CLAIMS:

1. A decoder implemented bandwidth extension method, comprising:

receiving a bit stream encoded from an audio signal;

performing decoding operations on the bit stream, wherein a low frequency signal is generated via the decoding operations, wherein a collection of parameters is acquired via the decoding operations, and wherein the collection of parameters comprises one or more of the following parameters: a linear predictive coefficient (LPC), a set of line spectral frequency (LSF) parameters, a pitch period, a decoding rate, an adaptive codebook contribution, and an algebraic codebook contribution;

predicting a high-frequency gain according to the LPC, and any one of or a combination of: a voicing factor, a noise gate factor, a spectrum tilt factor, and a classification parameter;

predicting a high frequency excitation signal by selecting a frequency band from a low frequency excitation signal according to a difference value between the LSF parameters, wherein the low frequency excitation signal is represented by a sum of the adaptive codebook contribution and the algebraic codebook contribution; and

generating a high frequency band signal from the high frequency excitation signal and the high frequency gain to recover the audio signal.

2. The method according to claim 1, wherein the high frequency–excitation signal is predicted according to the decoding rate.

3. The method according to claim 1, wherein predicting the high-frequency gain comprise:

computing an initial high-frequency gain according to the LPC; and

correcting the initial high-frequency gain according to a first correction factor to obtain the high-frequency gain, wherein the first correction factor comprises one or more of the following parameters: a voicing factor, a noise gate factor, and a spectrum tilt factor .

4. The method according to claim 3, wherein the first correction factor is determined according to the decoded low-frequency signal.

5. The method according to claim 1, wherein the high-frequency gain is corrected according to the pitch period.

6. The method according to claim 3, further comprising:

correcting the high-frequency gain and the high frequency excitation signal according to a second correction factor; wherein the second correction factor comprises at least one of a classification parameter and a signal type.

7. The method according to claim 3, wherein the high frequency excitation signal is based on a weighted combination of the predicted high frequency excitation signal and a random noise signal, wherein a weight of the weighted combination is determined according to a value of a classification parameter and/or a voicing factor of the decoded low-frequency signal.

8. The method according to claim 1, wherein the generation of the high frequency band signal comprises:

correcting the high frequency excitation signal by using the predicted high-frequency gain, and passing the corrected high frequency excitation signal through a LPC synthesis filter to obtain the high frequency band signal.

9. A bandwidth extension apparatus having a processor coupled to a memory storing instructions, wherein the processor executes the instructions to:

receive a bit stream encoded from an audio signal;

perform decoding operations on the bit stream, wherein a low frequency signal is generated via the decoding operations, wherein a collection of parameters is acquired via the decoding operations, and wherein the collection of parameters comprises one or more of the following parameters: a linear predictive coefficient (LPC), a set of line spectral frequency (LSF) parameters, a pitch period, a decoding rate, an adaptive codebook contribution, and an algebraic codebook contribution;

predict a high-frequency gain according to the LPC, and any one of or a combination of: a voicing factor, a noise gate factor, a spectrum tilt factor, and a classification parameter;

predict a high frequency excitation signal by selecting a frequency band from a low frequency excitation signal according to a difference value between the LSF parameters, wherein the low frequency excitation signal is represented by a sum of the adaptive

codebook contribution and the algebraic codebook contribution; and

generate a high frequency band signal from the high frequency excitation signal and the high frequency gain to recover the audio signal.

10. The apparatus according to claim 9, wherein the high frequency-excitation signal is predicted according to the decoding rate.

11. The apparatus according to claim 9, wherein the processor is further configured to compute an initial high-frequency gain according to the LPC; and correct the initial high-frequency gain according to a first correction factor to obtain the high-frequency gain, wherein the first correction factor comprises one or more of the following parameters:

a voicing factor, a noise gate factor, and a spectrum tilt factor.

12. The apparatus according to claim 11, wherein the first correction factor is determined according to the decoded low-frequency signal.

13. The apparatus according to claim 9, wherein the high-frequency gain is corrected according to the pitch period.

14. The apparatus according to claim 11, wherein the processor is further configured to correct the high-frequency gain and the high frequency excitation signal according to a second correction factor; wherein the second correction factor comprises at least one of a classification parameter and a signal type.

15. The apparatus according to claim 11, wherein the high frequency excitation signal is based on a weighted combination of the predicted high frequency-excitation signal and a random noise signal, wherein a weight of the weighted combination is determined according to a value of a classification parameter and/or a voicing factor of the decoded low-frequency signal.

16. The apparatus according to claim 15, wherein the processor is further configured to:

correct the high frequency excitation signal by using the predicted high frequency gain, and passing the corrected high frequency excitation signal through a LPC synthesis filter to obtain the high frequency band signal.

17. A non-transitory computer-readable storage medium containing computer instructions that, when executed by a processor, cause the processor to perform the steps of:

receiving a bit stream encoded from an audio signal;

performing decoding operations on the bit stream, wherein a low frequency signal is generated via the decoding operations, wherein a collection of parameters is acquired via the decoding operations, and wherein the collection of parameters comprises one or more of the following parameters: a linear predictive coefficient (LPC), a set of line spectral frequency (LSF) parameters, a pitch period, a decoding rate, an adaptive codebook contribution, and an algebraic codebook contribution;

predicting a high-frequency gain according to the LPC, and any one of or a combination of: a voicing factor, a noise gate factor, a spectrum tilt factor, and a classification parameter;

predicting a high frequency excitation signal by selecting a frequency band from a low frequency excitation signal according to a difference value between the LSF parameters, wherein the low frequency excitation signal is represented by a sum of the adaptive codebook contribution and the algebraic codebook contribution; and

generating a high frequency band signal from the high frequency excitation signal and the high frequency gain to recover the audio signal.