

Method and Device for Composing Music

TECHNICAL FIELD

[001] The present invention relates to the technical field of sound recognition, and specifically to a method for composing music and a device thereof.

BACKGROUND OF THE INVENTION

[002] Music composition is a method for expressing musical thoughts of a creator by means of a technical theory system of harmonics, polyphony, orchestration and musical structure.

[003] In music composition, it is necessary to make integration, assembling and creative arrangement and use to the musical source materials. This requires that the creator has learned professional musical knowledge, such as how to combine certain notes to form a certain mode, such as the major mode or the minor mode. Therefore, it can be seen that it is a highly professional operation to compose music.

[004] However, many persons without professional musical knowledge also can create a new tune, for example, he/she may sing a melody impromptu or play an instrument casually. However, as he/she may not study for any professional musical knowledge, it is difficult to transform the created tune into a certain combination of notes. That is, it is difficult to generate a corresponding music score.

SUMMARY OF THE INVENTION

[005] In the embodiment(s) of the present invention, a method for composing music is provided, which can lower the professional requirement for composing music.

[006] In the first aspect, in an embodiment of the present invention, a method for composing music is provided, comprising:

[007] establishing a note database, wherein the note database comprises at least one standard note and at least one standard audio feature as well as a correspondence between each of the standard note(s) and the at least one standard audio feature;

[008] obtaining tune information produced from a user side;

[009] analyzing the obtained tune information to get at least one current audio feature;

[0010] determining a target standard audio feature corresponding to each of the current audio feature(s), from the note database;

[0011] determining a target standard note corresponding to each of the target standard audio feature(s), according to the correspondence; and

[0012] generating a music score corresponding to the tune information, according to the determined target standard note.

[0013] Preferably,

[0014] each of the standard audio feature(s) corresponds to a sound frequency range as well as a high/low pitch identifier;

[0015] wherein the step of determining a target standard audio feature corresponding to each of the current audio feature(s) from the note database comprises:

[0016] performing for each of the current audio feature(s):

[0017] determining a current sound frequency corresponding to the current audio feature, and searching from the note database to find the sound frequency range corresponding to the current sound frequency;

[0018] using the standard audio feature corresponding to the found sound frequency range as the target standard audio feature;

[0019] wherein the step of generating the music score corresponding to the tune information according to the determined target standard note comprises:

[0020] using the high/low pitch identifier corresponding to the target standard audio feature as the high/low pitch identifier of the corresponding target standard note, for each of the target standard audio feature(s);

[0021] generating the music score corresponding to the tune information, according to the target standard note(s) as well as the high/low pitch identifier of each of the target standard note(s).

[0022] Preferably,

[0023] the step of analyzing the obtained tune information to get at least one current audio feature comprises:

[0024] analyzing the tune information to get the at least one current audio feature according to the time sequence, and recording a time point of each of the current audio feature(s) corresponding to the tune information;

[0025] wherein the step of generating a music score corresponding to the tune information according to the determined target standard note comprises:

[0026] determining a time interval between any two adjacent current audio features, according to the recorded time point of each of the current audio feature(s) corresponding to the tune information;

[0027] determining a beat corresponding to each of the target standard note(s), according to the determined time interval;

[0028] generating the music score according to the determined target standard note(s) as well as the beat corresponding to each of the target standard note(s).

[0029] Preferably,

[0030] the step of generating the music score corresponding to the tune information according to the determined target standard note(s) comprises:

[0031] using any one of the target standard note(s) as the current target standard note, and performing steps A1 to A3:

[0032] A1: determining an adjacent note adjacent to the current target standard note, according to the time point of each of the current audio features corresponding to the tune information;

[0033] A2: determining whether a pause time between the adjacent note and the current target standard note is lower than a preset threshold value, and if so, performing A3;

[0034] A3: combining the adjacent note and the current target standard note into a connection group, and using the adjacent note as the current target standard note to perform A1;

[0035] determining a starting note and an ending note from the target standard notes in the connection group, according to the time point of each of the current audio features corresponding to the tune information;

[0036] using a legato line to connect the starting note with the ending note;

[0037] generating the music score corresponding to the tune information, according to the connected starting note and ending note as well as other unconnected target standard note(s).

[0038] Preferably,

[0039] the step of establishing a note database comprises:

[0040] obtaining at least one standard audio feature produced by at least one audio source, wherein each of the standard audio feature(s) corresponds to one of the standard notes, wherein the at least one audio source comprises any one or more of musical instruments, singers, and electronic audio devices;

[0041] generating the note database according to the obtained standard audio feature(s) as well as the standard note corresponding to each of the standard audio feature(s).

[0042] In the second aspect, in an embodiment of the present invention, a device for composing music is provided comprising: an establishing unit, an analyzing unit, a determining unit, and a music score generating unit, wherein,

[0043] the establishing unit is used for establishing a note database, wherein the note database comprises at least one standard note and at least one standard audio feature as well as a correspondence between each of the standard note(s) and the at least one standard audio feature;

[0044] the analyzing unit is used for obtaining tune information produced from a user side, and analyzing the obtained tune information to get at least one current audio feature;

[0045] the determining unit is used for determining a target standard audio feature corresponding to each of the current audio feature(s) from the note database, and determining a target standard note corresponding to each of the target standard audio feature(s) according to the correspondence; and

[0046] the music score generating unit is used for generating a music score corresponding to the tune information, according to the determined target standard note.

[0047] Preferably,

[0048] each of the standard audio feature(s) corresponds to a sound frequency range as well as a high/low pitch identifier;

[0049] the determining unit is used for performing for each of the current audio feature(s): determining the current sound frequency corresponding to the current audio feature, and searching from the note database to find the sound frequency range corresponding to the current sound frequency; and using the standard audio feature corresponding to the found sound frequency range as the target standard audio feature;

[0050] the music score generating unit is used for using the high/low pitch identifier corresponding to the target standard audio feature as the high/low pitch identifier of the corresponding target standard note, for each of the target standard audio feature(s); and generating the music score corresponding to the tune information, according to the target standard note(s) as well as the high/low pitch identifier of each

of the target standard note(s).

[0051] Preferably,

[0052] the analyzing unit is used for analyzing the tune information to get the at least one current audio feature according to the time sequence, and recording a time point of each of the current audio feature(s) corresponding to the tune information;

[0053] the music score generating unit is used for determining a time interval between any two adjacent current audio features, according to the recorded time point of each of the current audio feature(s) corresponding to the tune information; determining a beat corresponding to each of the target standard note(s), according to the determined time interval; and

[0054] generating the music score according to the determined target standard note(s) as well as the beat corresponding to each of the target standard note(s).

[0055] Preferably,

[0056] the music score generating unit comprises a connection group determining subunit, a connecting subunit, and a generating subunit, wherein

[0057] the connection group determining subunit is used for using any one of the target standard note(s) as the current target standard note and performing steps A1 to A3:

[0058] A1: determining an adjacent note adjacent to the current target standard note, according to the time point of each of the current audio features corresponding to the tune information;

[0059] A2: determining whether a pause time between the adjacent note and the current target standard note is lower than a preset threshold value, and if so, performing A3;

[0060] A3: combining the adjacent note and the current target standard note into a connection group, and using the adjacent note as the current target standard note to perform A1;

[0061] the connecting subunit is used for determining a starting note and an ending note from the target standard notes in the connection group, according to the time point of each of the current audio features corresponding to the tune information; and using a legato line to connect the starting note with the ending note;

[0062] the generating subunit is used for generating the music score corresponding to the tune information, according to the connected starting note and ending note as well as other unconnected target standard note(s).

[0063] Preferably,

[0064] the establishing unit is used for obtaining at least one standard audio feature produced by at least one audio source, wherein each of the standard audio feature(s) corresponds to one of the standard notes, wherein the at least one audio source comprises any one or more of musical instruments, singers, and electronic audio devices; and generating the note database according to the obtained standard audio feature(s) as well as the standard note corresponding to each of the standard audio feature(s).

[0065] In the embodiment(s) of the present invention, a method and a device for composing music are provided, wherein a note database comprising at least one standard note and at least one standard audio feature as well as a correspondence therebetween is established in advance. When the tune information produced from a user side is obtained, the tune information is analyzed to get at least one current audio feature. Then, a target standard audio feature corresponding to each of the current audio feature(s) is determined from the pre-established note database, and a target standard note corresponding to each of the target standard audio feature(s), respectively, is determined according to the correspondence stored in the note database, and a music score corresponding to the tune information is generated according to the determined target standard note. Therefore, it is possible to use the tune information produced from the user side to automatically generate a corresponding music score such that a user without any musical knowledge can create a music score, thus lowering the professional requirement for composing music.

DESCRIPTION OF THE DRAWINGS

[0066] In order to explain the technical solutions of the embodiments of the present invention or in the prior art more clearly, the accompanying drawings to be used in the description of the embodiments or the prior art will be described briefly hereinafter. Apparently, the accompanying drawings in the description below are for some embodiments of the present invention. For those skilled in the art, other figure(s) can be obtained based on these accompanying drawings, without any inventive work.

[0067] Figure 1 is a flow chart of a method for composing music as provided in an embodiment of the present invention;

[0068] Figure 2 is a flow chart of a method for composing music as provided in another embodiment of the present invention;

[0069] Figure 3 is a structural diagram of a device for composing music as provided in an embodiment of the present invention; and

[0070] Figure 4 is a structural diagram of a device for composing music as provided in another embodiment of the present invention.

DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0071] Hereinafter, to make the objective(s), technical solution(s) and advantages of the embodiments of the present invention clearer, the technical solutions in the embodiments of the present invention will be described clearly and completely in combination with the accompanying drawings of the embodiments of the present invention. It is understandable that the described embodiments are only some embodiments of the present invention, rather than all embodiments thereof. Based on the embodiments of the present invention, all other embodiments obtained by those skilled in the art without any inventive work will fall within the scope of the present invention.

[0072] As shown in figure 1, in an embodiment of the present invention, a method for composing music is provided, and it can comprise the following steps:

[0073] Step 101: establishing a note database, wherein the note database comprises at least one standard note and at least one standard audio feature as well as a correspondence between each of the standard note(s) and the at least one standard audio feature;

[0074] Step 102: obtaining tune information produced from a user side;

[0075] Step 103: analyzing the obtained tune information to get at least one current audio feature;

[0076] Step 104: determining a target standard audio feature corresponding to each of the current audio feature(s), from the note database;

[0077] Step 105: determining a target standard note corresponding to each of the target standard audio feature(s), according to the correspondence;

[0078] Step 106: generating a music score corresponding to the tune information, according to the determined target standard note.

[0079] In the above embodiment, a note database comprising at least one standard note and at least one standard audio feature as well as a correspondence therebetween is established in advance. When the tune information produced from a user side is obtained, the tune information is analyzed to get at least one current audio

feature. Then, a target standard audio feature corresponding to each of the current audio feature(s) is determined from the pre-established note database, and a target standard note corresponding to each of the target standard audio feature(s), respectively, is determined according to the correspondence stored in the note database, and a music score corresponding to the tune information is generated according to the determined target standard note. Therefore, it is possible to use the tune information produced from the user side to automatically generate a corresponding music score such that a user without any musical knowledge can create a music score, thus lowering the professional requirement for composing music.

[0080] In an embodiment of the present invention, each of the standard audio feature(s) corresponds to a sound frequency range as well as a high/low pitch identifier; and Step 104 can specifically comprise:

[0081] performing for each of the current audio feature(s):

[0082] determining a current sound frequency corresponding to the current audio feature, and searching from the note database to find the sound frequency range corresponding to the current sound frequency;

[0083] using the standard audio feature corresponding to the found sound frequency range as the target standard audio feature;

[0084] Step 106 can specifically comprise:

[0085] using the high/low pitch identifier corresponding to the target standard audio feature as the high/low pitch identifier of the corresponding target standard note, for each of the target standard audio feature(s);

[0086] generating the music score corresponding to the tune information, according to the target standard note(s) as well as the high/low pitch identifier of each of the target standard note(s).

[0087] The sound frequency can characterize a high/low sound. Herein, each standard audio stored in the note database corresponds to a sound frequency range as well as a high/low pitch identifier. For example, the standard audio feature “do” corresponds to a sound frequency range of $[a_2, a_3)$, its high pitch corresponds to a sound frequency range of $[a_3, a_4)$ and its low pitch corresponds to a sound frequency range of $[a_1, a_2)$, wherein $a_1 < a_2 < a_3 < a_4$. The standard audio feature “do” and its high and low pitches all correspond to the standard note 1. The standard note 1 corresponds to a high/low pitch identifier of null, its high pitch corresponds to a high/low pitch identifier of a “•” above the standard note 1, and its low pitch corresponds to a

high/low pitch identifier of a “•” below the standard note 1. After the current sound frequency corresponding to the current audio feature is determined, for example, the current sound frequency of a3 being determined, it can be found that its corresponding sound frequency range is [a3,a4) and it can be determined that the standard audio feature corresponding to the current audio feature is the high pitch of the standard audio feature “do”, its corresponding target standard note is 1, and its high/low pitch identifier is the “•” above the 1. Therefore, the target standard note corresponding to each current audio feature as well as its corresponding high/low pitch identifier can be determined, respectively. For example, the determined target standard notes and the corresponding high/low pitch identifiers are $\overset{\cdot}{1}$, $\overset{\cdot}{3}$, $\overset{\cdot}{5}$, $\overset{\cdot}{4}$, 2, and according to the determined target standard notes and the corresponding high/low pitch identifiers, the music score is generated, thus the accuracy of generation of the music score can be improved.

[0088] In an embodiment of the present invention, Step 103 can specifically comprise: analyzing the tune information to get the at least one current audio feature according to the time sequence, and recording a time point of each of the current audio feature(s) corresponding to the tune information;

[0089] Step 105 can specifically comprise:

[0090] determining a time interval between any two adjacent current audio features, according to the recorded time point of each of the current audio feature(s) corresponding to the tune information;

[0091] determining a beat corresponding to each of the target standard note(s), according to the determined time interval;

[0092] generating the music score according to the determined target standard note(s) as well as the beat corresponding to each of the target standard note(s).

[0093] In the present embodiment, first, the tune information is analyzed to get the current audio features according to the time sequence. For example, the received tune information comprises a melody of 30s long, and then the analysis is made from the starting point (i.e. 0s) of the tune information till the end of the melody (30s). For each current audio feature as gotten by analysis, the time point of the current audio feature corresponding to the tune information is determined, according to a time to get the current audio feature by analysis and a starting time to start analyzing the tune information. For example, the starting time to start analyzing the tune information is

13:30:00 and the time to get the current audio feature A by analysis is 13:30:10, then it can be determined that the time point of the current audio feature A corresponding to the tune information is the 10th s.

[0094] After the time point of each of the current audio feature(s) corresponding to the tune information is determined, a time interval between any two adjacent current audio features can be determined. For example, the time point of the current audio feature B corresponding to the tune information is the 8th s, there is no other current audio feature between the current audio feature B and the current audio feature A, and the audio feature B is adjacent to the current audio feature A, then it can be determined that the time interval therebetween is 2s. If one beat is preset to be 1s, the current audio feature B includes 2 beats and is denoted in the music score as B-. If one beat is preset to be 0.5s, the current audio feature B includes 4 beats and is denoted in the music score as B---, wherein the preset value of second(s) corresponding to one beat can be defined by the user before composing music. Therefore, the target standard notes and the corresponding beat(s) can be used to generate the music score such that the generated music score can better match the music score information produced from the user side, thus improving the accuracy of the music score.

[0095] In an embodiment of the present invention, Step 106 can specifically comprise:

[0096] using any one of the target standard note(s) as the current target standard note, and performing steps A1 to A3:

[0097] A1: determining an adjacent note adjacent to the current target standard note, according to the time point of each of the current audio features corresponding to the tune information;

[0098] A2: determining whether a pause time between the adjacent note and the current target standard note is lower than a preset threshold value, and if so, performing A3;

[0099] A3: combining the adjacent note and the current target standard note into a connection group, and using the adjacent note as the current target standard note to perform A1;

[00100] determining a starting note and an ending note from the target standard notes in the connection group, according to the time point of each of the current audio features corresponding to the tune information;

[00101] using a legato line to connect the starting note with the ending note;

[00102] generating the music score corresponding to the tune information, according to the connected starting note and ending note as well as other unconnected target standard note(s).

[00103] For example, the determined current target standard notes are A, B, C, D, etc. The time point of the current audio feature A corresponding to the tune information is the 5th s, the time point of the current audio feature B corresponding to the tune information is the 6th s, the time point of the current audio feature C corresponding to the tune information is the 8th s, and the time point of the current audio feature D corresponding to the tune information is the 9th s. The target standard note C is used as the current target standard note, and then its adjacent notes are B and D accordingly. It is to be determined whether the pause times between the current target standard note C and its adjacent note B and between the current target standard note C and its adjacent note D are lower than the preset threshold value(s), respectively. If so, it means that the current target standard note and the adjacent note are successive in the tune information, and are presented to be connected by a connection line in the music score.

[00104] Herein, for example, the pause time between the current target standard note C and its adjacent note B is lower than a preset threshold value and the pause time between the current target standard note C and its adjacent note D is higher than a preset threshold value. In this case, the current target standard note C and its adjacent note B are combined into a connection group, the adjacent note B is used as the current standard note and the adjacent note of the current standard note B is then to be determined (in this example, it is determined to be the adjacent note A). Further, it is to be determined whether the pause time between the current target standard note B and its adjacent note A is lower than the preset threshold value, and if it remains so, the adjacent note is also added into the connection group and the adjacent note A continues to be used as the current standard note. Perform in this manner until the current target standard note does not have any further adjacent note in the target standard notes or it is determined that the pause time between any current target standard note and its adjacent note is not lower than the preset threshold value.

[00105] Then, according to the time points corresponding to the target standard notes, a starting note and an ending note in the connection group are determined. Herein, the target standard note A is the starting note of the connection group and the target standard note C is the ending note, with a legato line connecting them, for

example, $AB \cap C$. By the above method, the target standard notes are used as the current target standard notes, respectively. The connection relation between each target standard note and another target standard note can be determined, and then the music score can be generated according to the connected target standard notes (i.e. the starting note and ending note) as well as other unconnected target standard note(s). The generated music score can represent the connection relation(s) between the target standard notes as well as the successive relation(s) between the audio features in the tune information, thus improving the accuracy of the music score.

[00106] In an embodiment of the present invention, Step 101 can specifically comprise: obtaining at least one standard audio feature produced by at least one audio source, wherein each of the standard audio feature(s) corresponds to one of the standard notes, wherein the at least one audio source comprises any one or more of musical instruments, singers, and electronic audio devices;

[00107] generating the note database according to the obtained standard audio feature(s) as well as the standard note corresponding to each of the standard audio feature(s).

[00108] For example, the standard notes are 1, 2, 3, 4, 5, 6, 7. When establishing the note database, it is possible to play a piano, a guitar, a drum set, or other various instruments so as to collect the standard audio features from such instrument(s) corresponding to the standard notes 1, 2, 3, 4, 5, 6, 7, i.e. do, re, mi, fa, so, la, si. Also, it is possible to make a classmate or teacher from a musical conservatory or a professional singer sing these standard notes so as to collect the standard audio features corresponding to the standard notes. In addition, it is possible to use some electronic audio apparatus (such as a smart sound and an MP3), by means of music programs pre-stored in these electronic audio apparatuses, to play the respective standard notes so as to collect the respective standard audio features.

[00109] It should be noted that to facilitate accurately determine the standard audio feature corresponding to the current audio feature later, when obtaining the audio feature(s), the standard audio features for different high and low pitches, corresponding to each standard note should be obtained. Taking the standard note 1 as an example, with respect to the standard note 1, various standard audio features of “do”, its high and higher pitches, and its low and lower pitches are obtained. Therefore, each standard audio feature stored in the note database corresponds to the standard audio features for different high and low pitches, and each standard audio feature

corresponds to a timbre from various audio sources, thus facilitating accurately matching the target standard audio feature corresponding to the current audio feature, thereby facilitating accurately generating the respective music score.

[00110] Hereinafter, taking a numbered musical notation generated from the tune information sung by the user as an example, the method for composing music as provided by an embodiment of the present invention will be explained in detail. As shown in figure 2, the method can comprise the following steps:

[00111] Step 201: obtaining at least one standard audio feature sung by at least one singers, wherein each of the standard audio feature(s) corresponds to one of the standard notes, and each of the standard audio feature(s) corresponds to a sound frequency range as well as a high/low pitch identifier.

[00112] In the numbered musical notation, the standard notes are 1, 2, 3, 4, 5, 6, 7. Herein, it is possible to make a classmate or teacher from a musical conservatory or a professional singer sing these standard notes so as to collect the standard audio features corresponding to the standard notes.

[00113] In addition, when obtaining the audio feature(s), the standard audio features for different high and low pitches, corresponding to each standard note should be obtained. Taking the standard note 1 as an example, with respect to the standard note 1, various standard audio features of “do”, its high and higher pitches, and its low and lower pitches are obtained.

[00114] Also, each standard audio stored in the note database corresponds to a sound frequency range as well as a high/low pitch identifier. For example, the standard audio feature “do” corresponds to a sound frequency range of $[a2, a3)$, its high pitch corresponds to a sound frequency range of $[a3, a4)$ and its low pitch corresponds to a sound frequency range of $[a1, a2)$, wherein $a1 < a2 < a3 < a4$. The standard audio feature “do” and its high and low pitches all correspond to the standard note 1. The standard note 1 corresponds to a high/low pitch identifier of null, its high pitch corresponds to a high/low pitch identifier of a “•” above the standard note 1, and its low pitch corresponds to a high/low pitch identifier of a “•” below the standard note 1.

[00115] Step 202: generating the note database according to the obtained standard audio features and the standard note corresponding to each of the standard audio features.

[00116] Establishing the note database according to the obtained standard audio features such that each standard note stored in the note database corresponds

to the standard audio features for different high and low pitches, and each standard audio feature corresponds to a timbre from various audio sources, thus facilitating making matching later.

[00117] Step 203: obtaining the tune information sung by the user, and according to the time sequence, analyzing the obtained tune information to get at least one current audio feature, and recording a time point of each of the current audio feature(s) corresponding to the tune information.

[00118] For example, the received tune information is a melody of 30s long, and then the analysis is made from the starting point (i.e. 0s) of the tune information till the end of the melody (30s). For each current audio feature as gotten by analysis, the time point of the current audio feature corresponding to the tune information is determined, according to a time to get the current audio feature by analysis and a starting time to start analyzing the tune information. For example, the starting time to start analyzing the tune information is 13:30:00 and the time to get the current audio feature A by analysis is 13:30:10, then it can be determined that the time point of the current audio feature A corresponding to the tune information is the 10th s. In this manner, the time point of each current audio feature corresponding to the tune information can be determined.

[00119] Step 204: performing for each of the current audio feature(s): determining the current sound frequency corresponding to the current audio feature, and searching from the note database to find the sound frequency range corresponding to the current sound frequency; using the standard audio feature corresponding to the found sound frequency range as the target standard audio feature corresponding to the current audio feature.

[00120] Step 205: according to the correspondence(s), determining the target standard notes corresponding to the target standard audio features, and using the high/low pitch identifier of each of the target standard audio features as the high/low pitch identifier(s) of the corresponding target standard note(s).

[00121] For example, the current sound frequency of a certain current audio feature is determined to be a3, and then it can be found that its corresponding sound frequency range is [a3,a4) and it can be determined that the standard audio feature corresponding to the current audio feature is the high pitch of the standard audio feature “do”, its corresponding target standard note is 1, and its high/low pitch identifier is the “•” above the 1. In this manner, the target standard note corresponding to each

current audio feature as well as its corresponding high/low pitch identifier can be determined, respectively.

[00122] Step 206: determining a time interval between any two adjacent current audio features, according to the recorded time point of each of the current audio feature(s) corresponding to the tune information; and determining a beat corresponding to each of the target standard note(s), according to the determined time interval;

[00123] For example, the time point of the current audio feature B corresponding to the tune information is the 8th s, there is no other current audio feature between the current audio feature B and the current audio feature A, and the audio feature B is adjacent to the current audio feature A, then it can be determined that the time interval therebetween is 2s. If one beat is preset to be 1s, the current audio feature B includes 2 beats and is denoted in the music score as B-. If one beat is preset to be 0.5s, the current audio feature B includes 4 beats and is denoted in the music score as B---, wherein the preset value of second(s) corresponding to one beat can be defined by the user before composing music.

[00124] Step 207: selecting a target standard note which has not been selected before from the target standard notes as the current target standard note.

[00125] Step 208: determining an adjacent note adjacent to the current target standard note, according to the time point of each of the current audio features corresponding to the tune information.

[00126] For example, the determined current target standard notes are A, B, C, D, etc. The time point of the current audio feature A corresponding to the tune information is the 5th s, the time point of the current audio feature B corresponding to the tune information is the 6th s, the time point of the current audio feature C corresponding to the tune information is the 8th s, and the time point of the current audio feature D corresponding to the tune information is the 9th s. The target standard note C is used as the current target standard note, and then its adjacent notes are B and D accordingly.

[00127] Step 209: judging whether the pause time between the adjacent note and the current target standard note is lower than the preset threshold value, and if so, performing Step 210, otherwise terminating the current flow.

[00128] Step 210: combining the adjacent note and the current target standard note into a connection group, and using the adjacent note as the current target standard note, and performing Step 208.

[00129] It is to be determined whether the pause times between the current target standard note C and its adjacent note B and between the current target standard note C and its adjacent note D are lower than the preset threshold value(s), respectively. If so, it means that the current target standard note and the adjacent note are successive in the tune information, and are presented to be connected by a connection line in the music score.

[00130] Herein, the pause time between the current target standard note C and its adjacent note B is lower than a preset threshold value and the pause time between the current target standard note C and its adjacent note D is higher than a preset threshold value. In this case, the target standard note C and its adjacent note B are combined into a connection group, the adjacent note B is used as the current standard note and the adjacent note of the current standard note B is then to be determined (in this example, it is determined to be the adjacent note A). Further, it is to be determined whether the pause time between the current target standard note B and its adjacent note A is lower than the preset threshold value, and if it remains so, the adjacent note is also added into the connection group and the adjacent note A continues to be used as the current standard note. Perform in this manner until the current target standard note does not have any further adjacent note in the target standard notes or it is determined that the pause time between any current target standard note and its adjacent note is not lower than the preset threshold value.

[00131] It is understandable that to facilitate determining the connecting note corresponding to each target standard note, it is possible to select the target standard notes in turn according to the sequence of the time points, starting from the first target standard note. In this example, the target standard note A is first selected, and the pause time between it and the adjacent note B is determined. In this manner, the target standard notes are selected in turn. Therefore, it is possible to avoid determining the pause time between two adjacent target standard notes for several times during cycle process. For example, when A is used as the current target standard note, the pause time between A and B is determined; and when B is used as the current target standard note, the pause time between B and A is determined. However, the pause times therebetween are actually the same value and it is necessary to determine it only once, thus the efficiency of the connection group can be improved.

[00132] Step 211: judging whether there is any unselected target standard note, and if so, performing Step 207, otherwise performing Step 212.

[00133] Step 212: for each of the connection group(s), determining a starting note and an ending note from the target standard notes in the connection group, according to the time point of the current audio feature corresponding to the tune information; and using a legato line to connect the starting note with the ending note.

[00134] According to the time points corresponding to the target standard notes, a starting note and an ending note in the connection group are determined. Herein, the target standard note A is the starting note of the connection group and the target standard note C is the ending note, with a legato line connecting them, for example, $A \cap BC$.

[00135] Step 213: generating the numbered musical notation corresponding to the tune information according to the connected starting note and ending note, other unconnected target standard note(s), as well as the high/low pitch identifier and the beat corresponding to each of the target standard notes.

[00136] After the music score is generated this time according to the tune information produced from the user side, it is also possible to store the current audio feature gotten by analysis from the present tune information, as the standard audio feature, into the note database, and store the correspondence between the standard audio feature and the standard note. Therefore, the standard audio feature in the note database will be updated with the use time by the user increasing, thus facilitating the subsequent user, when composing music with the tune information, to determine the target audio feature corresponding to the current audio feature more accurately, thereby facilitating generating the music score.

[00137] As shown in figure 3, in an embodiment of the present invention, a device for composing music is provided, comprising: an establishing unit 301, an analyzing unit 302, a determining unit 303, and a music score generating unit 304, wherein:

[00138] The establishing unit 301 is used for establishing a note database, wherein the note database comprises at least one standard note and at least one standard audio feature as well as a correspondence between each of the standard note(s) and the at least one standard audio feature.

[00139] The analyzing unit 302 is used for obtaining tune information produced from a user side, and analyzing the obtained tune information to get at least one current audio feature.

[00140] The determining unit 303 is used for determining a target standard

audio feature corresponding to each of the current audio feature(s) from the note database, and determining a target standard note corresponding to each of the target standard audio feature(s) according to the correspondence.

[00141] The music score generating unit 304 is used for generating a music score corresponding to the tune information, according to the determined target standard note.

[00142] In an embodiment of the present invention, each of the standard audio feature(s) corresponds to a sound frequency range as well as a high/low pitch identifier.

[00143] The determining unit 303 is used for performing for each of the current audio feature(s): determining a current sound frequency corresponding to the current audio feature, and searching from the note database to find the sound frequency range corresponding to the current sound frequency; and using the standard audio feature corresponding to the found sound frequency range as the target standard audio feature.

[00144] The music score generating unit 304 is used for using the high/low pitch identifier corresponding to the target standard audio feature as the high/low pitch identifier of the corresponding target standard note, for each of the target standard audio feature(s); and generating the music score corresponding to the tune information, according to the target standard notes as well as the high/low pitch identifier of each of the target standard notes.

[00145] In an embodiment of the present invention, the analyzing unit 302 is used for analyzing the tune information to get the at least one current audio feature according to the time sequence, and recording a time point of each of the current audio feature(s) corresponding to the tune information.

[00146] The music score generating unit 304 is used for determining a time interval between any two adjacent current audio features, according to the recorded time point of each of the current audio feature(s) corresponding to the tune information; and determining a beat corresponding to each of the target standard note(s), according to the determined time interval; and generating the music score according to the determined target standard note(s) as well as the beat corresponding to each of the target standard note(s).

[00147] As shown in figure 4, in an embodiment of the present invention, the music score generating unit 304 comprises a connection group determining subunit

3041, a connecting subunit 3042, and a generating subunit 3043, wherein:

[00148] The connection group determining subunit 3041 is used for using any one of the target standard note(s) as the current target standard note and performing steps A1 to A3:

[00149] A1: determining an adjacent note adjacent to the current target standard note, according to the time point of each of the current audio features corresponding to the tune information;

[00150] A2: determining whether a pause time between the adjacent note and the current target standard note is lower than a preset threshold value, and if so, performing A3;

[00151] A3: combining the adjacent note and the current target standard note into a connection group, and using the adjacent note as the current target standard note to perform A1.

[00152] The connecting subunit 3042 is used for determining a starting note and an ending note from the target standard notes in the connection group, according to the time point of each of the current audio features corresponding to the tune information; and using a legato line to connect the starting note with the ending note.

[00153] The generating subunit 3043 is used for generating the music score corresponding to the tune information, according to the connected starting note and ending note as well as other unconnected target standard note(s).

[00154] In an embodiment of the present invention, the establishing unit 301 is used for obtaining at least one standard audio feature produced by at least one audio source, wherein each of the standard audio feature(s) corresponds to one of the standard notes, wherein the at least one audio source comprises any one or more of musical instruments, singers, and electronic audio devices; and generating the note database according to the obtained standard audio feature(s) as well as the standard note corresponding to each of the standard audio feature(s).

[00155] For the contents of information interaction between the various units in the above device and the performing process thereof, based on the same concept as those in the method embodiments of the present invention, the specific contents thereof may refer to the description in the method embodiments of the present invention and will not be repeated herein.

[00156] In an embodiment of the present invention, a readable medium is further provided, comprising execution instructions. When the processor of the store

controller executes the execution instructions, the store controller executes the method according to any one of the above embodiments of the present invention.

[00157] In an embodiment of the present invention, a store controller, comprising a processor, a storage, and a bus wherein the storage is used to store the execution instructions, the processor is connected via the bus with the storage, and when the store controller is running, the processor executes the execution instructions stored in the storage such that the store controller executes the method according to any one of the above embodiments of the present invention.

[00158] In summary, the above embodiments of the present invention have at least one of the following beneficial effects:

[00159] 1. In the embodiment(s) of the present invention, a note database comprising at least one standard note and at least one standard audio feature as well as a correspondence therebetween is established in advance. When the tune information produced from a user side is obtained, the tune information is analyzed to get at least one current audio feature. Then, a target standard audio feature corresponding to each of the current audio feature(s) is determined from the pre-established note database, and a target standard note corresponding to each of the target standard audio feature(s), respectively, is determined according to the correspondence stored in the note database, and a music score corresponding to the tune information is generated according to the determined target standard note. Therefore, it is possible to use the tune information produced from the user side to automatically generate a corresponding music score such that a user without any musical knowledge can create a music score, thus lowering the professional requirement for composing music.

[00160] 2. In the embodiment(s) of the present invention, after the target standard notes are determined, the high/low pitch identifier corresponding to each target standard note is further determined. According to the determined target standard notes and its corresponding high/low pitch identifiers, the music score is generated, thus improving the accuracy of the generated music score.

[00161] 3. In the embodiment(s) of the present invention, after the target standard notes are determined, by means of the time interval between any two target standard notes, a beat corresponding to each target standard note is further determined. The target standard notes and its corresponding beat(s) can be used to generate the music score such that the generated music score can better match the

music score information produced from the user side, thus improving the accuracy of the music score.

[00162] 4. In the embodiment(s) of the present invention, after the target standard notes are determined, by means of the pause time between adjacent target standard notes, the legato notes corresponding to the target standard notes are determined. Then, the music score is generated according to the connected target standard notes as well as unconnected target standard note(s). The generated music score can represent the connection relation(s) between the target standard notes, thus improving the accuracy of the music score.

[00163] 5. In the embodiment(s) of the present invention, each standard note stored in the note database corresponds to the standard audio features for different high and low pitches, and each standard audio feature corresponds to a timbre from various audio sources, thus facilitating accurately matching the target standard audio feature corresponding to the current audio feature, thereby facilitating accurately generating the respective music score.

[00164] It should be explained that in the present document, the relation terms, such as first or second, are used only to distinguish one entity or operation from another entity or operation, rather than necessarily requiring or suggesting that there is any actual relation or sequence between these entities or operations. Also, the terms “comprise”, “include” or any other variations thereof are intended to cover nonexclusive inclusion such that a process, method, item or device having a series of elements not only includes these elements, but also may include other element(s) not listed clearly, or may include any element(s) inherent to such process, method, item or device. Under the condition that there is not any further limitation, the element defined by the clause of “comprising a/one” does not exclude such a case in which the process, method, item or device including this element may also include other same element(s).

[00165] Those skilled in the art should understand that all or some of the steps of the above method embodiments can be achieved by the hardware related to the program instructions. The above-mentioned program can be stored in the computer readable storing medium. When the program is executed, the execution comprises the step(s) of the above method embodiment(s). The above-mentioned storing medium comprises: ROM, RAM, hard disks, or CD, or various media able to store program codes.

[00166] Finally, it should be explained that the above description is only for the

preferred embodiments of the present invention, to illustrate the technical solutions of the present invention, rather than limiting the protection scope of the present invention. Any modification, equivalent alternative or improvement made within the spirit and principle of the present invention should fall in the protection scope of the present invention.

CLAIMS

1. A method for composing music, characterized in that it comprises:
 - establishing a note database, wherein the note database comprises at least one standard note and at least one standard audio feature as well as a correspondence between each of the standard note(s) and the at least one standard audio feature;
 - obtaining tune information produced from a user side;
 - analyzing the obtained tune information to get at least one current audio feature;
 - determining a target standard audio feature corresponding to each of the current audio feature(s), from the note database;
 - determining a target standard note corresponding to each of the target standard audio feature(s), according to the correspondence; and
 - generating a music score corresponding to the tune information, according to the determined target standard note.
2. The method according to claim 1, characterized in that
 - each of the standard audio feature(s) corresponds to a sound frequency range as well as a high/low pitch identifier;
 - wherein the step of determining a target standard audio feature corresponding to each of the current audio feature(s) from the note database comprises:
 - performing for each of the current audio feature(s):
 - determining a current sound frequency corresponding to the current audio feature, and searching from the note database to find the sound frequency range corresponding to the current sound frequency;
 - using the standard audio feature corresponding to the found sound frequency range as the target standard audio feature;
 - wherein the step of generating the music score corresponding to the tune information according to the determined target standard note comprises:
 - using the high/low pitch identifier corresponding to the target standard audio feature as the high/low pitch identifier of the corresponding target standard note, for each of the target standard audio feature(s);
 - generating the music score corresponding to the tune information, according to the target standard note(s) as well as the high/low pitch identifier of each of the target

standard note(s).

3. The method according to claim 1, characterized in that

the step of analyzing the obtained tune information to get at least one current audio feature comprises:

analyzing the tune information to get the at least one current audio feature according to the time sequence, and recording a time point of each of the current audio feature(s) corresponding to the tune information;

wherein the step of generating a music score corresponding to the tune information according to the determined target standard note comprises:

determining a time interval between any two adjacent current audio features, according to the recorded time point of each of the current audio feature(s) corresponding to the tune information;

determining a beat corresponding to each of the target standard note(s), according to the determined time interval;

generating the music score according to the determined target standard note(s) as well as the beat corresponding to each of the target standard note(s).

4. The method according to claim 3, characterized in that

the step of generating the music score corresponding to the tune information according to the determined target standard note(s) comprises:

using any one of the target standard note(s) as the current target standard note, and performing steps A1 to A3:

A1: determining an adjacent note adjacent to the current target standard note, according to the time point of each of the current audio features corresponding to the tune information;

A2: determining whether a pause time between the adjacent note and the current target standard note is lower than a preset threshold value, and if so, performing A3;

A3: combining the adjacent note and the current target standard note into a connection group, and using the adjacent note as the current target standard note to perform A1;

determining a starting note and an ending note from the target standard notes in the connection group, according to the time point of each of the current audio features corresponding to the tune information;

using a legato line to connect the starting note with the ending note;

generating the music score corresponding to the tune information, according to the connected starting note and ending note as well as other unconnected target standard note(s).

5. The method according to any one of claims 1-4, characterized in that the step of establishing a note database comprises:

obtaining at least one standard audio feature produced by at least one audio source, wherein each of the standard audio feature(s) corresponds to one of the standard notes, wherein the at least one audio source comprises any one or more of musical instruments, singers, and electronic audio devices;

generating the note database according to the obtained standard audio feature(s) as well as the standard note corresponding to each of the standard audio feature(s).

6. A device for composing music, characterized in that it comprises an establishing unit, an analyzing unit, a determining unit, and a music score generating unit, wherein

the establishing unit is used for establishing a note database, wherein the note database comprises at least one standard note and at least one standard audio feature as well as a correspondence between each of the standard note(s) and the at least one standard audio feature;

the analyzing unit is used for obtaining tune information produced from a user side, and analyzing the obtained tune information to get at least one current audio feature;

the determining unit is used for determining a target standard audio feature corresponding to each of the current audio feature(s) from the note database, and determining a target standard note corresponding to each of the target standard audio feature(s) according to the correspondence; and

the music score generating unit is used for generating a music score corresponding to the tune information, according to the determined target standard note.

7. The device according to claim 6, characterized in that

each of the standard audio feature(s) corresponds to a sound frequency range as well as a high/low pitch identifier;

the determining unit is used for performing for each of the current audio feature(s): determining a current sound frequency corresponding to the current audio feature,

and searching from the note database to find the sound frequency range corresponding to the current sound frequency; and using the standard audio feature corresponding to the found sound frequency range as the target standard audio feature;

the music score generating unit is used for using the high/low pitch identifier corresponding to the target standard audio feature as the high/low pitch identifier of the corresponding target standard note, for each of the target standard audio feature(s); and generating the music score corresponding to the tune information, according to the target standard note(s) as well as the high/low pitch identifier of each of the target standard note(s).

8. The device according to claim 6, characterized in that

the analyzing unit is used for analyzing the tune information to get the at least one current audio feature according to the time sequence, and recording a time point of each of the current audio feature(s) corresponding to the tune information;

the music score generating unit is used for determining a time interval between any two adjacent current audio features, according to the recorded time point of each of the current audio feature(s) corresponding to the tune information; determining a beat corresponding to each of the target standard note(s), according to the determined time interval; and

generating the music score according to the determined target standard note(s) as well as the beat corresponding to each of the target standard note(s).

9. The device according to claim 8, characterized in that

the music score generating unit comprises a connection group determining subunit, a connecting subunit, and a generating subunit, wherein

the connection group determining subunit is used for using any one of the target standard note(s) as the current target standard note and performing steps A1 to A3:

A1: determining an adjacent note adjacent to the current target standard note, according to the time point of each of the current audio features corresponding to the tune information;

A2: determining whether a pause time between the adjacent note and the current target standard note is lower than a preset threshold value, and if so, performing A3;

A3: combining the adjacent note and the current target standard note into a connection group, and using the adjacent note as the current target standard note to

perform A1;

the connecting subunit is used for determining a starting note and an ending note from the target standard notes in the connection group, according to the time point of each of the current audio features corresponding to the tune information; and using a legato line to connect the starting note with the ending note;

the generating subunit is used for generating the music score corresponding to the tune information, according to the connected starting note and ending note as well as other unconnected target standard note(s).

10. The device according to any one of claims 6-9, characterized in that

the establishing unit is used for obtaining at least one standard audio feature produced by at least one audio source, wherein each of the standard audio feature(s) corresponds to one of the standard notes, wherein the at least one audio source comprises any one or more of musical instruments, singers, and electronic audio devices; and generating the note database according to the obtained standard audio feature(s) as well as the standard note corresponding to each of the standard audio feature(s).