the frequency domain by the frequency transformation means and acquiring time envelopes for a plurality of low frequency bands ;

time envelope calculation means for calculating a high frequency band time envelope using the time envelope information, which is acquired by the coded sequence decoding and dequantization means, and the plurality of low frequency band time envelopes, which are acquired by the low frequency band time envelope calculation means;

time envelope adjustment means for adjusting, using the time envelope acquired by the time envelope calculation means, a time envelope of the high frequency band components generated by the high frequency band generation means; and

inverse frequency transformation means for adding the high frequency band components, which are adjusted by the time envelope adjustment means, and the low frequency band signal, which is decoded by the low frequency band decoding means, and outputting a time domain signal containing entire frequency band components.

2. A speech decoder that decodes a coded sequence of encoded speech signal, comprising:

demultiplexing means for demultiplexing the coded sequence into a low frequency band coded sequence and a high frequency band coded sequence;

low frequency band decoding means for decoding the low frequency band coded sequence demultiplexed by the demultiplexing means and obtaining a low frequency band signal;

frequency transformation means for transforming the low frequency band signal, which is obtained by the low frequency band decoding means, into a frequency domain;

high frequency band coded sequence analysis means for analyzing the high frequency band coded sequence demultiplexed by the demultiplexing means and acquiring coded supplementary information for high frequency band generation, frequency envelope information, and time envelope information;

coded sequence decoding and dequantization means for decoding and dequantizing the supplementary information for high frequency band generation, the frequency envelope information, and the time envelope information acquired by the high frequency band coded sequence analysis means;

high frequency band generation means for generating, using the supplementary information for high frequency band generation decoded by the coded sequence decoding and dequantization means, high frequency band components in the frequency domain of the speech signal from the low frequency band signal transformed into the frequency domain by the frequency transformation means;

first to Nth (N is an integer equal to or larger than two) low frequency band time envelope calculation means for analyzing the low frequency band signal transformed into the frequency domain by the frequency transformation means and acquiring time envelopes for a

plurality of low frequency bands ;

time envelope calculation means for calculating a high frequency band time envelope using the time envelope information, which is acquired by the coded sequence decoding and dequantization means, and the plurality of low frequency band time envelopes, which are acquired by the low frequency band time envelope calculation means;

frequency envelope superposition means for superimposing the frequency envelope information, which is acquired by the coded sequence decoding and dequantization means, onto the high frequency band time envelope and acquiring a time-frequency envelope;

time-frequency envelope adjustment means for adjusting, using the time envelope acquired by the time envelope calculation means and the time-frequency envelope acquired by the frequency envelope superposition means, a time envelope and a frequency envelope of the high frequency band components generated by the high frequency band generation means; and

inverse frequency transformation means for adding the high frequency band components, which are adjusted by the time-frequency envelope adjustment means, and the low frequency band signal, which is decoded by the low frequency band decoding means, and outputting a time domain signal containing entire frequency band components.

3. A speech decoder that decodes a coded sequence of encoded speech signal, comprising:

demultiplexing means for demultiplexing the coded sequence

into a low frequency band coded sequence and a high frequency band coded sequence;

low frequency band decoding means for decoding the low frequency band coded sequence demultiplexed by the demultiplexing means and obtaining a low frequency band signal;

frequency transformation means for transforming the low frequency band signal, which is obtained by the low frequency band decoding means, into a frequency domain;

high frequency band coded sequence analysis means for analyzing the high frequency band coded sequence demultiplexed by the demultiplexing means and acquiring coded supplementary information for high frequency band generation, frequency envelope information, and time envelope information;

coded sequence decoding and dequantization means for decoding and dequantizing the supplementary information for high frequency band generation, the frequency envelope information, and the time envelope information acquired by the high frequency band coded sequence analysis means;

high frequency band generation means for generating, using the supplementary information for high frequency band generation decoded by the coded sequence decoding and dequantization means, high frequency band components in the frequency domain of the speech signal from the low frequency band signal transformed into the frequency domain by the frequency transformation means;

first to Nth (N is an integer equal to or larger than two) low frequency band time envelope calculation means for analyzing the low

frequency band signal transformed into the frequency domain by the frequency transformation means and acquiring time envelopes for a plurality of low frequency bands ;

time envelope calculation means for calculating a high frequency band time envelope using the time envelope information, which is acquired by the coded sequence decoding and dequantization means and the plurality of low frequency band time envelopes, which is acquired by the low frequency band time envelope calculation means;

frequency envelope calculation means for calculating a frequency envelope using the frequency envelope information acquired by the coded sequence decoding and dequantization means;

time-frequency envelope adjustment means for adjusting, using the time envelope acquired by the time envelope calculation means and the frequency envelope acquired by the frequency envelope calculation means, a time envelope and a frequency envelope of the high frequency band components generated by the high frequency band generation means; and

inverse frequency transformation means for adding the high frequency band components, which are adjusted by the time-frequency envelope adjustment means, and the low frequency band signal, which is decoded by the low frequency band decoding means, and outputting a time domain signal containing entire frequency band components.

4. The speech decoder according to any one of Claims 1 to 3, further comprising:

time envelope calculation control means for controlling, using

the low frequency band signal transformed into the frequency domain by the frequency transformation means, at least one of (i) calculation of the low frequency band time envelopes in the first to Nth low frequency band time envelope calculation means and (ii) calculation of the high frequency band time envelope in the time envelope calculation means.

5. The speech decoder according to any one of Claims 1 to 3, further comprising:

time envelope calculation control means for controlling, using the time envelope information acquired by the coded sequence decoding and dequantization means, at least one of (i) calculation of the low frequency band time envelopes in the first to Nth low frequency band time envelope calculation means and (ii) calculation of the high frequency band time envelope in the time envelope calculation means.

6. The speech decoder according to any one of Claims 1 to 3, wherein

the high frequency band coded sequence analysis means further acquires time envelope calculation control information, and

the speech decoder further comprises time envelope calculation control means for controlling, using the time envelope calculation control information acquired by the high frequency band coded sequence analysis means, at least one of (i) calculation of the low frequency band time envelopes in the first to Nth low frequency band time envelope calculation means and (ii) calculation of the high frequency band time envelope in the time envelope calculation means.

7. The speech decoder according to any one of Claims 1 to 3, wherein

the high frequency band coded sequence analysis means further acquires time envelope calculation control information,

the coded sequence decoding and dequantization means further acquires second frequency envelope information, and

the speech decoder further comprises time envelope calculation control means for determining, based on the time envelope calculation control information, whether to adjust the frequency envelope of the high frequency band components based on the second frequency envelope information and, when it is determined to adjust the frequency envelope, controlling not to perform calculation of the low frequency band time envelopes in the first to Nth low frequency band time envelope calculation means or calculation of the high frequency band time envelope in the time envelope calculation means.

8. The speech decoder according to Claim 2 or 3, wherein

the time-frequency envelope adjustment means processes, with a specified function, the high frequency band components of the speech signal generated by the high frequency band generation means .

9. The speech decoder according to any one of Claims 1 to 8, wherein

the low frequency band time envelope calculation means processes, with a specified function, the acquired plurality of low

frequency band time envelopes .

10. A speech encoder that encodes a speech signal, comprising:

frequency transformation means for transforming the speech signal into a frequency domain;

down-sampling means for down-sampling the speech signal and acquiring a low frequency band signal;

low frequency band encoding means for encoding the low frequency band signal acquired by the down-sampling means;

first to Nth (N is an integer equal to or larger than two) low frequency band time envelope calculation means for calculating a plurality of time envelopes of low frequency band components of the speech signal transformed into the frequency domain by the frequency transformation means;

time envelope information calculation means for calculating, using the time envelopes of the low frequency band components calculated by the first to Nth low frequency band time envelope calculation means, time envelope information necessary to acquire a time envelope of high frequency band components of the speech signal transformed by the frequency transformation means;

supplementary information calculation means for analyzing the speech signal and calculating supplementary information for high frequency band generation to be used for generating high frequency band components from the low frequency band signal;

quantization and encoding means for quantizing and encoding the supplementary information for high frequency band generation,

which is generated by the supplementary information calculation means, and the time envelope information, which is calculated by the time envelope information calculation means;

coded sequence construction means for constructing a high frequency band coded sequence from the supplementary information for high frequency band generation and the time envelope information quantized and encoded by the quantization and encoding means; and

multiplexing means for generating a coded sequence in which the low frequency band coded sequence, which is acquired by the low frequency band encoding means, and the high frequency band coded sequence, which is constructed by the coded sequence construction means, are multiplexed.

11. The speech encoder according to Claim 10, further comprising:

frequency envelope calculation means for calculating frequency envelope information of the high frequency band components of the speech signal transformed into the frequency domain by the frequency transformation means, wherein

the quantization and encoding means further quantizes and encodes the frequency envelope information, and

the coded sequence construction means constructs the high frequency band coded sequence by further adding the frequency envelope information quantized and encoded by the quantization and encoding means.

12. The speech encoder according to Claim 10 or 11, further comprising:

control information generation means for generating time envelope calculation control information that controls time envelope calculation in a speech decoder using at least one of (i) the speech signal transformed into the frequency domain by the frequency transformation means and (ii) the time envelope information calculated by the time envelope information calculation means, wherein

the coded sequence construction means constructs the high frequency band coded sequence by further adding the time envelope calculation control information generated by the control information generation means.

13. The speech encoder according to any one of Claims 10 to 12, wherein

the time envelope information calculation means calculates a time envelope of high frequency band components of the speech signal transformed into the frequency domain by the frequency transformation means, and calculates the time envelope information based on correlation between a time envelope calculated from the first to Nth time envelopes of low frequency band components and the time envelope of the frequency components.

14. A speech decoding method of decoding a coded sequence generated by encoding a speech signal, comprising:

a demultiplexing step, performed by demultiplexing means, of

demultiplexing the coded sequence into a low frequency band coded sequence and a high frequency band coded sequence;

a low frequency band decoding step, performed by low frequency band decoding means, of decoding the low frequency band coded sequence demultiplexed by the demultiplexing means and obtaining a low frequency band signal;

a frequency transformation step, performed by frequency transformation means, of transforming the low frequency band signal obtained by the low frequency band decoding means into a frequency domain;

a high frequency band coded sequence analysis step, performed by high frequency band coded sequence analysis means, of analyzing the high frequency band coded sequence demultiplexed by the demultiplexing means and acquiring coded supplementary information for high frequency band generation and time envelope information;

a coded sequence decoding and dequantization step, performed by coded sequence decoding and dequantization means, of decoding and dequantizing the supplementary information for high frequency band generation and the time envelope information acquired by the high frequency band coded sequence analysis means;

a high frequency band generation step, performed by high frequency band generation means, of generating, using the supplementary information for high frequency band generation decoded by the coded sequence decoding and dequantization means, high frequency band components in the frequency domain of the speech signal from the low frequency band signal transformed into the

frequency domain by the frequency transformation means;

a first to Nth (N is an integer equal to or larger than two) low frequency band time envelope calculation step, performed by first to Nth low frequency band time envelope calculation means, of analyzing the low frequency band signal transformed into the frequency domain by the frequency transformation means and acquiring a plurality of low frequency band time envelopes;

a time envelope calculation step, performed by time envelope calculation means, of calculating a high frequency band time envelope using the time envelope information, which is acquired by the coded sequence decoding and dequantization means, and the plurality of low frequency band time envelopes, which are acquired by the low frequency band time envelope calculation means;

a time envelope adjustment step, performed by the time envelope adjustment means, of adjusting a time envelope of the high frequency band components generated by the high frequency band generation means using the time envelope acquired by the time envelope calculation means; and

an inverse frequency transformation step, performed by inverse frequency transformation means, of adding the high frequency band components, which are adjusted by the time envelope adjustment means, and the low frequency band signal, which is decoded by the low frequency band decoding means, and outputting a time domain signal containing the entire frequency band components.

15. A speech decoding method of decoding a coded sequence

generated by encoding a speech signal, comprising:

a demultiplexing step, performed by demultiplexing means, of demultiplexing the coded sequence into a low frequency band coded sequence and a high frequency band coded sequence;

a low frequency band decoding step, performed by low frequency band decoding means, of decoding the low frequency band coded sequence demultiplexed by the demultiplexing means and obtaining a low frequency band signal;

a frequency transformation step, performed by frequency transformation means, of transforming the low frequency band signal, which is obtained by the low frequency band decoding means, into a frequency domain;

a high frequency band coded sequence analysis step, performed by high frequency band coded sequence analysis means, of analyzing the high frequency band coded sequence demultiplexed by the demultiplexing means and acquiring coded supplementary information for high frequency band generation, frequency envelope information, and time envelope information;

a coded sequence decoding and dequantization step, performed by coded sequence decoding and dequantization means, of decoding and dequantizing the supplementary information for high frequency band generation, the frequency envelope information, and the time envelope information acquired by the high frequency band coded sequence analysis means;

a high frequency band generation step, performed by high frequency band generation means, of generating, using the

supplementary information for high frequency band generation decoded by the coded sequence decoding and dequantization means, high frequency band components in the frequency domain of the speech signal from the low frequency band signal transformed into the frequency domain by the frequency transformation means;

a first to Nth (N is an integer of two or more) low frequency band time envelope calculation step, performed by first to Nth low frequency band time envelope calculation means, of analyzing the low frequency band signal transformed into the frequency domain by the frequency transformation means and acquiring a plurality of low frequency band time envelopes;

a time envelope calculation step, performed by time envelope calculation means, of calculating a high frequency band time envelope using the time envelope information, which is acquired by the coded sequence decoding and dequantization means, and the plurality of low frequency band time envelopes, which are acquired by the low frequency band time envelope calculation means;

a frequency envelope superposition step, performed by frequency envelope superposition means, of superimposing the frequency envelope information, which is acquired by the coded sequence decoding and dequantization means, onto the high frequency band time envelope and acquiring a time-frequency envelope;

a time-frequency envelope adjustment step, performed by time-frequency envelope adjustment means, of adjusting, using the time envelope acquired by the time envelope calculation means and the time-frequency envelope acquired by the frequency envelope

superposition means, a time envelope and a frequency envelope of the high frequency band components generated by the high frequency band generation means; and

an inverse frequency transformation step, performed by inverse frequency transformation means, of adding the high frequency band components, which are adjusted by the time-frequency envelope adjustment means, and the low frequency band signal, which is decoded by the low frequency band decoding means, and outputting a time domain signal containing entire frequency band components.

16. A speech decoding method of decoding a coded sequence generated by encoding a speech signal, comprising:

a demultiplexing step, performed by demultiplexing means, of demultiplexing the coded sequence into a low frequency band coded sequence and a high frequency band coded sequence;

a low frequency band decoding step, performed by low frequency band decoding means, of decoding the low frequency band coded sequence demultiplexed by the demultiplexing means and obtaining a low frequency band signal;

a frequency transformation step, by frequency transformation means, of transforming the low frequency band signal, which is obtained by the low frequency band decoding means, into a frequency domain;

a high frequency band coded sequence analysis step, performed by high frequency band coded sequence analysis means, of analyzing the high frequency band coded sequence demultiplexed by the

demultiplexing means and acquiring coded supplementary information for high frequency band generation, frequency envelope information, and time envelope information;

a coded sequence decoding and dequantization step, performed by coded sequence decoding and dequantization means, of decoding and dequantizing the supplementary information for high frequency band generation, the frequency envelope information, and the time envelope information acquired by the high frequency band coded sequence analysis means;

a high frequency band generation step, performed by high frequency band generation means, of generating, using the supplementary information for high frequency band generation decoded by the coded sequence decoding and dequantization means, high frequency band components in the frequency domain of the speech signal from the low frequency band signal transformed into the frequency domain by the frequency transformation means;

a first to Nth (N is an integer equal to or larger than two) low frequency band time envelope calculation step, performed by first to Nth low frequency band time envelope calculation means, of analyzing the low frequency band signal transformed into the frequency domain by the frequency transformation means and acquiring a plurality of low frequency band time envelopes;

a time envelope calculation step, performed by time envelope calculation means, of calculating a high frequency band time envelope using the time envelope information, which is acquired by the coded sequence decoding and dequantization means, and the plurality of low

frequency band time envelopes, which are acquired by the low frequency band time envelope calculation means;

a frequency envelope calculation step, performed by frequency envelope calculation means, of calculating a frequency envelope using the frequency envelope information acquired by the coded sequence decoding and dequantization means;

a time-frequency envelope adjustment step, performed by time-frequency envelope adjustment means, of adjusting, using the time envelope acquired by the time envelope calculation means and the frequency envelope acquired by the frequency envelope calculation means, a time envelope and a frequency envelope of the high frequency band components generated by the high frequency band generation means; and

an inverse frequency transformation step, performed by inverse frequency transformation means, of adding the high frequency band components, which are adjusted by the time-frequency envelope adjustment means, and the low frequency band signal, which is decoded by the low frequency band decoding means, and outputting a time domain signal containing entire frequency band components.

17. A speech encoding method of encoding a speech signal, comprising:

a frequency transformation step, performed by frequency transformation means, of transforming the speech signal into a frequency domain;

a down-sampling step, performed by down-sampling means, of

down-sampling the speech signal and acquiring a low frequency band signal;

a low frequency band encoding step, performed by low frequency band encoding means, of encoding the low frequency band signal acquired by the down-sampling means;

a first to Nth (N is an integer equal to or larger than two) low frequency band time envelope calculation step, performed by first to Nth low frequency band time envelope calculation means, of calculating a plurality of time envelopes of low frequency band components of the speech signal transformed into the frequency domain by the frequency transformation means;

a time envelope information calculation step, performed by time envelope information calculation means, of calculating, using the time envelopes of the low frequency band components calculated by the first to Nth low frequency band time envelope calculation means, time envelope information necessary to acquire a time envelope of high frequency band components of the speech signal transformed by the frequency transformation means;

a supplementary information calculation step, performed by supplementary information calculation means, of analyzing the speech signal and calculating supplementary information for high frequency band generation to be used for generating high frequency band components from the low frequency band signal;

a quantization and encoding step, performed by quantization and encoding means, of quantizing and encoding the supplementary information for high frequency bands generation, which is generated by

the supplementary information calculation means, and the time envelope information, which is calculated by the time envelope information calculation means;

a coded sequence construction step, performed by coded sequence construction means, of constructing a high frequency band coded sequence from the supplementary information for high frequency band generation and the time envelope information quantized and encoded by the quantization and encoding means; and

a multiplexing step, performed by multiplexing means, of generating a coded sequence in which the low frequency band coded sequence, which is acquired by the low frequency band encoding means, and the high frequency band coded sequence, which is constructed by the coded sequence construction means, are multiplexed.

18. A speech decoding program that decodes a coded sequence of encoded speech signal, the program causing a computer to function as:

demultiplexing means for demultiplexing the coded sequence into a low frequency band coded sequence and a high frequency band coded sequence;

low frequency band decoding means for decoding the low frequency band coded sequence demultiplexed by the demultiplexing means and obtaining a low frequency band signal;

frequency transformation means for transforming the low frequency band signal obtained by the low frequency band decoding means into a frequency domain;

high frequency band coded sequence analysis means for analyzing the high frequency band coded sequence demultiplexed by the demultiplexing means and acquiring coded supplementary information for high frequency band generation and time envelope information;

coded sequence decoding and dequantization means for decoding and dequantizing the supplementary information for high frequency band generation and the time envelope information acquired by the high frequency band coded sequence analysis means;

high frequency band generation means for generating, using the supplementary information for high frequency band generation decoded by the coded sequence decoding and dequantization means, high frequency band components in the frequency domain of the speech signal from the low frequency band signal transformed into the frequency domain by the frequency transformation means;

first to Nth (N is an integer equal to or larger than two) low frequency band time envelope calculation means for analyzing the low frequency band signal transformed into the frequency domain by the frequency transformation means and acquiring a plurality of low frequency band time envelopes;

time envelope calculation means for calculating a high frequency band time envelope using the time envelope information, which is acquired by the coded sequence decoding and dequantization means, and the plurality of low frequency band time envelopes, which are acquired by the low frequency band time envelope calculation means;

time envelope adjustment means for adjusting, using the time envelope acquired by the time envelope calculation means, a time envelope of the high frequency band components generated by the high frequency band generation means; and

inverse frequency transformation means for adding the high frequency band components, which are adjusted by the time envelope adjustment means, and the low frequency band signal, which is decoded by the low frequency band decoding means, and outputting a time domain signal containing entire frequency band components.

19. A speech decoding program that decodes a coded sequence of encoded speech signal, the program causing a computer to function as:

demultiplexing means for demultiplexing the coded sequence into a low frequency band coded sequence and a high frequency band coded sequence;

low frequency band decoding means for decoding the low frequency band coded sequence demultiplexed by the demultiplexing means and obtaining a low frequency band signal;

frequency transformation means for transforming the low frequency band signal obtained by the low frequency band decoding means into a frequency domain;

high frequency band coded sequence analysis means for analyzing the high frequency band coded sequence demultiplexed by the demultiplexing means and acquiring coded supplementary information for high frequency band generation, frequency envelope

information, and time envelope information;

coded sequence decoding and dequantization means for decoding and dequantizing the supplementary information for high frequency band generation, the frequency envelope information, and the time envelope information acquired by the high frequency band coded sequence analysis means;

high frequency band generation means for generating, using the supplementary information for high frequency band generation decoded by the coded sequence decoding and dequantization means, high frequency band components in the frequency domain of the speech signal from the low frequency band signal transformed into the frequency domain by the frequency transformation means;

first to Nth (N is an integer of two or more) low frequency band time envelope calculation means for analyzing the low frequency band signal transformed into the frequency domain by the frequency transformation means and acquiring a plurality of low frequency band time envelopes;

time envelope calculation means for calculating a high frequency band time envelope using the time envelope information, which is acquired by the coded sequence decoding and dequantization means, and the plurality of low frequency band time envelopes, which are acquired by the low frequency band time envelope calculation means;

frequency envelope superposition means for superimposing the frequency envelope information, which is acquired by the coded sequence decoding and dequantization means, onto the high frequency

band time envelope and acquiring a time-frequency envelope;

time-frequency envelope adjustment means for adjusting, using the time envelope acquired by the time envelope calculation means and the time-frequency envelope acquired by the frequency envelope superposition means, a time envelope and a frequency envelope of the high frequency band components generated by the high frequency band generation means; and

inverse frequency transformation means for adding the high frequency band components, which are adjusted by the time-frequency envelope adjustment means, and the low frequency band signal, which is decoded by the low frequency band decoding means, and outputting a time domain signal containing entire frequency band components.

20. A speech decoding program that decodes a coded sequence of encoded speech signal, the program causing a computer to function as:

demultiplexing means for demultiplexing the coded sequence into a low frequency band coded sequence and a high frequency band coded sequence;

low frequency band decoding means for decoding the low frequency band coded sequence demultiplexed by the demultiplexing means and obtaining a low frequency band signal;

frequency transformation means for transforming the low frequency band signal obtained by the low frequency band decoding means into a frequency domain;

high frequency band coded sequence analysis means for

analyzing the high frequency band coded sequence demultiplexed by the demultiplexing means and acquiring coded supplementary information for high frequency band generation, frequency envelope information, and time envelope information;

coded sequence decoding and dequantization means for decoding and dequantizing the supplementary information for high frequency band generation, the frequency envelope information, and the time envelope information acquired by the high frequency band coded sequence analysis means;

high frequency band generation means for generating, using the supplementary information for high frequency band generation decoded by the coded sequence decoding and dequantization means, high frequency band components in the frequency domain of the speech signal from the low frequency band signal transformed into the frequency domain by the frequency transformation means;

first to Nth (N is an integer equal to or larger than two) low frequency band time envelope calculation means for analyzing the low frequency band signal transformed into the frequency domain by the frequency transformation means and acquiring a plurality of low frequency band time envelopes;

time envelope calculation means for calculating a high frequency band time envelope using the time envelope information, which is acquired by the coded sequence decoding and dequantization means, and the plurality of low frequency band time envelopes, which are acquired by the low frequency band time envelope calculation means;

frequency envelope calculation means for calculating a frequency envelope using the frequency envelope information acquired by the coded sequence decoding and dequantization means;

time-frequency envelope adjustment means for adjusting, using the time envelope acquired by the time envelope calculation means and the frequency envelope acquired by the frequency envelope calculation means, a time envelope and a frequency envelope of the high frequency band components generated by the high frequency band generation means; and

inverse frequency transformation means for adding the high frequency band components, which are adjusted by the time-frequency envelope adjustment means, and the low frequency band signal, which is decoded by the low frequency band decoding means, and outputting a time domain signal containing entire frequency band components.

21. A speech encoding program that encodes a speech signal, the program causing a computer to function as:

frequency transformation means for transforming the speech signal into a frequency domain;

down-sampling means for down-sampling the speech signal and acquiring a low frequency band signal;

low frequency band encoding means for encoding the low frequency band signal acquired by the down-sampling means;

first to Nth (N is an integer equal to or larger than two) low frequency band time envelope calculation means for calculating a plurality of time envelopes of low frequency band components of the

speech signal transformed into the frequency domain by the frequency transformation means;

time envelope information calculation means for calculating, using the time envelopes of the low frequency band components calculated by the first to Nth low frequency band time envelope calculation means, time envelope information necessary to acquire a time envelope of high frequency band components of the speech signal transformed by the frequency transformation means;

supplementary information calculation means for analyzing the speech signal and calculating supplementary information for high frequency band generation to be used for generating high frequency band components from the low frequency band signal;

quantization and encoding means for quantizing and encoding the supplementary information for high frequency band generation, which is generated by the supplementary information calculation means, and the time envelope information, which is calculated by the time envelope information calculation means;

coded sequence construction means for constructing a high frequency band coded sequence from the supplementary information for high frequency band generation and the time envelope information quantized and encoded by the quantization and encoding means; and

multiplexing means for generating a coded sequence in which the low frequency band coded sequence, which is acquired by the low frequency band encoding means, and the high frequency band coded sequence, which is constructed by the coded sequence construction means, are multiplexed.

CLAIMS

1. An invention not claimed in any divisional application.