AUDIO SIGNAL TRANSMISSION METHOD, MOBILE TERMINAL AND INTELLIGENT KEY DEVICE

CROSS REFERENCE TO RELATED APPLICATION

This application is based upon and claims a priority to Chinese Patent Application Serial No. 201410048538.X, filed with the State Intellectual Property Office of P. R. China on February 12, 2014 by TENDYRON CORPORATION, and entitled "a method for transmitting an audio signal, a mobile terminal and an intelligent cipher key token", the entire contents of which are incorporated herein by reference.

FIELD

The present disclosure generally relates to the electronic technology field, and more particularly to a method for transmitting an audio signal, a mobile terminal and an intelligent cipher key token.

BACKGROUND

Currently, an intelligent cipher key token (for example, an electronic signature token with a signature function or a dynamic password token with a ONE-TIME password generation function) may communicate with a mobile terminal (for example, a mobile phone, a tablet personal computer) via an audio interface, that is, the transmission of valid data between the intelligent cipher key token and the mobile terminal may be realized by transmitting a waveform corresponding to an audio signal.

During processes of transmitting and receiving data by the mobile terminal via the audio interface, data transmitted by the mobile terminal may be lost. Therefore, how to avoid the data loss is a serious problem to be solved.

SUMMARY

The present disclosure provides a method for transmitting an audio signal, a mobile terminal and an intelligent cipher key token, so as to solve a problem of data loss when a mobile terminal transmits a waveform.

The technical solutions of the present disclosure may be realized specifically as follows.

According to an aspect of the present disclosure, there is provided a method for transmitting an audio signal, including: encoding, by a mobile terminal, format information of a waveform corresponding to an audio signal according to a first encoding mode so as to obtain a first encoded data, in which the first encoding mode is an encoding mode used by the mobile terminal to transmit the waveform corresponding to the audio signal, and the format information includes: valid data, a length of a pre-frame protected field in front of the valid data, a length of a post-frame protected field behind of the valid data, and a length of an initial domain field configured to determine a beginning of the valid data and located behind of the pre-frame protected field and in front of the valid data; transmitting, by the mobile terminal, a first waveform corresponding to the first encoded data; receiving, by an intelligent cipher key token, the first waveform; decoding, by the intelligent cipher key token, the first waveform according to a first decoding mode corresponding to the first encoding mode so as to obtain the format information; transmitting, by the intelligent cipher key token, a second waveform according to the format information and a second encoding mode, in which the second encoding mode is an encoding mode used by the intelligent cipher key token to transmit the waveform corresponding to the audio signal; and receiving, by the mobile terminal, the second waveform, and decoding, by the mobile terminal, the second waveform according to the format information and a second decoding mode corresponding to the second encoding mode so as to obtain valid data in the second waveform.

According to another aspect of the present disclosure, there is provided a method for transmitting an audio signal, including: encoding, by a mobile terminal, format information of a waveform corresponding to an audio signal according to a first encoding mode so as to obtain a first encoded data, in which the first encoding mode is an encoding mode used by the mobile terminal to transmit the waveform corresponding to the audio signal, and the format information includes: valid data, a length of a pre-frame protected field in front of the valid data, a length of a post-frame protected field behind of the valid data, and a length of an initial domain field configured to determine a beginning of the valid data and located behind of the pre-frame protected field and in front of the valid data; transmitting, by the mobile terminal, a first waveform corresponding to the first encoded data; receiving, by an intelligent cipher key token, the first waveform; decoding, by the intelligent cipher key token, the first waveform according to a first decoding mode corresponding to the first encoding mode so as to obtain the format information; transmitting, by the mobile terminal, a third waveform according to the format information and the

first encoding mode; receiving, by the intelligent cipher key token, the third waveform, and decoding, by the intelligent cipher key token, the third waveform according to the format information and the first decoding mode corresponding to the first encoding mode so as to obtain valid data in the third waveform.

In addition, the format information is obtained by one of: way one: visiting, by the mobile terminal, a preset website, and obtaining, by the mobile terminal, format information corresponding to a type of the mobile terminal from the preset website; and way two: obtaining, by the mobile terminal, an application software corresponding to a type of the mobile terminal, the application software including format information corresponding to the type of the mobile terminal.

In addition, the format information further includes: a length of a data head behind of the pre-frame protected field and in front of the valid data; and a length of a data tail behind of the valid data and in front of the post-frame protected field.

In addition, before encoding by a mobile terminal format information of a waveform corresponding to an audio signal according to a first encoding mode, the method further includes: obtaining, by both the mobile terminal and the intelligent cipher key token, the first encoding mode and the second encoding mode.

According to still another aspect of the present disclosure, there is provided a mobile terminal, including: an encoding module, configured to encode format information of a waveform corresponding to the audio signal according to a first encoding mode so as to obtain a first encoded data, in which the first encoding mode is an encoding mode used by the mobile terminal to transmit the waveform corresponding to the audio signal, and the format information includes: valid data, a length of a pre-frame protected field in front of the valid data, a length of a post-frame protected field behind of the valid data, and a length of an initial domain field configured to determine a beginning of the valid data and located behind of the pre-frame protected field and in front of the valid data; a transmitting module, configured to transmit a first waveform corresponding to the first encoded data to an intelligent cipher key token; a first communicating module, including: a receiving sub module, configured to receive a second waveform, in which the second waveform is obtained by processing data to be transmitted according to the format information and a second encoding mode, in which the second encoding mode is an encoding mode used by the intelligent cipher key token to transmit the waveform corresponding to the audio

signal; a decoding sub module, configured to decode the second waveform according to the format information and a second decoding mode corresponding to the second encoding mode so as to obtain valid data in the second waveform; a second communicating module, including: an encoding sub module, configured to encode data to be transmitted according to the format information and the first encoding mode so as to obtain a third encoded data; a transmitting sub module, configured to transmit a third waveform corresponding to the third encoded data.

In addition, the mobile terminal further includes: a visiting module, configured to visit a preset website; a first obtaining module, configured to obtain format information corresponding to a type of the mobile terminal from the preset website.

In addition, the mobile terminal further includes: a second obtaining module, configured to obtain an application software corresponding to a type of the mobile terminal, the application software including format information corresponding to the type of the mobile terminal.

In addition, the mobile terminal further includes: a third obtaining module, configured to obtain the first encoding mode and the second encoding mode.

In addition, the format information further includes: a length of a data head behind of the pre-frame protected field and in front of the valid data; and a length of a data tail behind of the valid data and in front of the post-frame protected field.

According to yet another aspect of the present disclosure, there is provided an intelligent cipher key token, including: a receiving module, configured to receive a first waveform corresponding to first encoded data transmitted by a mobile terminal, in which the first encoded data is obtained by the mobile terminal by encoding format information of a waveform corresponding to an audio signal according to a first encoding mode, and the first encoding mode is an encoding mode used by the mobile terminal to transmit the waveform corresponding to the audio signal, and the format information includes: valid data, a length of a pre-frame protected field in front of the valid data, a length of a post-frame protected field behind of the valid data, and a length of an initial domain field configured to determine a beginning of the valid data and located behind of the pre-frame protected field and in front of the valid data; a decoding module, configured to decode the first waveform according to a first decoding mode corresponding to the first encoding mode so as to obtain the format information; a first communicating module, including: a receiving sub module, configured to receive a third waveform, in which the third waveform is obtained by processing data to be transmitted according to the format information and

the first encoding mode; a decoding sub module, configured to decode the third waveform according to the format information and the first decoding mode corresponding to the first encoding mode so as to obtain valid data in the third waveform; a second communicating module, including: an encoding sub module, configured to encode data to be transmitted according to the format information and a second encoding mode to obtain a second encoded data, in which the second encoding mode is an encoding mode used by the intelligent cipher key token to transmit the waveform corresponding to the audio signal; a transmitting sub module, configured to transmit a second waveform corresponding to the second encoded data.

In addition, the intelligent cipher key token further includes: an obtaining module, configured to obtain the first encoding mode and the second encoding mode.

In addition, the format information further includes: a length of a data head behind of the pre-frame protected field and in front of the valid data; and a length of a data tail behind of the valid data and in front of the post-frame protected field.

According to yet still another aspect of the present disclosure, there is provided a mobile terminal, including: a housing, a screen, a processor and a circuit board, in which the screen is arranged on the housing, the circuit board is arranged in a space enclosed by the housing, and the processor is arranged on the circuit board; the processor is configured to process data, so as to: encode format information of a waveform corresponding to an audio signal according to a first encoding mode used by the mobile terminal to transmit the waveform corresponding to the audio signal so as to obtain a first encoded data, and the format information including: valid data, a length of a pre-frame protected field in front of the valid data, a length of a post-frame protected field behind of the valid data, and a length of an initial domain field configured to determine a beginning of the valid data and located behind of the pre-frame protected field and in front of the valid data; transmit a first waveform corresponding to the first encoded data to an intelligent cipher key token; receive a second waveform, in which the second waveform is obtained by processing data to be transmitted according to the format information and a second encoding mode, in which the second encoding mode is an encoding mode used by the intelligent cipher key token to transmit the waveform corresponding to the audio signal, and decode the second waveform according to the format information and a second decoding mode corresponding to the second encoding mode so as to obtain valid data in the second waveform; or encode data to be transmitted according to the format information and the first encoding mode so as to obtain a third encoded

data, and transmit a third waveform corresponding to the third encoded data.

According to yet still another aspect of the present disclosure, there is provided an intelligent cipher key token, including: one or more processors; a memory; one or more programs stored in the memory, in which when being executed by the one or more processors, the one or more programs are configured to: receive a first waveform corresponding to a first encoded data transmitted by a mobile terminal, in which the first encoded data is obtained by encoding by the mobile terminal format information of a waveform corresponding to an audio signal according to a first encoding mode, and the first encoding mode is an encoding mode used by the mobile terminal to transmit the waveform corresponding to the audio signal, and the format information includes: valid data, a length of a pre-frame protected field in front of the valid data, a length of a post-frame protected field behind of the valid data, and a length of an initial domain field configured to determine a beginning of the valid data and located behind of the pre-frame protected field and in front of the valid data; decode the first waveform according to a first decoding mode corresponding to the first encoding mode so as to obtain the format information; receive a third waveform, in which the third waveform is obtained by processing data to be transmitted according to the format information and the first encoding mode, and decode the third waveform according to the format information and the first decoding mode corresponding to the first encoding mode so as to obtain valid data in the third waveform; or encode data to be transmitted according to the format information and a second encoding mode so as to obtain a second encoded data, in which the second encoding mode is an encoding mode used by the intelligent cipher key token to transmit the waveform corresponding to the audio signal; and transmit a second waveform corresponding to the second encoded data.

It can be seen from the above technical solutions provided by the present disclosure that, in the present disclosure, the mobile terminal transmits the format information of the waveform corresponding to the audio signal transmitted by the mobile terminal to the intelligent cipher key token, and the intelligent cipher key token may transmit the waveform to the mobile terminal according to the format information, thereby ensuring the integrity of waveform received by the mobile terminal; meanwhile, the intelligent cipher key token may also decode the waveform received from the mobile terminal according to the format information, thereby obtaining integrated valid data. The characteristic of fading into/out of the mobile terminal may be compensated by the pre-frame protected field and the post-frame protected field, so as to ensure

the integrity of waveform transmission between the intelligent cipher key token and the mobile terminal. The beginning of the valid data is determined by using the initial domain field, so that the mobile terminal and/or the intelligent cipher key token may obtain the valid data accurately.

BRIEF DESCRIPTION OF THE DRAWINGS

In order to make technique solutions according to embodiments of the present disclosure more apparent, drawings needed to be used in descriptions of the embodiments will be illustrated in the following. Obviously, the drawings to be illustrated in the following only represent some embodiments of the present disclosure, and other drawings can be obtained according these drawings by those having ordinary skills in the related art without making creative labors.

Fig. 1 is a flow chart illustrating a method for transmitting an audio signal provided by Embodiment One of the present disclosure;

Fig. 2 is a block diagram illustrating a mobile terminal provided by Embodiment Three of the present disclosure; and

Fig. 3 is a block diagram illustrating an intelligent cipher key token provided by Embodiment Four of the present disclosure.

DETAILED DESCRIPTION

The technique solution in embodiments of the present disclosure will be described in the following with reference to drawings in the embodiments of the present disclosure. Obviously, the embodiments to be described only are some embodiments of the present disclosure, instead of all the embodiments thereof. Based on embodiments of the present disclosure, other embodiments obtained by those having ordinary skills in the related art without making creative labors fall into a protection scope of the present disclosure.

In the description of the present disclosure, it should be understood that, unless specified or limited otherwise, the terms "mounted," "connected," and "coupled" and variations thereof are used broadly and encompass such as mechanical or electrical mountings, connections and couplings, also can be inner mountings, connections and couplings of two components, and further can be direct and indirect mountings, connections, and couplings, which can be understood by those skilled in the art according to the detail embodiment of the present disclosure. In addition, terms such as "first" and "second" are used herein for purposes of description and are not intended

to indicate or imply relative importance or significance.

Embodiments of the present disclosure will be further described in the following with reference to the drawings.

Embodiment One

The embodiment provides a method for transmitting an audio signal, applied to an audio signal transmission between an intelligent cipher key token and a mobile terminal. The intelligent cipher key token may be an electronic signature token configured to sign a signature so as to ensure information security, or a dynamic password token capable of generating a ONE-TIME password according to a challenge code. The mobile terminal may be a device having an audio interface, for example, a laptop computer, a tablet computer, a mobile phone, a smart watch, smart glasses. The intelligent cipher key token may be connected with the mobile terminal via the audio interface. The audio interface of the intelligent cipher key token may be matched with the audio interface of the mobile terminal. The intelligent cipher key token may be connected with the mobile terminal and transmit the audio signal via the audio interface thereof, in which the intelligent cipher key token may have an audio interface; or the intelligent cipher key token may have a USB interface thereof as the audio interface via a USB-to-audio adapter. Also, the audio signal may be transmitted between the intelligent cipher key token and the mobile terminal via a speaker and a microphone.

Fig. 1 is a flow chart illustrating a method for transmitting an audio signal provided by Embodiment One of the present disclosure. As shown in Fig. 1, the method includes the following steps 101 to 106.

In step 101, the mobile terminal encodes format information of a waveform corresponding to an audio signal according to a first encoding mode so as to obtain a first encoded data, in which the first encoding mode is an encoding mode used by the mobile terminal to transmit the waveform corresponding to the audio signal, and the format information includes: valid data, a length of a pre-frame protected field in front of the valid data, a length of a post-frame protected field behind of the valid data, and a length of an initial domain field configured to determine a beginning of the valid data and located behind of the pre-frame protected field and in front of the valid data.

The first encoding mode may be one or more encoding modes supported by the mobile terminal. That is, the mobile terminal may use the one or more encoding modes to transmit the

format information, and the intelligent cipher key token may correctly decode the waveform corresponding to the first encoded data which is encoded by the mobile terminal with the first encoding mode to obtain the valid data. It should be noted that, when the mobile terminal uses a plurality of encoding modes, the intelligent cipher key token may recognize the encoding mode corresponding to a certain segment of the waveform.

The above format information is set for the characteristic of fading into/out of the mobile terminal shown when the mobile terminal transmits the waveform. The mobile terminal's own characteristic leads to the presence of fading into/out when the mobile terminal transmits the waveform. The fading into/out refers to that, the head portion of the waveform gradually increases from zero to the amplitude of the valid data in the waveform and the end portion of the waveform gradually decreases from the amplitude of the valid data to zero, when the mobile terminal transmits or receives the waveform corresponding to the audio signal. The above characteristic of the mobile terminal may cause that the waveform of partial transmitted valid data is in the state of fading into/out. The amplitude of the waveform corresponding to the partial transmitted valid data may be reduced or even to zero. That is, the transmitted waveform is not integrated and important data is lost.

The characteristic of fading into/out of the mobile terminal may be compensated by the pre-frame protected field and the post-frame protected field, so as to ensure the integrity of waveform transmitted between the intelligent cipher key token and the mobile terminal. The beginning of the valid data is determined by using the initial domain field, so that the mobile terminal and/or the intelligent cipher key token may obtain the valid data accurately.

For example, the pre-frame protected field has a length of 1000 bits. When the mobile terminal receives the waveform, under the impact of fading into of the waveform, the waveform amplitudes corresponding to the first 900-bits of the pre-frame protected field are zero, and those of the last 100-bits of the pre-frame protected field gradually increase from zero to a waveform amplitude corresponding to an initial field. The post-frame protected field has a length of 1000 bits. When the mobile terminal receives the waveform, under the impact of fading out of the waveform, the waveform amplitudes corresponding to the first 100-bits of the post-frame protected field decrease from the waveform amplitude corresponding to the valid data to zero, and those of the last 900-bits of the post-frame protected field are zero. Thus, the impact of fading into of the waveform is compensated by the pre-frame protected field, and the impact of fading out of the

waveform is compensated by the post-frame protected field, so as to ensure that the waveform of the valid data is integrated. The case of transmitting the waveform by the mobile terminal is similar to that of receiving the waveform, which is not mentioned herein. Certainly, the length of the pre-frame protected field is different from that of the post-frame protected field, which is determined by the characteristic of the mobile terminal.

In step 102, the mobile terminal transmits a first waveform corresponding to the first encoded data.

In step 103, the intelligent cipher key token receives the first waveform.

In step 104, the intelligent cipher key token decodes the first waveform according to a first decoding mode corresponding to the first encoding mode so as to obtain the format information.

In step 105, the intelligent cipher key token transmits a second waveform according to the format information and a second encoding mode, in which the second encoding mode is an encoding mode used by the intelligent cipher key token to transmit the waveform corresponding to the audio signal. The second encoding mode may be one or more encoding modes supported by the intelligent cipher key token, and the mobile terminal may correctly decode the second waveform transmitted with the second encoding mode to obtain the valid data.

In step 106, the mobile terminal receives the second waveform, and decodes the second waveform according to the format information and a second decoding mode corresponding to the second encoding mode so as to obtain valid data in the second waveform.

The mobile terminal informs the intelligent cipher key token of the format information of the waveform corresponding to the audio signal transmitted by itself. When the audio signal (or the waveform corresponding to the audio signal) is transmitted, both the mobile terminal and the intelligent cipher key token process data to be transmitted in accordance with the format information, thereby preventing the waveform transmitted and/or received by the mobile terminal from the impact of the characteristic of fading into/out of the waveform, and ensuring the integrity of the transmitted waveform.

The format information may be obtained by the mobile terminal according to one of Way one and Way two.

Way one: the mobile terminal visits a preset website, and obtains format information corresponding to a type of the mobile terminal from the preset website. The website may be a website of an intelligent cipher key token manufacturer, an intelligent cipher key token publisher

or other designated website, and types of multiple mobile terminals and corresponding format information may be stored in the website.

Way two: the mobile terminal obtains an application software corresponding to a type of the mobile terminal, the application software including format information corresponding to the type of the mobile terminal. That is, the mobile terminal downloads the application software matched with its type and obtains the format information corresponding to the mobile terminal from this application software. The above application software (for example, a mobile client of the bank) is used for the data transmission between the intelligent cipher key token and the mobile terminal.

The format information further includes: a length of a data head behind of the pre-frame protected field and in front of the valid data; and a length of a data tail behind of the valid data and in front of the post-frame protected field. The data head is used to enable an amplitude of an output audio stream to be stable and to inform a data receiver of entering a synchronous status. The data tail is used to inform the data receiver of stopping receiving the audio stream. The bit of the pre-frame protected field may be the same with that of the data head (for example, both are bit 1) or may be different from that of the data head (for example, the pre-frame protected field may be n 1 bits and the data head may be m 0 bits). Based on the same reason, the bit of the post-frame protected field may be same as or different from that of the data tail.

In addition, before the mobile terminal encodes the format information of the waveform corresponding to the audio signal according to the first encoding mode, the method further includes a step of: obtaining, by both the mobile terminal and the intelligent cipher key token, the first encoding mode and the second encoding mode. Both the mobile terminal and the intelligent cipher key token obtain the encoding modes supported by themselves and the opposite, and correctly decode the waveform transmitted by the opposite according to the encoding mode supported by the opposite, thereby ensuring correctly decoding of waveform. The mobile terminal and the intelligent cipher key token may obtain the first encoding mode and the second encoding mode by negotiation.

In the present embodiment, the mobile terminal transmits the format information of the waveform corresponding to the audio signal transmitted by the mobile terminal to the intelligent cipher key token, and the intelligent cipher key token may transmit the waveform to the mobile terminal according to the format information, thereby avoiding the impact of the characteristic of fading into/out of the mobile terminal, ensuring that the mobile terminal receives the integrated

waveform of the valid data, and further obtaining the integrated valid data. The characteristic of fading into/out of the mobile terminal may be compensated by the pre-frame protected field and the post-frame protected field, so as to ensure the integrity of waveform transmission between the intelligent cipher key token and the mobile terminal. The beginning of the valid data is determined by using the initial domain field, so that the mobile terminal and/or the intelligent cipher key token may obtain the valid data accurately.

Embodiment Two

Compared to the method for transmitting an audio signal provided by Embodiment One, the difference is that: the method provided by Embodiment One relates to an uplink transmission (the intelligent cipher key token transmits a waveform to the mobile terminal) and the method provided by Embodiment Two relates to a downlink transmission (the mobile terminal transmits a waveform to the intelligent cipher key token).

Specifically, the first few steps in Embodiment Two are the same as step 101 to step 104 shown in Embodiment One. After the intelligent cipher key token obtains the format information, the mobile terminal transmits a third waveform according to the first encoding mode and the format information; the intelligent cipher key token receives the third waveform and decodes the third waveform according to the format information and the first decoding mode corresponding to the first encoding mode so as to obtain valid data in the third waveform.

In the present embodiment, the mobile terminal transmits the format information of the waveform corresponding to the audio signal transmitted by the mobile terminal to the intelligent cipher key token, and the mobile terminal transmits the waveform to the intelligent cipher key token according to the format information and the first encoding mode, and the intelligent cipher key token may decode the received waveform according to the format information and the decoding mode corresponding to the first encoding mode, thereby avoiding the impact of the characteristic of fading into/out of the mobile terminal, ensuring that the mobile terminal receives the integrated waveform of the valid data, and further obtaining the integrated valid data. The characteristic of fading into/out of the mobile terminal may be compensated by the pre-frame protected field and the post-frame protected field, so as to ensure the integrity of waveform transmitted between the intelligent cipher key token and the mobile terminal. The beginning of the valid data is determined by using the initial domain field, so that the mobile terminal and/or the intelligent cipher key token may obtain the valid data accurately.

Embodiment Three

The embodiment provides a mobile terminal which may realize the methods for transmitting an audio signal provided by Embodiment One and Embodiment Two. As shown in Fig. 2, the mobile terminal includes an encoding module 21, a transmitting module 22, a first communicating module 23 and a second communicating module 24.

The encoding module 21 is configured to encode format information of a waveform corresponding to an audio signal according to a first encoding mode so as to obtain a first encoded data, wherein the first encoding mode is an encoding mode used by the mobile terminal to transmit the waveform corresponding to the audio signal. The format information includes valid data, a length of a pre-frame protected field in front of the valid data, a length of a post-frame protected field behind of the valid data, and a length of an initial domain field configured to determine a beginning of the valid data and located behind of the pre-frame protected field and in front of the valid data.

The transmitting module 22 is connected with the encoding module 21 and configured to transmit a first waveform corresponding to the first encoded data to an intelligent cipher key token.

The first communicating module 23 is connected with the transmitting module 22 and includes a receiving sub module 231 a decoding sub module 232.

The receiving sub module 231 is configured to receive a second waveform, in which the second waveform is obtained by processing data to be transmitted according to the format information and a second encoding mode, in which the second encoding mode is an encoding mode used by the intelligent cipher key token to transmit the waveform corresponding to the audio signal.

The decoding sub module 232 is connected with the receiving sub module 231 and configured to decode the second waveform according to the format information and a second decoding mode corresponding to the second encoding mode so as to obtain valid data in the second waveform.

The second communicating module 24 is connected with the transmitting module 22 and includes an encoding sub module 241 and a transmitting sub module 242.

The encoding sub module 241 is configured to encode data to be transmitted according to the format information and the first encoding mode so as to obtain a third encoded data.

The transmitting sub module 242 is connected with the encoding sub module 241 and

configured to transmit a third waveform corresponding to the third encoded data.

Corresponding to Way one of obtaining the format information in Embodiment One, the mobile terminal further includes a visiting module and a first obtaining module. The visiting module is configured to visit a preset website. The first obtaining module is configured to obtain format information corresponding to a type of the mobile terminal from the preset website.

Corresponding to Way two of obtaining the format information in Embodiment One, the mobile terminal further includes a second obtaining module. The second obtaining module is configured to obtain an application software corresponding to a type of the mobile terminal, the application software comprising format information corresponding to the type of the mobile terminal.

The mobile terminal may further include: a third obtaining module. The third obtaining module is configured to obtain the first encoding mode and the second encoding mode. The specific implementation is the same as that shown in Embodiment One, which is not mentioned here.

The format information further includes: a length of a data head behind of the pre-frame protected field and in front of the valid data; and a length of a data tail behind of the valid data and in front of the post-frame protected field. The data head is used to enable an amplitude of an output audio stream to be stable and to inform a data receiver of entering a synchronous status. The data tail is used to inform the data receiver of stopping receiving the audio stream.

Certainly, the above module division is only a schematic division and the present disclosure is not limited thereto. The mobile terminal may only include an encoding module, a transmitting module, a receiving module, a decoding module and an obtaining module, in which the encoding module may perform functions related to the encoding, the transmitting module may perform functions related to the transmitting, the receiving module may perform functions related to the receiving, the decoding module may perform functions related to the decoding and the obtaining module may perform functions related to the obtaining of the format information and the encoding mode. As long as the module division may realize the purposes of the present disclosure, it should belong to the scope of the present disclosure.

Embodiment Four

The embodiment provides an intelligent cipher key token which may realize the methods for transmitting an audio signal provided by Embodiment One and Embodiment Two. As shown in Fig.

3, the intelligent cipher key token includes a receiving module 31, a decoding module 32, a first communicating module 33 and a second communicating module 34.

The receiving module 31 is configured to receive a first waveform corresponding to a first encoded data transmitted by a mobile terminal, in which the first encoded data is obtained by encoding by the mobile terminal format information of a waveform corresponding to an audio signal according to a first encoding mode, and the first encoding mode is an encoding mode used by the mobile terminal to transmit the waveform corresponding to the audio signal, and the format information includes: valid data, a length of a pre-frame protected field in front of the valid data, a length of a post-frame protected field behind of the valid data, and a length of an initial domain field configured to determine a determining the beginning of the valid data and located behind of the pre-frame protected field and in front of the valid data.

The decoding module 32 is connected with the receiving module 31 and configured to decode the first waveform according to a first decoding mode corresponding to the first encoding mode so as to obtain the format information.

The first communicating module 33 is connected with the decoding module 32 and includes a receiving sub module 331 and a decoding sub module 332.

The receiving sub module 331 is configured to receive a third waveform, in which the third waveform is obtained by processing data to be transmitted according to the format information and the first encoding mode.

The decoding sub module 332 is connected with the receiving sub module 331 and configured to decode the third waveform according to the format information and the first decoding mode corresponding to the first encoding mode so as to obtain valid data in the third waveform.

The second communicating module 34 is connected with the decoding module 32 and includes an encoding sub module 341 and a transmitting sub module 342.

The encoding sub module 341 is configured to encode data to be transmitted according to the format information and a second encoding mode to obtain a second encoded data, in which the second encoding mode is an encoding mode used by the intelligent cipher key token to transmit the waveform corresponding to the audio signal.

The transmitting sub module 342 is connected with the encoding sub module 341 and configured to transmit a second waveform corresponding to the second encoded data.

The intelligent cipher key token further includes: an obtaining module, configured to obtain the first encoding mode and the second encoding mode.

The format information further includes: a length of a data head behind of the pre-frame protected field and in front of the valid data; and a length of a data tail behind of the valid data and in front of the post-frame protected field. The data head is used to enable an amplitude of an output audio stream to be stable and to inform a data receiver of entering a synchronous status. The data tail is used to inform the data receiver of stopping receiving the audio stream.

Certainly, the above module division is only a schematic division and the present disclosure is not limited thereto. The intelligent cipher key token may only include an encoding module, a transmitting module, a receiving module, a decoding module and an obtaining module, in which the encoding module may perform functions related to the encoding, the transmitting module may perform functions related to the transmitting, the receiving module may perform functions related to the receiving, the decoding module may perform functions related to the decoding and the obtaining module may perform functions related to the obtaining of the encoding mode. As long as the module division may realize the purposes of the present disclosure, it should belong to the scope of the present disclosure.

Embodiment Five

The embodiment also provides a mobile terminal which may realize the methods for transmitting an audio signal provided by Embodiment One and Embodiment Two. The mobile terminal includes a housing, a screen, a circuit board and a processor, in which the screen is arranged on the housing, the circuit board is arranged inside a space enclosed by the housing, and the processor is arranged on the circuit board and is configured to process data. Specifically, the processor is configured to execute the following steps S101' to S106'.

In step 101', format information of a waveform corresponding to an audio signal is encoded, according to a first encoding mode used by the mobile terminal to transmit the waveform corresponding to the audio signal, to obtain a first encoded data, in which the format information includes: valid data, a length of a pre-frame protected field in front of the valid data, a length of a post-frame protected field behind of the valid data, and a length of an initial domain field configured to determine a beginning of the valid data and located behind of the pre-frame protected field and in front of the valid data.

In step 102', a first waveform corresponding to the first encoded data is transmitted to an

intelligent cipher key token.

In step 103', a second waveform is received, in which the second waveform is obtained by processing data to be transmitted according to the format information and a second encoding mode, in which the second encoding mode is an encoding mode used by the intelligent cipher key token to transmit the waveform corresponding to the audio signal.

In step 104', the second waveform is decoded according to the format information and a second decoding mode corresponding to the second encoding mode, to obtain valid data in the second waveform.

Or, in another embodiment of the present disclosure, after performing the above step 102', the processor may perform the following steps S105' and S106'.

In step 105', data to be transmitted is encoded according to the format information and the first encoding mode to obtain a third encoded data.

In step 106', a third waveform corresponding to the third encoded data is transmitted.

Embodiment Six

The embodiment also provides an intelligent cipher key token which may realize the methods for transmitting an audio signal provided by Embodiment One and Embodiment Two. The intelligent cipher key token includes one or more processors, a memory, and one or more programs stored in the storage, in which when being executed by the one or more processors, the one or more programs are configured to perform the following steps S201' to S206'.

In S201', a first waveform corresponding to a first encoded data and transmitted by the mobile terminal is received, in which the mobile terminal encodes format information of a waveform corresponding to an audio signal according to a first encoding mode to obtain the first encoded data, and the first encoding mode is an encoding mode used by the mobile terminal to transmit the waveform corresponding to the audio signal, and the format information includes: valid data, a length of a pre-frame protected field in front of the valid data, a length of a post-frame protected field behind of the valid data, and a length of an initial domain field after the protection field configured to determine a beginning of the valid data and located behind of the pre-frame protected field and in front of the valid data.

In step 202', the first waveform is decoded according to a first decoding mode corresponding to the first encoding mode to obtain the format information.

In step 203', a third waveform is received, in which the third waveform is obtained by

processing data to be transmitted according to the format information and the first encoding mode.

In step 204', the third waveform is decoded according to the format information and the first decoding mode corresponding to the first encoding mode to obtain valid data in the third wave form.

Or, in another embodiment of the present disclosure, after performing the above step 202', the one or more processors may perform the following steps S205' and S206'.

In step 205', data to be transmitted is encoded according to the format information and a second encoding mode to obtain a second encoded data, in which the second encoding mode is an encoding mode that is used by the intelligent cipher key token to transmit the waveform corresponding to the audio signal.

In step 206', a second waveform corresponding to the second encoded data is transmitted.

The mobile terminal in Embodiment Three and Embodiment Five together with the intelligent cipher key token in Embodiment Four and Embodiment Six may realize the method for transmitting an audio signal in Embodiment One and Embodiment Two.

Any procedure or method described in the flow charts or described in any other way herein may be understood to comprise one or more modules, portions or parts for storing executable codes that realize particular logic functions or procedures. Moreover, advantageous embodiments of the present disclosure comprises other implementations in which the order of execution is different from that which is depicted or discussed, including executing functions in a substantially simultaneous manner or in an opposite order according to the related functions. This should be understood by those skilled in the art which embodiments of the present disclosure belong to.

It is understood that each part of the present disclosure may be realized by the hardware, software, firmware or their combination. In the above embodiments, a plurality of steps or methods may be realized by the software or firmware stored in the memory and executed by the appropriate instruction execution system. For example, if it is realized by the hardware, likewise in another embodiment, the steps or methods may be realized by one or a combination of the following techniques known in the art: a discrete logic circuit having a logic gate circuit for realizing a logic function of a data signal, an application-specific integrated circuit having an appropriate combination logic gate circuit, a programmable gate array (PGA), a field programmable gate array (FPGA), etc.

It would be understood by those skilled in the art that all or a part of the steps carried by the

method in the above-described embodiments may be completed by relevant hardware instructed by a program. The program may be stored in a computer readable storage medium. When the program is executed, one or a combination of the steps of the method in the above-described embodiments may be completed.

In addition, individual functional units in the embodiments of the present disclosure may be integrated in one processing module or may be separately physically present, or two or more units may be integrated in one module. The integrated module as described above may be achieved in the form of hardware, or may be achieved in the form of a software functional module. If the integrated module is achieved in the form of a software functional module and sold or used as a separate product, the integrated module may also be stored in a computer readable storage medium.

The storage medium mentioned above may be read-only memories, magnetic disks or CD, etc.

Reference throughout this specification to "an embodiment," "some embodiments," "an example," "a specific example," or "some examples," means that a particular feature, structure, material, or characteristic described in connection with the embodiment or example is included in at least one embodiment or example of the present disclosure. The appearances of the phrases throughout this specification are not necessarily referring to the same embodiment or example of the present disclosure. Furthermore, the particular features, structures, materials, or characteristics may be combined in any suitable manner in one or more embodiments or examples.

Although explanatory embodiments have been shown and described, it would be appreciated by those skilled in the art that the above embodiments cannot be construed to limit the present disclosure, and changes, alternatives, and modifications can be made in the embodiments without departing from spirit, principles and scope of the present disclosure.

WHAT IS CLAIMED IS:

1. A method for transmitting an audio signal, comprising:

encoding, by a mobile terminal, format information of a waveform corresponding to an audio signal according to a first encoding mode so as to obtain a first encoded data, wherein the first encoding mode is an encoding mode used by the mobile terminal to transmit the waveform corresponding to the audio signal, and the format information comprises:

valid data,

a length of a pre-frame protected field in front of the valid data,

a length of a post-frame protected field behind of the valid data, and

a length of an initial domain field configured to determine a beginning of the valid data, located behind of the pre-frame protected field and in front of the valid data;

transmitting, by the mobile terminal, a first waveform corresponding to the first encoded data;

receiving, by an intelligent cipher key token, the first waveform;

decoding, by the intelligent cipher key token, the first waveform, according to a first decoding mode corresponding to the first encoding mode so as to obtain the format information;

transmitting, by the intelligent cipher key token, a second waveform according to the format information and a second encoding mode, wherein the second encoding mode is an encoding mode used by the intelligent cipher key token to transmit the waveform corresponding to the audio signal; and

receiving, by the mobile terminal, the second waveform, and decoding, by the mobile terminal, the second waveform according to the format information and a second decoding mode corresponding to the second encoding mode so as to obtain valid data in the second waveform.

2. A method for transmitting an audio signal, comprising:

encoding, by a mobile terminal, format information of a waveform corresponding to an audio signal according to a first encoding mode so as to obtain a first encoded data, wherein the first encoding mode is an encoding mode used by the mobile terminal to transmit the waveform corresponding to the audio signal, and the format information comprises:

valid data,

a length of a pre-frame protected field in front of the valid data,

a length of a post-frame protected field behind of the valid data, and

a length of an initial domain field configured to determine a beginning of the valid data and located behind of the pre-frame protected field and in front of the valid data;

transmitting, by the mobile terminal, a first waveform corresponding to the first encoded data;

receiving, by an intelligent cipher key token, the first waveform;

decoding, by the intelligent cipher key token, the first waveform according to a first decoding mode corresponding to the first encoding mode so as to obtain the format information;

transmitting, by the mobile terminal, a third waveform according to the format information and the first encoding mode;

receiving, by the intelligent cipher key token, the third waveform, and decoding, by the intelligent cipher key token, the third waveform according to the format information and the first decoding mode corresponding to the first encoding mode so as to obtain valid data in the third waveform.

3. The method according to claim 1 or 2, wherein the format information is obtained by one of

way one: visiting, by the mobile terminal, a preset website, and obtaining, by the mobile terminal, format information corresponding to a type of the mobile terminal from the preset website; and

way two: obtaining, by the mobile terminal, an application software corresponding to a type of the mobile terminal, wherein the application software comprises format information corresponding to the type of the mobile terminal.

4. The method according to claim 1 or 2, wherein the format information further comprises:

a length of a data head behind of the pre-frame protected field and in front of the valid data; and

a length of a data tail behind of the valid data and in front of the post-frame protected field.

5. The method according to claim 1 or 2, before encoding by a mobile terminal format information of a waveform corresponding to an audio signal according to a first encoding mode, further comprising:

obtaining, by both the mobile terminal and the intelligent cipher key token, the first encoding mode and the second encoding mode.

6. A mobile terminal, comprising:

an encoding module, configured to encode format information of a waveform corresponding

to an audio signal according to a first encoding mode so as to obtain a first encoded data, wherein the first encoding mode is an encoding mode used by the mobile terminal to transmit the waveform corresponding to the audio signal, and the format information comprises:

valid data,

a length of a pre-frame protected field in front of the valid data,

a length of a post-frame protected field behind of the valid data, and

a length of an initial domain field configured to determine a beginning of the valid data, located behind of the pre-frame protected field and in front of the valid data;

a transmitting module, configured to transmit a first waveform corresponding to the first encoded data to an intelligent cipher key token;

a first communicating module, comprising:

a receiving sub module, configured to receive a second waveform, wherein the second waveform is obtained by processing data to be transmitted according to the format information and a second encoding mode, wherein the second encoding mode is an encoding mode used by the intelligent cipher key token to transmit the waveform corresponding to the audio signal;

a decoding sub module, configured to decode the second waveform according to the format information and a second decoding mode corresponding to the second encoding mode so as to obtain valid data in the second waveform;

a second communicating module, comprising:

an encoding sub module, configured to encode data to be transmitted according to the format information and the first encoding mode so as to obtain a third encoded data;

a transmitting sub module, configured to transmit a third waveform corresponding to the third encoded data.

7. The mobile terminal according to claim 6, further comprising:

a visiting module, configured to visit a preset website;

a first obtaining module, configured to obtain format information corresponding to a type of the mobile terminal from the preset website.

8. The mobile terminal according to claim 6, further comprising:

a second obtaining module, configured to obtain an application software corresponding to a type of the mobile terminal, wherein the application software comprises format information

corresponding to the type of the mobile terminal.

9. The mobile terminal according to any one of claims 6 to 8, further comprising:

a third obtaining module, configured to obtain the first encoding mode and the second encoding mode.

10. The mobile terminal according to any one of claims 6 to 8, wherein the format information further comprises:

a length of a data head behind of the pre-frame protected field and in front of the valid data; and

a length of a data tail behind of the valid data and in front of the post-frame protected field.

11. An intelligent cipher key token, comprising:

a receiving module, configured to receive a first waveform corresponding to a first encoded data transmitted by a mobile terminal, wherein the first encoded data is obtained by encoding by the mobile terminal format information of a waveform corresponding to an audio signal according to a first encoding mode, and the first encoding mode is an encoding mode used by the mobile terminal to transmit the waveform corresponding to the audio signal, and the format information comprises: valid data, a length of a pre-frame protected field in front of the valid data, a length of a post-frame protected field behind of the valid data, and a length of an initial domain field configured to determine a beginning of the valid data and located behind of the pre-frame protected field and in front of the valid data;

a decoding module, configured to decode the first waveform according to a first decoding mode corresponding to the first encoding mode so as to obtain the format information;

a first communicating module, comprising:

a receiving sub module, configured to receive a third waveform, wherein the third waveform is obtained by processing data to be transmitted according to the format information and the first encoding mode;

a decoding sub module, configured to decode the third waveform according to the format information and the first decoding mode corresponding to the first encoding mode so as to obtain valid data in the third waveform;

a second communicating module, comprising:

an encoding sub module, configured to encode data to be transmitted according to the format information and a second encoding mode to obtain a second encoded data, wherein the

second encoding mode is an encoding mode used by the intelligent cipher key token to transmit the waveform corresponding to the audio signal;

a transmitting sub module, configured to transmit a second waveform corresponding to the second encoded data.

12. The intelligent cipher key token according to claim 11, further comprising:

an obtaining module, configured to obtain the first encoding mode and the second encoding mode.

13. The intelligent cipher key token according to claim 11 or 12, wherein the format information further comprises:

a length of a data head behind of the pre-frame protected field and in front of the valid data; and

a length of a data tail behind of the valid data and in front of the post-frame protected field.