CLAIMS

1. A bandwidth extension method, comprising:

acquiring a bandwidth extension parameter, wherein the bandwidth extension parameter comprises one or more of the following parameters: a linear predictive coefficient, LPC, a line spectral frequency, LSF parameter, a pitch period, a decoding rate, an adaptive codebook contribution, and an algebraic codebook contribution; and

performing, according to the bandwidth extension parameter, bandwidth extension on a decoded low-frequency signal, to obtain a high frequency band signal.

~~2. The method according to claim 1,~~

wherein the performing, according to the bandwidth extension parameter, bandwidth extension on a decoded low-frequency signal, to obtain a high frequency band signal comprises:

predicting high-frequency energy and a high band excitation signal according to the bandwidth extension parameter; and

obtaining the high frequency band signal according to the high-frequency energy and the high band excitation signal.

~~3. The method according to claim 2,~~

wherein the high-frequency energy comprises a high-frequency gain; and

the predicting high-frequency energy and a high band excitation signal according to the bandwidth extension parameter comprises:

predicting the high-frequency gain according to the LPC; and

adaptively predicting the high band excitation signal according to the LSF parameter, the adaptive codebook contribution, and the algebraic codebook contribution.

~~4~~2. The method according to claim ~~3~~1, wherein the adaptively predicting the high band excitation signal according to the LSF parameter, the adaptive codebook contribution, and the algebraic codebook contribution comprises:

adaptively predicting the high band excitation signal according to the decoding rate, the LSF parameter, the adaptive codebook contribution, and the algebraic codebook contribution.

~~5~~3. The method according to any one of claims ~~2to~~1 to 42, wherein after the predicting a high-frequency energy and a high band excitation signal according to the bandwidth extension parameter, the method further comprises:

determining a first correction factor according to at least one of the bandwidth extension parameter and the decoded low-frequency signal, 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;

and

correcting the high-frequency energy according to the first correction factor.

64. The method according to claim 53, wherein the determining a first correction factor according to at least one of the bandwidth extension parameter and the decoded low-frequency signal comprises:

determining the first correction factor according to the decoded low-frequency signal.

75. The method according to any one of claims 5 3 to or 64, further comprising:

correcting the high-frequency energy according to the pitch period.

86. The method according to any one of claims 5 3 to 75, further comprising:

determining a second correction factor according to at least one of the bandwidth extension parameter and the decoded low-frequency signal, wherein the second correction factor comprises at least one of a classification parameter and a signal type; and

correcting the high-frequency energy and the high band excitation signal according to the second correction factor.

97. The method according to any one of claims 5to 3 to 86, further comprising:

weighting the predicted high band excitation signal and a random noise signal, to obtain a final high band excitation signal, wherein a weight of the weighting is determined according to a value of a classification parameter and/or a voicing factor of the decoded low-frequency signal.

108. The method according to any one of claims 2 1 to 97, wherein the obtaining the high frequency band signal according to the high-frequency energy and the high band excitation signal comprises:

synthesizing the high-frequency energy, the high band excitation signal, and a predicted LPC, to obtain the high frequency band signal, wherein the predicted LPC comprises a predicted high frequency band LPC or a predicted wideband LPC, and the predicted LPC is obtained based on the LPC.

119. A bandwidth extension apparatus, comprising:

an acquisition unit, configured to acquire a bandwidth extension parameter, wherein the bandwidth extension parameter comprises one or more of the following parameters: a linear predictive coefficient, LPC, a line spectral frequency, LSF parameter, a pitch period, a decoding rate, an adaptive codebook contribution, and an algebraic codebook contribution; and

a bandwidth extension unit, configured to perform, according to the bandwidth extension parameter acquired by the acquisition unit, bandwidth extension on a decoded low-frequency signal, to obtain a high frequency band signal.

12. The apparatus according to claim 11,

wherein the bandwidth extension unit comprises:

a prediction subunit, configured to predict high-frequency energy and a high band excitation signal according to the bandwidth extension parameter; and

a synthesis subunit, configured to obtain the high frequency band signal according to the high-frequency energy and the high band excitation signal.

~~13. The apparatus according to claim 12,~~

wherein the high-frequency energy comprises a high-frequency gain; and

the prediction subunit is specifically configured to:

predict the high-frequency gain according to the LPC; and

adaptively predict the high band excitation signal according to the LSF parameter, the adaptive codebook contribution, and the algebraic codebook contribution.

~~14~~10. The apparatus according to claim ~~12~~9, wherein the high-frequency energy comprises a high-frequency gain; and

the prediction subunit is specifically configured to:

predict the high-frequency gain according to the LPC; and

adaptively predict the high band excitation signal according to the decoding rate, the LSF parameter, the adaptive codebook contribution, and the algebraic codebook contribution.

~~15~~11. The apparatus according to any one of claims ~~12~~ 9 to ~~14~~10, wherein the bandwidth extension unit further comprises: a first correction subunit, configured to: after the high-frequency energy and the high band excitation signal are predicted according to the bandwidth extension parameter, determine a first correction factor according to at least one of the bandwidth extension parameter and the decoded low-frequency signal; and correct the high-frequency energy according to the first correction factor, 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.

~~16~~12. The apparatus according to claim ~~15~~11, wherein the first correction subunit is specifically configured to:

determine the first correction factor according to the decoded low-frequency signal; and correct the high-frequency energy according to the first correction factor.

~~17~~13. The apparatus according to any one of claims ~~15~~ 11 ~~or~~ to ~~16~~12, wherein the bandwidth extension unit further comprises: a second correction subunit, configured to correct the high-frequency energy according to the pitch period.

~~18~~14. The apparatus according to any one of claims ~~15~~ 11 to ~~17~~13, wherein the bandwidth extension unit further comprises: a third correction subunit, configured to determine a second correction factor according to at least one of the bandwidth extension parameter and the decoded

low-frequency signal, wherein the second correction factor comprises at least one of a classification parameter and a signal type; and correct the high-frequency energy and the high band excitation signal according to the second correction factor.

~~19~~15. The apparatus according to any one of claims ~~15~~ 11 to ~~18~~14, wherein the bandwidth extension unit further comprises: a weighting subunit, configured to weight the predicted high band excitation signal and a random noise signal, to obtain a final high band excitation signal, wherein a weight of the weighting is determined according to a value of a classification parameter and/or a voicing factor of the decoded low-frequency signal.

~~20~~16. The apparatus according to any one of claims ~~12~~ 9 to ~~19~~15, wherein the synthesis subunit is specifically configured to: synthesize the high-frequency energy, the high band excitation signal, and a predicted LPC, to obtain the high frequency band signal, wherein the predicted LPC comprises a predicted high frequency band LPC or a predicted wideband LPC, and the predicted LPC is obtained based on the LPC.