WHAT IS CLAIMED IS:

1. A signal encoding method, performed by an encoding end, comprising:

obtaining an audio signal in a mixed format, wherein the audio signal in the mixed format comprises at least one format of a channel-based audio signal, an object-based audio signal, and a scene-based audio signal;

determining, based on signal characteristics of audio signals in different formats, an encoding mode of the audio signal in each format; and

encoding the audio signal in each format using the encoding mode of the audio signal in each format to obtain encoded signal parameter information of the audio signal in each format, writing the encoded signal parameter information of the audio signal in each format into an encoded stream and sending the encoded stream to a decoding end;

wherein determining, based on the signal characteristics of the audio signals in different formats, the encoding mode of the audio signal in each format comprises: determining an encoding mode of the channel-based audio signal based on a signal characteristic of the channel-based audio signal;

wherein determining the encoding mode of the channel-based audio signal based on the signal characteristic of the channel-based audio signal comprises:

obtaining a number of object signals included in the channel-based audio signal;

in response to the number of the object signals included in the channel-based audio signal being less than a first threshold, determining that the encoding mode of the channel-based audio signal is at least one of:

encoding each object signal in the channel-based audio signal using an object signal encoding kernel; or

obtaining input first command line control information, and encoding at least part of the object signals in the channel-based audio signal using the object signal encoding kernel based on the first command line control information, wherein the first command line control information is configured to indicate object signals that need to be encoded among the object signals included in the channel-based audio signal, and a number of the object signals that need to be encoded is greater than or equal to 1 and less than the number of the object signals included in the channel-based audio signal.

2. The method of claim 1, wherein determining, based on the signal characteristics of the audio signals in different formats, the encoding mode of the audio signal in each format comprises:

determining an encoding mode of the object-based audio signal based on a signal characteristic of the object-based audio signal; and

determining an encoding mode of the scene-based audio signal based on a signal characteristic of the scene-based audio signal.

3. The method of claim 1, wherein determining the encoding mode of the channel-based audio signal based on the signal characteristic of the channel-based audio signal comprises:

in response to the number of the object signals included in the channel-based audio signal being not less than the first threshold, determining that the encoding mode of the channel-based audio signal is at least one of:

converting the channel-based audio signal into a first audio signal in another format, and encoding the first audio signal in another format using an encoding kernel corresponding to the first audio signal in another format, wherein a number of channels of the first audio signal in another format is smaller than a number of channels of the channel-based audio signal;

obtaining input first command line control information, and encoding at least part of the object signals in the channel-based audio signal using an object signal encoding kernel based on the first command line control information, wherein the first command line control information is configured to indicate object signals that need to be encoded among the object signals included in the channel-based audio signal, and a number of the object signals that need to be encoded is greater than or equal to 1 and less than the number of the object signals included in the channel-based audio signal;

obtaining input second command line control information, and encoding at least part of channel signals in the channel-based audio signal using the object signal encoding kernel based on the second command line control information, wherein the second command line control information is configured to indicate channel signals that need to be encoded among the channel signals included in the channel-based audio signal, and a number of the channel signals that need to be encoded is greater than or equal to 1 and less than a number of the

channel signals included in the channel-based audio signal.

4. The method of claim 2, wherein determining the encoding mode of the object-based audio signal based on the signal characteristic of the object-based audio signal comprises:

performing a signal characteristic analysis on the object-based audio signal to obtain an analysis result;

performing a classification on the object-based audio signal to obtain a first type of object signal set and a second type of object signal set, wherein each of the first type of object signal set and the second type of object signal set comprises at least one object-based audio signal;

determining an encoding mode corresponding to the first type of object signal set; and

performing a classification on the second type of object signal set based on the analysis result to obtain at least one object signal subset, and determining an encoding mode corresponding to each object signal subset based on a classification result, wherein the object signal subset comprises at least one object-based audio signal.

5. The method of claim 4, wherein performing the classification on the object-based audio signal to obtain the first type of object signal set and the second type of object signal set comprises one of the following:

classifying one or more signals that need not to be individually operated and processed in the object-based audio signal into the first type of object signal set, and classifying remaining signals into the second type of object signal set;

classifying one or more signals belonging to a background sound in the object-based audio signal into the first type of object signal set, and classifying remaining signals into the second type of object signal set; or

classifying one or more signals that need not to be individually operated and processed in the object-based audio signal into a first object signal subset, classifying one or more signals belonging to a background sound in the object-based audio signal into a second object signal subset, and classifying remaining signals into the second type of object signal set, wherein the first type of object signal set comprises the first object signal subset and the second object signal subset.

6. The method of claim 5, wherein determining the encoding mode corresponding to the first type of object signal set comprises one of the following:

performing first pre-rendering processing on an object-based audio signal in the first type of object signal set, and encoding the signal after the first pre-rendering processing using a multi-channel encoding kernel; wherein, the first type of object signal set comprises the one or more signals that need not to be individually operated and processed; wherein, the first pre-rendering processing comprises: performing signal format conversion processing on an object-based audio signal to convert the object-based audio signal into a channel-based audio signal;

performing second pre-rendering processing on an object-based audio signal in the first type of object signal set, and encoding the signal after the second pre-rendering processing using a high order ambisonics (HOA) encoding kernel; wherein, the first type of object signal set comprises the one or more signals belonging to the background sound; and the second pre-rendering processing comprises: performing signal format conversion processing on an object-based audio signal to convert the object-based audio signal into a scene-based audio signal; or

performing first pre-rendering processing on an object-based audio signal in the first object signal subset, and encoding the signal after the first pre-rendering processing using a multi-channel encoding kernel; wherein the first pre-rendering processing comprises: performing signal format conversion processing on an object-based audio signal to convert the object-based audio signal into a channel-based audio signal; and performing second pre-rendering processing on an object-based audio signal in the second object signal subset, and encoding the signal after the second pre-rendering processing using an HOA encoding kernel; wherein the second pre-rendering processing comprises: performing signal format conversion processing on an object-based audio signal to convert the object-based audio signal into a scene-based audio signal.

7. The method of claim 6, wherein performing the signal characteristic analysis on the object-based audio signal to obtain the analysis result comprises:

performing high-pass filtering processing on object-based audio signals; and

performing a correlation analysis on the signals after the high-pass filtering processing to determine cross-correlation parameter values between the object-based audio signals.

8. The method of claim 7, wherein performing the classification on the second type of object signal set based on the analysis result to obtain at least one object signal subset, and determining the encoding mode corresponding to each object signal subset based on the classification result comprises:

setting a normalized correlation degree interval based on correlation degrees; and

performing the classification on the second type of object signal set based on the cross-correlation parameter values of the object-based audio signals and the normalized correlation degree interval to obtain the at least one object signal subset, and determining the corresponding encoding mode based on a correlation degree corresponding to the at least one object signal subset.

9. The method of claim 8, wherein the encoding mode corresponding to the object signal subset comprises an independent encoding mode or a joint encoding mode.

10. The method of claim 8, wherein encoding the audio signal in each format using the encoding mode of the audio signal in each format to obtain the encoded signal parameter information of the audio signal in each format comprises:

encoding the object-based audio signal using the encoding mode of the object-based audio signal;

wherein encoding the object-based audio signal using the encoding mode of the object-based audio signal comprises:

encoding one or more signals in the first type of object signal set using an encoding mode corresponding to the first type of object signal set;

performing preprocessing on one or more object signal subsets in the second type of object signal set, and encoding all the object signal subsets after the preprocessing in the second type of object signal set using respective encoding modes and using a same object signal encoding kernel.

11. The method of claim 6, wherein performing the signal characteristic analysis on the object-based audio signal to obtain the analysis result comprises:

analyzing a frequency-band bandwidth range of the object-based audio signal.

12. The method of claim 11, wherein performing the classification on the second type of object signal set based on the analysis result to obtain at least one object signal subset, and determining the encoding mode corresponding to each object signal subset based on the classification result comprises one of the following:

determining bandwidth intervals corresponding to different frequency-band bandwidths; performing the classification on the second type of object signal set to obtain the at least one object signal subset based on the frequency-band bandwidth range of the object-based audio signal and the bandwidth intervals corresponding to different frequency-band bandwidths, and determining a corresponding encoding mode based on a frequency-band bandwidth corresponding to the at least one object signal subset; or

obtaining input third command line control information, wherein the third command line control information is configured to indicate a frequency-band bandwidth range to be encoded corresponding to the object-based audio signal; and performing the classification on the second type of object signal set by combining the third command line control information and the analysis result to obtain the at least one object signal subset, and determining the encoding mode corresponding to each object signal subset based on the classification result.

13. The method of claim 11, wherein encoding the audio signal in each format using the encoding mode of the audio signal in each format to obtain the encoded signal parameter information of the audio signal in each format comprises:

encoding the object-based audio signal using the encoding mode of the object-based audio signal;

wherein encoding the object-based audio signal using the encoding mode of the object-based audio signal comprises:

encoding one or more signals in the first type of object signal set using the encoding mode corresponding to the first type of object signal set;

performing preprocessing on object signal subsets in the second type of object signal set, and encoding different object signal subsets after the preprocessing using respective encoding modes and using different object signal encoding kernels.

14. The method of claim 2, wherein determining the encoding mode of the scene-based audio signal based on the signal characteristic of the scene-based audio signal comprises:

obtaining a number of object signals included in the scene-based audio signal;

determining whether the number of the object signals included in the scene-based audio signal is less than a second threshold;

in response to the number of the object signals included in the scene-based audio signal being less than the second threshold, determining that the encoding mode of the scene-based audio signal is at least one of:

encoding each object signal in the scene-based audio signal using an object signal encoding kernel;

obtaining input fourth command line control information, and encoding at least part of the object signals in the scene-based audio signal using the object signal encoding kernel based on the fourth command line control information, wherein the fourth command line control information is configured to indicate object signals that need to be encoded among the object signals included in the scene-based audio signal, and a number of the object signals that need to be encoded is greater than or equal to 1 and less than the number of the object signals included in the scene-based audio signal.

15. The method according to claim 2, wherein determining the encoding mode of the scene-based audio signal based on the signal characteristic of the scene-based audio signal comprises:

obtaining a number of object signals included in the scene-based audio signal;

determining whether the number of the object signals included in the scene-based audio signal is less than a second threshold;

in response to the number of the object signals included in the scene-based audio signal being not less than the second threshold, determining that the encoding mode of the scene-based audio signal is at least one of:

converting the scene-based audio signal into a second audio signal in another format, and encoding the second audio signal in another format using a scene signal encoding kernel, wherein a number of channels of the second audio signal in another format is smaller than a number of channels of the scene-based audio signal;

performing a low-order conversion on the scene-based audio signal to covert the scene-based audio signal to a scene-based audio signal with a lower order than a current order of the scene-based audio signal, and encoding the scene-based audio signal with the lower order using the scene signal encoding kernel.

16. The method of claim 3 or 4 or 14, wherein writing the encoded signal parameter information of the audio signal in each format into the encoded stream and sending the encoded stream to the decoding end comprises:

determining a classification side information parameter, wherein the classification side information parameter is configured to indicate a classification manner for the second type of object signal set;

determining a side information parameter corresponding to the audio signal in each format, wherein the side information parameter is configured to indicate the encoding mode corresponding to the audio signal in each format;

performing code stream multiplexing on the classification side information parameter, the side information parameter corresponding to the audio signal in each format, and the encoded signal parameter information of the audio signal in each format to obtain the encoded stream, and sending the encoded stream to the decoding end.

17. A signal decoding method, performed by a decoding end, comprising:

receiving an encoded stream sent by an encoding end, wherein the encode stream is determined by the encoding end according to any of claims 1-16; and

decoding the encoded stream to obtain an audio signal in a mixed format, wherein the audio signal in the mixed format comprises at least one format of a channel-based audio signal, an object-based audio signal, and a scene-based audio signal.

18. The method of claim 17, further comprising:

performing a code stream analysis on the encoded stream to obtain a classification side information parameter, a side information parameter corresponding to an audio signal in each format, and encoded signal parameter information of the audio signal in each format;

wherein, the classification side information parameter is configured to indicate a classification manner for a second type of object signal set of the object-based audio signal, and the side information parameter is configured to indicate an encoding mode corresponding to the audio signal in each format.

19. The method of claim 18, wherein decoding the encoded stream to obtain the audio signal in the mixed format comprises:

decoding encoded signal parameter information of the channel-based audio signal based on a side information parameter corresponding to the channel-based audio signal;

decoding encoded signal parameter information of the object-based audio signal based on the classification side information parameter and a side information parameter corresponding to the object-based audio signal; and

decoding encoded signal parameter information of the scene-based audio signal based on a side information parameter corresponding to the scene-based audio signal.

20. The method of claim 19, wherein decoding the encoded signal parameter information of the object-based audio signal based on the classification side information parameter and the side information parameter corresponding to the object-based audio signal comprises:

determining, from the encoded signal parameter information of the object-based audio signal, encoded signal parameter information corresponding to a first type of object signal set and encoded signal parameter information corresponding to the second type of object signal set;

decoding the encoded signal parameter information corresponding to the first type of object signal set based on a side information parameter corresponding to the first type of object signal set; and

decoding the encoded signal parameter information corresponding to the second type of object signal set based on the classification side information parameter and the side

information parameter corresponding to the second type of object signal set.

21. The method of claim 20, wherein decoding the encoded signal parameter information corresponding to the second type of object signal set based on the classification side information parameter and the side information parameter corresponding to the second type of object signal set comprises:

determining the classification manner for the second type of object signal set based on the classification side information parameter;

decoding the encoded signal parameter information corresponding to the second type of object signal set based on the classification manner for the second type of object signal set and the side information parameter corresponding to the second type of object signal set.

22. The method of claim 21, wherein the classification side information parameter indicates that the classification manner for the second type of object signal set is based on cross-correlation parameter values or a frequency-band bandwidth range;

wherein decoding the encoded signal parameter information corresponding to the second type of object signal set based on the classification manner for the second type of object signal set and the side information parameter corresponding to the second type of object signal set comprises one of the following:

decoding the encoded signal parameter information of all signals in the second type of object signal set using a same object signal decoding kernel based on the classification manner for the second type of object signal set and the side information parameter corresponding to the second type of object signal set; or

decoding the encoded signal parameter information of different signals in the second type of object signal set using different object signal decoding kernels based on the classification manner for the second type of object signal set and the side information parameter corresponding to the second type of object signal set.

23. The method of claims 20-22, further comprising:

performing post-processing on the decoded object-based audio signal.

24. The method of claim 19, wherein decoding the encoded signal parameter information of the channel-based audio signal based on the side information parameter corresponding to the channel-based audio signal comprises:

determining an encoding mode corresponding to the channel-based audio signal based on the side information parameter corresponding to the channel-based audio signal; and

decoding the encoded signal parameter information of the channel-based audio signal using a corresponding decoding mode based on the encoding mode corresponding to the channel-based audio signal.

25. The method of claim 19, wherein decoding the encoded signal parameter information of the scene-based audio signal based on the side information parameter corresponding to the scene-based audio signal comprises:

determining an encoding mode corresponding to the scene-based audio signal based on the side information parameter corresponding to the scene-based audio signal; and

decoding the encoded signal parameter information of the scene-based audio signal using a corresponding decoding mode based on the encoding mode corresponding to the scene-based audio signal.

26. A communication apparatus, comprising a processor and a memory, wherein a computer program is stored in the memory, and the processor executes the computer program stored in the memory, to cause the apparatus to perform the method of any one of claims 1 to 16.

27. A communication apparatus, comprising a processor and a memory, wherein a computer program is stored in the memory, and the processor executes the computer program stored in the memory, to cause the apparatus to perform the method of any one of claims 17 to 25.