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(54) **Method for implementing an automatic music jam session**

Methode zur Implementierung einer automatischen Jam Session

Procédé de mise en oeuvre d'une session automatique de musique jam.

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EP 2 793 222 B1

Description

FIELD OF THE INVENTION

[0001] The present invention relates generally to the field of multimedia editing and, more generally, to automatically composing musical works with intuitive user interaction.

[0002] The field of music editing and generation has undergone substantial change in recent years. Among the more significant changes is that music generation went from a work intensive and time consuming process of learning to play and master a real instrument to one that based around the use of computerized techniques to generate new music works.

[0003] Despite all the technological advances, computer driven / digital data driven composition has never completely supplanted the traditional way of making music by playing actual instruments. That being said, a number of approaches are available wherein computers and instruments can be used in together to help a user compose music. These approaches, however, are typically very limited in that the user enters music into the computer via an instrument and the computer records the music. The computer may additionally provide, for example, background music or supporting music to accompany the user's performance. This accompaniment however, once initiated is static or at least always depends on continuous input by the user to change particulars, like the music itself, or the key, rhythm or pitch which prevents the user from concentrating on playing the instrument.

[0004] Thus, what is needed is a system and method that supports a user when generating music, wherein the level of support is adjustable by the user. The level of support should be variable and include approaches such as fully automatic, user driven selection, and real-time automatic accompaniment generation for a user who is playing an instrument. Additionally what is needed is a system and method that smoothly combines the traditional approach to music creation -with instruments - with a computer based music clip driven approach.

[0005] Heretofore, as is well known in the media generating and editing industry, there has been a need for an invention to address and solve the above-described problems. Accordingly it should now be recognized, as was recognized by the present inventors, that there exists, and has existed for some time, a very real need for a system and method that would address and solve the above-described problems.

[0006] EP1557836 defines composing/editing media clips by automatic selection of themes and of (harmony-) compatible replacement clips and by pointing on-screen on a media track. Criteria are clip-type, -tempo, -start and -ending time. However there is no audio loops in the description, although Figure 4 shows audio loops, only audio clips are meant; and not real time interactive music composition is disclosed.

[0007] EP1876583 defines a block sequence compiler

with a user interface defining duration, library (=part) selection. Loop playback command while correcting tempo and pitch is also disclosed, additionally a play repetition of a single loop is foreseen. However there is no disclosure of the selection of either instrument, tempo and/or pitch values by the user.

[0008] XP031481665: 'AudioCycle: Browsing Musical Loop Libraries_', CONTENT BASED MULTIMEDIA INDEXING, 2009. CMBI 09. SEVENTH INTERNATIONAL WORKSHOP ON, IEEE, PISCATAWAY, NJ, USA, 3June 2009 (2009-06-03), pages 73-80 discloses music loop library browser displaying music according to similarity in timbre, harmony and rhythm. Spatial sound is obtained by playing several extracts at the same time, including beat synchronous loop play and pitch alteration. It defines a database having descriptors (style, instrument) and data structure having features (timbre, rhythm, tempo, onset positions, pitch, harmony notes) stored as metadata in the music loops library, the loop segments being synchronized at beat locations and having a length of a beat period. However it does not define music composition, it only discloses simultaneous multi-loop beat synchronous playback.

[0009] US2004089141 provides a top-down and interactive auto-composition approach. It defines patterns used as building blocks for real time interactive music composition, or a user modifying an auto-composed music in real time. Improvisation is also disclosed as well as data structures having instrument, chord, tempo, key, style and structure indexed by part. It does not disclose audio loops or that individual parts can be utilized as parts, it discloses sub-blocks or riffs but no loops. It discloses the storage of MIDI-loops however these are not utilized within the disclosed algorithm.

[0010] US2012297959 defines particular loop replacement according to a score versus a specific harmony matrix. A default instrument is automatically selected for each given audio track. However these tracks are key adjusted note by note, not loop by loop.

[0011] US2012312145 defines a music composition automation system combining 'phrases_ which can be pre-recorded audio clips, synthesizer loops or other types of audio data sources. Each instrument in the style includes a set of phrases that can be played, associated with a specific song section type using this data structure. The music style library data structure includes fields: Phrase to loop_, style, re-trigger flag, chord, start, end, genre, instrument and volume. The audio recordings library data structure includes type, tempo, beats per bar, key and chords. It does not disclose a real time interactive algorithm, no jam session capability and no recursive algorithm.

[0012] E P1666967 discloses automatically creating an emotion-controlled soundtrack for use with an existing video work. An algorithm initiates loop insertions according to emotion tag and style. The selected music loops will be cut, looped, cross-faded, etc., to create a seamless audio soundtrack with additional automatic insertion of

fade-ins or fade-outs before and after selected music loops to smooth the audio transitions into / out of a section. This reference discloses clips/loops, tags, it does not however disclose a part-suitability tag or field. Additionally it does disclose beat insertion of clips bases on similar beat length, not beat synchronicity.

[0013] US5877445 defines an audio block sequence compiler selecting segments from a segments library classified in a characteristic compatibility table by: Duration; suitability for begin or end of a sequence, compatibility with each block. The compiler generates audio sequences using the characteristic table and user criteria (duration, mood, intensity), it does not define however audio loops, it utilizes looping of individual segments, additionally there is no tempo selection, no style selection and no disclosure of an iterative algorithm.

[0014] XP032265400 'Advanced Synchronization of Audio or Symbolic Musical Patterns: AnAlgebraic Approach_ SEMANTIC COMPUTING (IGSC), 2012 IEEE SIXTH INTERNATIONAL CONFERENCE ON, IEEE, 19 September 2012 (2012-09-19), pages 302-309 discloses an 'advance live looping_ approach using synchronization windows for the creation of interactive music pieces, wherein loops are added to an initial loop selection in real time. However, style and audio loops data structures having the fields 'instrument, tempo, part_ are not disclosed.

[0015] Before proceeding to a description of the present invention, however, it should be noted and remembered that the description of the invention which follows, together with the accompanying drawings, should not be construed as limiting the invention to the examples (or preferred embodiments) shown and described. This is so because those skilled in the art to which the invention pertains will be able to devise other forms of the invention within the ambit of the appended claims.

SUMMARY OF THE INVENTION

[0016] The invention is as defined by the appended independent claims 1, 11, 12, with specific embodiments defined by dependent claims 2-10.

[0017] The expressions "MIDI loops, "audio loops, "audio clips", "sound" are considered here equivalent, specifically in the context of the present description, see figure 6 and in view of EP1557836 figure 4.

[0018] All passages of the description, even if defined as "maybe" or "in some embodiments" or as optional, that correspond to the subject-matter of claim 1 are to be interpreted as non-optional essential features.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] Other objects and advantages of the invention will become apparent upon reading the following detailed description and upon reference to the drawings in which:

Figure 1 depicts a general working environment of

the instant invention.

Figure 2 illustrates a preferred graphical user interface of the instant invention.

Figure 3 illustrates a general workflow suitable for use with the instant invention.

Figure 4 depicts a general layout of the data structure of the audio material suitable for use with the instant invention.

Figure 5 illustrates one possible data content of the individual selectable styles of the instant invention.

Figure 6 illustrates one possible data structure and content of the audio loops suitable for use with the instant invention.

Figure 7 contains a more detailed operating logic suitable for use with the instant invention.

Figure 8 illustrates one example by which filter settings might be altered in real time.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0020] Referring now to the drawings, wherein like reference numerals indicate the same parts throughout the several views, there is provided a preferred system and method for implementing an intelligent automatic music jam session.

[0021] As is generally indicated in Figure 1, at least a portion of the instant invention will be implemented in form of software running on a user's computer 100. Such a computer will have some amount of program memory and hard disc storage (whether internal or accessible via a network) as is conventionally utilized by such units. Additionally it is possible that an external camera 110 of some sort be utilized with - and will preferably be connectible to - the computer so that video and/or graphic information can be transferred to and from the computer. Preferably the camera 110 will be a digital video camera, although that is not a requirement, as it is contemplated that the user might wish to utilize still images from a digital still camera in the creation of his or her multimedia work. Further given the modern trend toward incorporation of cameras into other electronic components (e.g. in handheld computers, telephones, laptops, etc.) those of ordinary skill in the art will recognize that the camera might be integrated into the computer or some other electronic device and, thus, might not be a traditional single-purposes video or still camera. Although the camera will preferably be digital in nature, any sort of camera might be used, provided that the proper interfacing between it and the computer is utilized.

[0022] Additionally a microphone 130 might be utilized so that the user can add voice-over narration to a multi-

media work or can control his or her computer via voice-recognition software. A CD or DV D burner 120 could be useful for storing content on writable or rewritable media. Additionally it might be possible that a mobile data storage device 140 might be connected to the computer, such as an mp3 player for example, for storage of individual music clips or other data as needed by the instant invention. Furthermore in some embodiments the user would bring a smart phone 150 or other touch based device (e.g., a tablet computer such as a Microsoft[®] Surface[®] tablet or an iPad[®], or other device with a touch-sensitive display) into communication with the computer in order to, for example, control the computer or exchange data between the computer and the device.

[0023] According to an embodiment of the instant invention, the user might also be able to connect instruments such as a keyboard 160 to the computer to allow for the input and recording of music data directly from the user.

[0024] The process of the instant invention will provide a user-friendly preferably touch-based graphical user interface via music generation and editing software. The method will preferably utilize MIDI loops or audio clips organized into styles, with these MIDI loops being enhanced with a classification into song parts.

[0025] The loops will also be tagged with data that is then used by the instant invention during the music generation process. These tags represent a classification of the loops - as song parts, pitch and melody qualification. A well organized and tagged database of MIDI loops or audio loops is an essential part of the instant invention. Such a database of MIDI loops or a selection of individual styles referring to the MIDI loops will preferably be provided by the instant inventors.

[0026] The type, layout and interaction possibilities of the graphical user interface will be accessible, in some embodiments, by the user with mouse and keyboard. However, the instant invention will be especially useful when used in connection with a touch interface, if the device(s) on which the instant invention is executed provide such a possibility.

[0027] The music generation, or jam mode of the instant invention will react to the user interactions and user input in real time, incorporating the users activities into the music generation process. This will give the user instantaneous dynamic feedback and sense of achievement. Each different interaction of the user, the selection of a different tone pitch, the selection and de-selection of a different instrument or the definition of a different song part will be incorporated almost instantly by the instant invention, however in a preferred embodiment only after the next bar is reached.

[0028] The present invention will preferably begin with the initiation by the user of the music generation process - the live jam mode. The live jam mode might be a component part of a general music generation software or it might be a standalone program

[0029] In an embodiment, the user will be presented

with a graphical user interface 200 containing controls for all essential settings. All of these controls will be selectable and changeable by the user at any time both before and during the music generation process, with the selections made by the user being incorporated by the instant invention into the music generation process in real time.

[0030] The user preferably will preferably start with the selection of a music style 210, a style which will then be used in connection with the created music work as long as it is selected. The user will also be able to define and change the tempo 220 of the music work. A volume control 230 will be provided which will allow the user to change the output volume. In some embodiments, the volume control 230 will affect only the voice that is currently selected in the instrument bank 270 (e.g., keyboard 275), thereby adjusting the volume of the selected voice as compared with the other currently active / selected voices 260. In other instances, it could be used to control the total audio volume as heard through an attached speaker or headphones. The overall volume setting will generally not be stored by the instant invention during the music generation process (i.e., preferably the setting of the output volume will not effect the volume of the musical work that is subsequently saved), although in some instances it might be tracked in order to adjust the relative volume of one instrument / part with respect to another during playback.

[0031] In addition, in an embodiment there will be a number of controls and settings that allow the user to direct the music generation process, i.e., to influence the live jam mode on a deeper level. The user will be able to define and select individual song parts 240 which can be combined to create a complete song. That is, in some embodiments the user will be able to signal to the instant invention that he or she wants the music that is being created to transition into the next phase, e.g., from the introduction, to the verse. The instant invention will then select and play MIDI or music loops that are compatible with or representative of the selected song section. The instant invention will provide the user with an assortment of different song parts that allow the user to control the song structure. For example, by selecting the 'Intro_ option the instant invention will incorporate at least one music or MIDI loop that is tagged with the 'intro_ tag and has a tempo, chord structure, etc., compatible with an introduction. Other possibilities include such parts as verse, chorus, bridge, outro, etc., as those terms are known in the music arts.

[0032] Returning to Figure 2, the instant invention in this embodiment has provided parts labeled 'Ending_', 'VAR1_', 'Fill_' and 'VAR2_' selection of which will cause the instant program to insert different music or MIDI loops that contain music that adheres to the selected style, and pitch and to the selected song part. For purposes of the instant disclosure, it should be noted that 'VAR1_' and 'VAR2_' stand for variations and 'Fill_' represents music material that is usable as fill material as those terms are

known and understood in the art. In an embodiment, the selection of 'Ending_' will insert a music or MIDI loop that provides an ending to the current music piece, allowing the user to end the generated song in a musically pleasing and/or correct fashion. It should be noted that after the selection of the 'VAR1_' or 'VAR2_' song part, the instant invention will preferably cycle through the audio loop material that is available to prevent the same audio loops from being selected for, by way of example, four consecutive bars. The instant invention will preferably do that for all audio loops, including both loops containing melody based instruments as well as loops containing drum and bass audio material.

[0033] For the novice user the selection of the 'automatic_' option regarding the song part setting 240 will also be possible. In this variation, the instant invention will preferably generate and select the song parts automatically (e.g., intro, verse, chorus, outro, ending) and the user will be provided with a fully rough structured song.

[0034] Additionally, and in some embodiments, the instant invention will provide an effects option 242. Preferably, when the user selects this on-screen icon an opportunity will be provided to apply, modify, or remove various audio effects (e.g., filters, reverb, flange, etc.).

[0035] In some embodiments, when the user selects the PLAY control 292 the instant invention will automatically start the music generation process. In this example, this will cause the program to utilize the user's selected style, song parts, tone pitch / key and instruments in the generation process. Preferably when the PLAY control 292 is selected, the REC control 295 will be activated too, thereby initiating the recording process. By selecting the REC control 295 again, in some embodiments the user will indicate to the instant invention that the generation and recording of the current music work is to be ended. In this instance, the instant invention will insert a music loop representing an ending in order to complete the music generation process for the current music piece.

[0036] A pitch setting 250 will also be provided in some embodiments. This option will allow the user to select individual tone pitch / note values manually or to select an automatic setting wherein the instant invention will automatically generate tone pitch / note changes accordingly. In an embodiment, the currently selected and active tone pitch will be displayed in the graphical user interface. However it is also preferable that the real key will also be displayed to the user, so that the user who playing along with the instant invention via a connected instrument will be able to play in the correct key. However it is also possible, and within the scope of the instant invention, for the user to ignore the key and play as he sees fit. In that case, the instant invention will preferably select tone pitch / note settings in order to adapt to generated song to the playing of the user, thereby generating a musically pleasing music work. If a specific tone pitch has been selected by the user then the instant invention will generate the music - i.e., it will initiate the jam mode in

the selected tone pitch / key as long as it is selected.

[0037] In addition to the already described user controls, in an embodiment the user will also be able to define and select the instruments that are to be used in generating the music. In some embodiments, the graphical user interface will provide an instrument selection bar 260 displays the current voice selection (i.e., the instrument bank 270). In an embodiment the user will be able to select and de-select individual instruments dynamically which changes will be reflected in real time via external speakers, headphones, etc. Preferably, the inclusion / exclusion and change of instruments can be done at any time and without any restrictions, although the instant invention also provides an automatic setting, which when activated, utilizes and automatically selects instruments that are available according to the currently selected style. The instant invention will select / deselect and change these instruments in an alternating fashion to generate a pleasing music work.

[0038] Figure 3 provides a summary of a preferred workflow of the instant invention. In a first preferred step the user will activate the jam mode 300. Next, and preferably, the user will select a style 310, the tempo 320, the tone pitch 330, the individual song parts 340 and the preferred instruments 350. However, it should be noted that these settings do not necessarily need to be defined sequentially before the start of the music generation process. They will be selectable and changeable the whole time that the jam mode is active. This will encourage the user to alternate between multiple ones of the available settings 360. In an embodiment, the instant invention will automatically incorporate the changed settings into the jam mode - the music generation process will be modified dynamically in real time.

[0039] The instant invention will record 370 the generated music while jam mode is active and store it on a computer. The store might be hard disc, a flash based memory device, etc. The recording will then be available for the user for further additional processing if that is desired.

[0040] Figure 4 illustrates a preferred data structure of the instant invention. The instant invention utilizes, in an embodiment, an organized and data structure. This database will be provided in some instances by the instant inventors. In some embodiments, a limited set of styles might be provided initially, with additional styles available on demand and for a fee. Where a user desires additional styles, the order will be initiated by the user, with the new styles being transmitted digitally directly to the user. Of course, it is also possible that the purchased styles might be shipped on a storage medium after purchase. The user's styles could be stored either locally on the user's computer, or remotely and access via a LAN, Wi-Fi, the Internet, etc. Each style will preferably be stored and named internally according to a simple naming scheme. For example, see Style A 400, where each style has a specific number of audio loops associated with that style. However, each of these loops (audio loop A 405, audio

loop B 410, and audio loop C 415) need not be strictly associated with a single style. It is preferable and possible that an audio loop might be associated with multiple different styles (style b 420).

[0041] Figure 5 depicts a preferred data structure of one of the individual styles 500 of the instant invention. The data record associated with a style 500 will preferably contain information about the number of individual song parts that are available and selectable 510. Additionally, the number and type of individual instruments 520 that are part of the style will preferably be stored in the data structure of each individual style. Each style will preferably have a predefined tempo 530. However it should be noted that once the user selects the style and interacts with the user controls, the predefined tempo might be changed automatically and/or manually by the user.

[0042] Additionally in some embodiments each style will have a predefined tone pitch 540 or key that can be modified by the user. Further, in an embodiment each style will contain icons 550 and animations 560 that represent the corresponding instrument and/or the particular style. These pictures and animations will preferably be displayed in the graphical user interface as is generally indicated in Figure 5. In some embodiments, the icons / images will be animated so that the user will be able to see a representation of a musician playing the selected instrument. A nother preferred data value that could be stored with each style is the name 570 of that style which will be the name that is displayed in the graphical user interface for selection by the user.

[0043] Figure 6 depicts a preferred data structure for use with the individual audio loops 600. In this embodiment, the audio loops, in addition to the audio material, might contain information about the styles 610 with which they have been associated. This might be a plurality of styles, or only one style. Furthermore the audio loop has a specific predefined inherent tempo value 620, which is also stored in the data structure of the audio loop. Additionally information about the usability of the audio loop as a part 630 (intro, variance 1, variance 2, ending, etc.) in the music generation process will be stored in this data structure.

[0044] Each audio loop will additionally, and preferably, be associated with information regarding the instrument 640 the loop was taken from or created by. In some embodiments, an important value in the data structure of the audio loops will be the information about the harmony suitability 650 or compatibility of each clip with respect to the others. This quantity will indicate, in a general way, whether or not one audio loop is musically compatible with another. The harmony suitability could either be provided by the user and inserted into the data structure, or designed by the creator of the database based on a scale that indicates compatibility with another currently selected audio loop. Additionally it might be possible that the instant invention will determine the harmony suitability by first analyzing the data values of a selected audio loop and then comparing those values to the data of an-

other audio loop to determine respective pitch, tempo, note scale (e.g., blues, minor, rock, etc.).

[0045] In one example, and as is indicated in Figure 8, the user might be provided with the option to modify the filter effects in real time. In this example, the effects button 242 has been activated which has brought a filter parameter window 810 to the forefront. In this figure, which would be most representative of the appearance of the instant invention while executing on a tablet computer, the user has been provided with the option of simultaneously adjusting two parameters by way of a stroke 820 across the face of the open window 810. In this instance, the user will be able to simultaneously modify two parameters, although it should also be clear that a single parameter (or three or more) could be similarly modified. In Figure 8, the audio center frequency might be modified ('HIGH_' to 'LOW_') and/or the reverb ('HEAVY_' to 'LIGHT_'). In this example, the user has elected to increase the center frequency and increase the reverb by virtue of this single stroke 820. Clearly, other variations of this approach are possible and have been specifically contemplated by the instant inventors.

[0046] Turning next to Figure 7, according to one embodiment, the instant invention will be used in practice generally as indicated in this figure. As a first step in this embodiment, the jam mode will be activated (step 700). This will initiate the computer program that implements the instant invention on the device selected by the user which might include a desktop computer, a laptop computer, a smart phone, a tablet computer, etc. Next, in this embodiment, the style, tempo, and musical key of the work will be selected (step 705).

[0047] Although the choice of instruments (Figure 2) might be conventional orchestral instruments (e.g., brass, woodwinds, violins or other stringed instruments, drum or other percussion, etc.) in some embodiments the user-specified style will guide selection of those instruments. Such a selection will automatically populate, in some embodiments, an instrument bank 270 with a selection of alternative instruments that are suitable for the selected style. For example, in the embodiment of Figure 2, selection of the rock/pop style will populate the instrument bank 270 with sounds from a rock drum set, guitars, electric or acoustic keyboards, etc. In other embodiments, e.g., where jazz is selected as the style, the instrument bank 270 might include a vocal performance of scat lyrics. In still other embodiments, the selection of style might automatically populate the voice bank with horns, strings, woodwinds, etc., each of which will preferably have been selected to compliment the style selected by the user.

[0048] As a specific example, if the user selects, for example, a 'salsa_' style the associated instruments might include claves and/or drums (on percussion), acoustic guitar(s), bass, piano, flute, etc. The time signature will often be 12/8 or 6/8, but, in some embodiments it will be 4/4, 2/2, or 2/4.

[0049] As another example, if the user selects a 'blues_'

style, the default instruments might be drums, guitar(s) (e.g., electric, slide, or acoustic), bass, harmonica, keyboard, fiddle (violin), etc. The time signature would most commonly be 4/4, but other choices are certainly possible. The form of the music could follow, by default, the standard 12 bar or 8 bar blues chord progressions, as those terms are known in the art. The solo instruments (e.g., lead guitar, harmonica, keyboard, etc.) would often be restricted to playing the standard blues scale (e.g., flatted third, fifth and seventh of the major scale), but other variations are certainly possible. The exact solo sequences that will be played in a given instance would be designed to follow and complete the current state of the underlying chord progression and complement it. Those sequences might be provided by the instant invention using standard riffs or sequences, or determined in real-time (e.g., randomly or according to some deterministic sequence) according to the desires of the user.

[0050] As a next preferred step 710, the user will accept the default instrument bank 270 or select alternative instruments or vocals. That is, in some embodiments, the user might prefer, by way of example only, a distorted guitar sound as opposed to an acoustic guitar sound. In such an instance, the user will be able to either accept the instruments/vocals offered or replace any of those with another instrument or vocal sound.

[0051] Next, and preferably, the user will activate a first instrument (step 715) which will cause it to begin playing according to the parameters previously selected by the user. As is indicated in Figure 2, the activated instruments 275, 280, and 285 will preferably be highlighted on the screen so that the user can readily tell which instrument or instruments have been activated and are, thus, in the current mix. In some embodiments, when the instant invention will execute on a tablet computer or other device with a touch-sensitive screen. In such environments, the user will merely need to touch the associated icon in order to activate or mute an instrument.

[0052] Upon activation of the first instrument, the instant invention will preferably automatically begin a performance of that instrument according to the selected style, at the selected tempo, and in the selected key or according to a selected pitch (step 725), etc. In an embodiment, the current state of the work will be communicated to the user as it is generated via a local speaker or, if the user is wearing headphones, to the user's headphones. This first instrument that is selected will provide the foundation for what is to follow. In many cases, the first instrument that is activated will be the drums, but that is not a requirement.

[0053] Next, the instant invention will, in some embodiments, begin to continuously record the performance (step 730). Of course, at the first iteration, there will typically be a single instrument that is playing but, subsequently, more instruments will be added as is discussed below. In some embodiments, for example, if the user has elected automatic generation of a music work, the recording will be initiated using all appropriate instru-

ments. In that case, the user will select/deselect and modify the instruments that are currently playing as described below.

[0054] Returning to the example of Figure 7, in an embodiment, the starting and stopping of the recording will be under the control of the user and the recording may not commence until after the user has added several instruments to the mix, at which time it will begin automatically. In other cases, no recording will be performed until the user specifically selects that option (e.g., via the on-screen "Record_ button 295 in Figure 2).

[0055] Next, if the user has made a change in the settings (decision item 735), the instant invention will preferably follow the 'YES_ branch. On the other hand, if no change has been made in the settings (i.e., the 'NO_ branch of decision item 735), the instant invention will preferably branch to step 725 and thereby continue to perform and, optionally, record the performance according to the step 730.

[0056] If there has been a change in the settings per the: YES_ branch of decision item 735, in some embodiments, a test will be performed to determine whether or not the change that has been made is an indication that the user wishes to stop the music generation process (decision item 738). If the user has decided to end the music creation process (i.e., the 'YES_ branch of decision item 738), the instant invention will preferably write whatever recording was made to nonvolatile computer storage / computer readable media (e.g., magnetic disk, flash memory, CD, DVD, etc.) and stop the music creation process (step 750).

[0057] On the other hand, if there is no indication that user wishes to stop (the 'NO_ branch of decision item 738), the user will be given an opportunity to make changes in the performance environment (step 740). In this instance, and according to some embodiments, the user will be given the option of replacing any or all of the items in the instrument bank 270, adjusting the relative volume of each instrument in the mix, adjusting the tempo of the entire work, changing the style of the entire musical work, it's key, time signature, etc. In short, the user will be given the option of modifying any performance-related parameter in real time while the performance and/or recording is taking place (step 740). As is discussed in greater detail below, changed parameters will be instantly reflected in the audio output of the work, where 'instantly_ should be understood to mean that the changes will be performed at the next moment when it would make musical sense to do so (e.g., at the next beat, at the start of the next measure, etc.), i.e., at a moment that is musically synchronous with the instruments/style/tempo that are already in the performance. Said another way, in an embodiment, any change that the user makes in a performance variable will be immediately reflected in the audio output of the performance.

[0058] Next, and preferably, the change or changes indicated by the user will be implemented in the musical performance (step 745) in such a way as to harmoniously

combine the additional, changed, or removed (muted) instruments/vocals with the current performance. This might mean, by way of example, matching the tempo of the current performance, its key, etc. Preferably, the new instrument will not enter the mix until the start of the next full measure of the performance but that is not a requirement. Of course, it is not a requirement that the modifications be only introduced at measure boundaries and, in some embodiments, the next beat (or 1/8th note, 1/16th note, etc.) could be used as an entry point. Any point of entry might be used so long as the entry is at a musically synchronous moment so as to create a harmonious combined work. Those of ordinary skill in the art will readily be able to devise other methods of smoothly adding new instruments to the output mix.

[0059] In summary, the instant invention provides a highly creative work method for both novice and professional user when generating music or just enjoying music and the music generation process. The instant invention will adapt to the knowledge and professionalism of the user providing individual options and features for selection that either adds complexity (for professionals) or minimizes complexity (for novice users).

CONCLUSIONS

[0060] Of course, many modifications and extensions could be made to the instant invention by those of ordinary skill in the art. For example in one preferred embodiment the instant invention will enter a random creativity mode, wherein the method will automatically change and replace loops, instruments and pitch. This mode will be entered when the user interaction level is very low. In another preferred embodiment the user can link an instrument with the instant invention and the method will 'listen' to the input from the instrument of the user and will accordingly select song parts, instruments and pitch to therewith generate a music work.

[0061] Thus, the present invention is well adapted to carry out the objects and attain the ends and advantages mentioned above as well as those inherent therein.

Claims

1. A method for automatically composing musical works with intuitive user interaction, comprising the steps of:

a. accessing an audio loop database containing a plurality of audio loops (600), each of said plurality of audio loops (600) being associated with at least one of a music style (610) a harmony suitability value (650), an information about the usability of the audio loop as a song part (630) a tempo value (620) and an information regarding the at least one instrument (640) the loop was taken from or created by ;

b. requiring a user to select a music style (210, 310, 705), said music style (210) being associated with a specific number of audio loops (600), a plurality of instruments (640), a plurality of song parts (240, 340), a tempo value (220, 320), a predefined tone pitch value (250, 330) related to the instruments and key related to the overall music score, a plurality of icons, or images (550), animations (560) and a name (570);

c. requiring the user to select a tempo value (220, 320) and a tone pitch value (250, 330), thereby determining a tempo value of the musical work a tone pitch value of the musical work;

d. assembling an instrument bank (270), wherein said instrument bank (270) is comprised of one or more of said plurality of audio loops (600), each of said assembled one or more audio loops (600) having at least one of said at least one associated music style (310) compatible with said selected music style (310).

e. presenting a representation of one or more instruments (260) with said selected music style to the user on a display device and a representation of a plurality of individual sequential song parts (240), and a representation of a pitch value (250) and tempo (220) ;

f. requiring the user to select from said displayed representation of said instruments at least one instrument, therewith selecting from said instrument bank (270) an initial audio loop from among said associated one or more audio loops (600).

g. algorithmically modifying said selected initial audio loop (600) at least according to said tempo value (220, 320) and said key, thereby producing a modified initial audio loop (600);

h. initiating a performance (725) of said selected modified initial audio loop (600) in said selected music style (210, 310);

i. creating an audible representation of said performance of said selected modified initial audio loop (600) for the user;

j. requiring (735) the user to select from said displayed representation of instruments (260, 350) at least one of another instrument and another song part (240, 340) and a tone pitch value (250, 330) and a tempo value (220, 320) and a style (210, 310) therewith selecting from said instrument bank (270) another audio loop (600), wherein said selection of said another loop (600) is depending on the harmony suitability value (650), said information about the usability of the audio loop as a song part (240, 340) and the tempo value (220, 320) associated with each audio loop (600);

k. algorithmically modifying (740, 745) said selected another audio loop (600) at least according to said tempo value (220, 320) or said instrument selection, or said song part selection (240,

- 340) or said tone pitch value (250, 330);
 l. adding said modified different audio loop (600) to said performance of said selected modified initial audio loop (600) in real time during said performance of said selected modified initial audio loop (600) to create a combined performance, wherein said modified different audio loop (600) is added at the next bar, musically synchronous with said performance of said modified initial audio loop (600) and corresponding with said information about the usability as a song part (630).
 m. creating (725) an audible representation of said combined performance for the user;
 n. performing at least steps (j) (725) through (1) (745) a plurality of times for a plurality of different instruments (640), therewith automatically composing musical works.
2. A method_for automatically composing musical works with intuitive user interaction according to Claim 1, wherein said audio loops (600) are selected from a group consisting of a horn, a guitar, a vocal performance, a drum, a harmonica, and a violin.
3. A method_for automatically composing musical works with intuitive user interaction according to Claim 1, further comprising the step of:
- n. storing at least a portion of said composed musical works on a computer readable medium.
4. A method_for automatically composing musical works with intuitive user interaction according to Claim 1, wherein said harmony suitability value (650) is indicating whether or not one audio loop (600) is musically compatible with another.
5. A method_for automatically composing musical works with intuitive user interaction to Claim 1, wherein said harmony suitability value (650) is either provided by the user, designed by the creator of the data structure, or determined by analysis of selected audio loops (600).
6. A method for automatically composing musical works with intuitive user interaction according to claim 5, wherein said analysis is determining musical values of selected audio loops (600) and comparing these determined musical values to determined musical values of other audio loops (600).
7. A method for automatically composing musical works with intuitive user interaction according to Claim 1, wherein said information about the usability of the audio loop (600) as a part (630) defines the usability of each audio loop (600) for individual parts of said musical works.

8. A method_for automatically composing musical works with intuitive user interaction according to Claim 7, wherein said individual parts of said musical works are selected from a group consisting of intro, variance and ending.
9. A method for automatically composing musical works with intuitive user interaction according to Claim 1, wherein said selection of another instrument (640), a tempo value (530) and a predefined tone pitch value (540) is carried out automatically after selection of an automatic mode.
10. A method for automatically composing musical works with intuitive user interaction according to Claim 1, wherein said intuitive user interaction is based on an adjustable user interaction level.
11. An apparatus configured to perform all the steps of the method of any of the previous claims.
12. A computer program adapted to perform all the steps of the method of any of the previous claims.

Patentansprüche

1. Eine Methode zur automatischen Komposition von Musikstücken mit intuitiver Nutzerinteraktion umfasst folgende Schritte:
- a. zugreifen auf eine Audio Loop Datenbank, welche eine Vielzahl von Audio Loops (600) enthält, jeder der Vielzahl von Audio Loops (600) ist verknüpft mit mindestens einem Musikstil (610), einem Harmonie-Tauglichkeitswert (650), einer Information über die Verwendbarkeit des Audio Loop als ein Song Bestandteil (630), einem Tempowert (620) und einer Information hinsichtlich des mindestens einem Instruments (640) von welchem das Loop erstellt oder entnommen wurde;
- b. verlangen vom Nutzer der Auswahl eines Musikstils (210, 310, 705), dieser Musikstil (210) ist verknüpft mit einer spezifischen Anzahl von Audio Loops (600), einer Vielzahl von Instrumenten (640), einer Vielzahl von Song Bestandteilen (240, 340), einem Tempowert (220, 320), einem vordefinierten Tonhöhenwert (250, 330) der einen Bezug zu den Instrumenten hat und einer Tonart die einen Bezug zu dem gesamten Musikstück hat, eine Vielzahl von Bildsymbolen, oder Bildern (550), Animationen (560) und einen Namen (570);
- c. verlangen vom Nutzer der Auswahl eines Tempowertes (220, 320) und eines Tonhöhenwertes (250, 330), somit bestimmen eines Tempowertes des Musikstücks und des Tonhöhen-

wertes des Musikstücks;

d. zusammenstellen einer Instrumentenbank (270), wobei die Instrumentenbank (270) einen oder mehrere Audio Loops (600) aus der Vielzahl von Audio Loops umfasst, jeder der zusammengestellten einen oder mehreren Audio Loops (600) hat mindestens einen der genannten Musikstile (310) welcher kompatibel mit dem ausgewählten Musikstil (310) ist.

e. bereitstellen einer Darstellung von einem oder mehreren Instrumenten (260) verknüpft mit dem ausgewählten Musikstil zum Nutzer auf einem Darstellungsgerät, sowie einer Darstellung einer Vielzahl von individuellen aufeinanderfolgenden Songbestandteilen (240) und einer Darstellung von Tonhöhenwert (250) und Tempo (220);

f. verlangen vom Nutzer der Auswahl aus der bereitgestellten Darstellung der Instrumente mindestens ein Instrument, somit auswählen aus der Instrumenten Bank (270) eines ersten Audio Loops aus den verknüpften einen oder mehreren Audio Loops (600);

g. algorithmische Veränderung des ausgewählten ersten Audio Loop (600) zumindest gemäß des Tempowertes (220, 320) und der Tonart, somit Erstellung eines modifizierten ersten Audio Loop (600);

h. initiieren einer Wiedergabe (725) des ausgewählten modifizierten ersten Audio Loop (600) in dem gewählten Musikstil (210, 310);

i. erstellen einer hörbaren Darstellung der Wiedergabe des ausgewählten modifiziertem ersten Audio Loop (600) für den Nutzer;

j. verlangen (735) vom Nutzer der Auswahl aus der bereitgestellten Darstellung von Instrumenten (260, 350) mindestens eines der anderen Instrumente und einen anderen Song Bestandteil (240, 340) und einen Tonhöhenwert (250, 330) und einen Tempowert (220, 320) und einen Stil (210, 310) somit Auswahl aus der Instrumentenbank (270) einen anderen Audio Loop (600), wobei die Auswahl des anderen Audio Loop (600) abhängig von dem Harmonie-Tauglichkeitswert (650) ist, die Information über die Verwendbarkeit des Audio Loop als einen Song Bestandteil (240, 340) und dem Tempowert (220, 320) verknüpft mit jedem Audio Loop (600);

k. algorithmisches verändern (740, 745) des ausgewählten anderen Audio Loop (600) mindestens gemäß des Tempowertes (220, 320) oder der Instrumentenauswahl, oder der Auswahl als Song Bestandteil (240, 340) oder des Tonhöhenwertes (250, 330);

l. hinzufügen des modifizierten anderen Audio Loop (600) zur Wiedergabe des ausgewählten modifizierten ersten Audio Loop (600) in Echtzeit während der Wiedergabe des ausgewähl-

ten modifizierten ersten Audio Loop (600) zur Erstellung einer kombinierten Wiedergabe, wobei der modifizierte andere Audio Loop (600) zum nächsten Takt hinzugefügt wird, musikalisch synchron mit der Wiedergabe des modifizierten ersten Audio Loop (600) und gemäß der Information über die Verwendbarkeit als ein Song Bestandteil (630);

m. erstellen (725) einer hörbaren Darstellung der kombinierten Wiedergabe für den Nutzer;

n. durchführen von mindestens Schritten (j) (725) bis (1) (745) mehrmals für eine Vielzahl von verschiedenen Darstellungen von Instrumenten (640), somit automatische Komposition von Musikstücken.

2. Eine Methode zur automatischen Komposition von Musikstücken mit intuitiver Nutzerinteraktion gemäß Anspruch 1, worin die Audio Loops (600) ausgewählt werden aus einer Gruppe bestehend aus einem Horn, einer Gitarre, einer gesanglichen Vorstellung, einem Schlagzeug, einer Harmonika und einer Violine ausgewählt werden.

3. Eine Methode zur automatischen Komposition von Musikstücken mit intuitiver Nutzerinteraktion gemäß Anspruch 1, enthält den folgenden weiteren Schritt:

n. Speicherung von mindestens einem Teil des komponierten Musikstücks auf einem Computer lesbaren Medium.

4. Eine Methode zur automatischen Komposition von Musikstücken mit intuitiver Nutzerinteraktion gemäß Anspruch 1, wobei der Harmonie-Tauglichkeitswert (650) anzeigt ob ein Audio Loop (600) musikalisch kompatibel mit einem anderen Audio Loop ist.

5. Eine Methode zur automatischen Komposition von Musikstücken mit intuitiver Nutzerinteraktion gemäß Anspruch 1, wobei der Harmonie-Tauglichkeitswert (650) entweder vom Nutzer bereitgestellt wird, vom Ersteller der Datenstruktur generiert wurde, oder durch eine Analyse ausgewählter Audio Loops bestimmt wurde (600).

6. Eine Methode zur automatischen Komposition von Musikstücken mit intuitiver Nutzerinteraktion gemäß Anspruch 5, wobei die Analyse die musikalischen Werte von ausgewählten Audio Loops (600) bestimmt und diese Werte mit musikalischen Werten von anderen Audio Loops vergleicht.

7. Eine Methode zur automatischen Komposition von Musikstücken mit intuitiver Nutzerinteraktion gemäß Anspruch 1, wobei die Information über die Verwendbarkeit des Audio Loop (600) als Song Bestandteil (630) die Verwendbarkeit von jedem Audio

Loop für individuelle Bestandteile der Musikstücke definiert.

8. Eine Methode zur automatischen Komposition von Musikstücken mit intuitiver Nutzerinteraktion gemäß Anspruch 7, wobei die individuellen Song Bestandteile der Musikstücke aus einer Gruppe bestehend aus Intro, Varianz und Ende ausgewählt werden. 5
9. Eine Methode zur automatischen Komposition von Musikstücken mit intuitiver Nutzerinteraktion gemäß Anspruch 1, wobei die Selektion von anderen Instrumenten (640), einem Tempowert (530) und einem vordefinierten Tonhöhenwert (540) automatisch nach der Auswahl eines automatischen Modi durchgeführt wird. 10 15
10. Eine Methode zur automatischen Komposition von Musikstücken mit intuitiver Nutzerinteraktion gemäß Anspruch 1, wobei die intuitive Nutzerinteraktion auf einem anpassbaren Nutzerinteraktionslevel basiert. 20
11. Eine Vorrichtung so konfiguriert, das von dieser alle Schritte der Methode von jedem der vorhergehenden Ansprüche ausgeführt werden können. 25
12. Ein Computerprogramm so konfiguriert, das von diesem alle Schritte der Methode von jedem der vorhergehenden Ansprüche ausgeführt werden können. 30

Revendications

1. Une méthode qui permet de composer automatiquement des oeuvres musicales avec une interaction utilisateur intuitive et qui englobe les étapes suivantes : 35
 - a. Accès à une base de données de boucles audio qui contient un grand nombre de boucles audio (600), chacune desdites boucles audio (600) étant associée à au moins un style musical (610), une valeur d'adéquation harmonique (650), une information sur son utilisabilité en tant que composant de morceau de musique (630), une valeur de tempo (620) et une information concernant ledit au moins un instrument (640) à partir duquel la boucle a été créée ou extraite ; 40
 - b. Demande à l'utilisateur de sélectionner un style musical (210, 310, 705), ledit style musical (210) étant associé à un nombre spécifique de boucles audio (600), un grand nombre d'instruments (640), un grand nombre de composants de morceau de musique (240, 340), une valeur de tempo (220, 320), une valeur de tonalité (250, 330) pré-définie en lien avec les instruments et un ton en lien avec le morceau de musique en- 45 50 55

tier, un grand nombre d'icônes ou d'images (550), des animations (560) et un nom (570) ;
 c. Demande à l'utilisateur de sélectionner une valeur de tempo (220, 320) et une valeur de tonalité (250, 330), déterminant ainsi la valeur de tempo et la valeur de tonalité de l'oeuvre musicale ;
 d. Composition d'une banque d'instruments (270), ladite banque d'instruments (270) comprenant une ou plusieurs boucles audio (600) issues du grand nombre de boucles audio, chacune desdites une ou plusieurs boucles audio (600) assemblées étant dans au moins un desdits styles musicaux (310), qui est compatible avec le style musical (310) sélectionné.
 e. Mise à disposition de la représentation d'un ou de plusieurs instruments (260) associés avec le style musical sélectionné sur un dispositif d'affichage, ainsi que de la représentation d'un grand nombre de composants de morceau de musique (240) consécutifs individuels et de la représentation de la valeur de tonalité (250) et de la valeur de tempo (220) ;
 f. Demande à l'utilisateur de sélectionner au moins un instrument depuis la représentation des instruments mise à disposition, c'est-à-dire de sélectionner dans la banque d'instruments (270) une première boucle audio parmi lesdites une ou plusieurs boucles audio (600) associées ;
 g. Modification algorithmique de la première boucle audio (600) sélectionnée au moins en fonction de la valeur de tempo (220, 320) et du ton, créant ainsi une première boucle audio (600) modifiée ;
 h. Lancement de la lecture (725) de la première boucle audio (600) modifiée sélectionnée dans le style musical (210, 310) choisi ;
 i. Création d'une représentation audible de la lecture de la première boucle audio (600) modifiée sélectionnée pour l'utilisateur ;
 j. Demande (735) à l'utilisateur de sélectionner dans la représentation d'instruments (260, 350) mise à disposition au moins l'un des autres instruments, un autre composant de morceau de musique (240, 340), une valeur de tonalité (250, 330), une valeur de tempo (220, 320) et un style musical (210, 310), c'est-à-dire de sélectionner dans la banque d'instruments (270) une autre boucle audio (600), ladite autre boucle audio (600) étant sélectionnée en fonction de la valeur d'adéquation harmonique (650), de l'information sur l'utilisabilité en tant que composant de morceau de musique (240, 340) et de la valeur de tempo (220, 320) associée à chaque boucle audio (600) ;
 k. Modification algorithmique (740, 745) de l'autre boucle audio (600) sélectionnée au

- moins en fonction de la valeur de tempo (220, 320), de la sélection d'instrument, de la sélection en tant que composant de morceau de musique (240, 340) ou de la valeur de tonalité (250, 330) ;
- l. Ajout de l'autre boucle audio (600) modifiée pour la lecture en temps réel de la première boucle audio (600) modifiée sélectionnée pendant la lecture de la première boucle audio (600) modifiée sélectionnée pour la création d'une lecture combinée, ladite autre boucle audio (600) modifiée étant ajoutée à la mesure suivante, musicalement synchronisée avec la lecture de la première boucle audio (600) modifiée et en fonction de l'information sur son utilisabilité en tant que composant de morceau de musique (630) ;
- m. Création (725) d'une représentation audible de la lecture combinée pour l'utilisateur ;
- n. Réalisation au moins des étapes (j) (725) à (1) (745) plusieurs fois pour un grand nombre de représentations différentes d'instruments (640), et composition automatique d'oeuvres musicales.
2. Une méthode qui permet de composer automatiquement des oeuvres musicales avec une interaction utilisateur intuitive conformément à la revendication 1 et qui consiste à sélectionner les boucles audio (600) à partir d'un groupe composé d'un cor, d'une guitare, d'un chant, d'une batterie, d'un harmonica et d'un violon.
3. Une méthode qui permet de composer automatiquement des oeuvres musicales avec une interaction utilisateur intuitive conformément à la revendication 1 et qui comprend l'étape supplémentaire suivante :
- n. Sauvegarde d'au moins une partie de l'oeuvre musicale composée sur un support lisible par ordinateur.
4. Une méthode qui permet de composer automatiquement des oeuvres musicales avec une interaction utilisateur intuitive conformément à la revendication 1 et qui prévoit que la valeur d'adéquation harmonique (650) indique si une boucle audio (600) est musicalement compatible avec une autre boucle audio.
5. Une méthode qui permet de composer automatiquement des oeuvres musicales avec une interaction utilisateur intuitive conformément à la revendication 1 et qui prévoit que la valeur d'adéquation harmonique (650) est soit mise à disposition par l'utilisateur, soit générée par le créateur de la structure de données, soit déterminée par une analyse de boucles audio (600) sélectionnées.
6. Une méthode qui permet de composer automatiquement des oeuvres musicales avec une interaction
- utilisateur intuitive conformément à la revendication 5 et qui prévoit que l'analyse détermine les valeurs musicales de boucles audio (600) sélectionnées et compare lesdites valeurs avec les valeurs musicales d'autres boucles audio.
7. Une méthode qui permet de composer automatiquement des oeuvres musicales avec une interaction utilisateur intuitive conformément à la revendication 1 et qui prévoit que l'information sur l'utilisabilité de la boucle audio (600) en tant que composant de morceau de musique (630) définit l'utilisabilité de chaque boucle audio pour des composants individuels des oeuvres musicales.
8. Une méthode qui permet de composer automatiquement des oeuvres musicales avec une interaction utilisateur intuitive conformément à la revendication 7 et qui prévoit que les composants individuels des oeuvres musicales sont sélectionnés à partir d'un groupe composé d'une introduction, d'une variation et d'une fin.
9. Une méthode qui permet de composer automatiquement des oeuvres musicales avec une interaction utilisateur intuitive conformément à la revendication 1 et qui prévoit que la sélection d'autres instruments (640), d'une valeur de tempo (530) et d'une valeur de tonalité (540) pré-définie est effectuée automatiquement après la sélection d'un mode automatique.
10. Une méthode qui permet de composer automatiquement des oeuvres musicales avec une interaction utilisateur intuitive conformément à la revendication 1 et qui prévoit que l'interaction utilisateur intuitive est basée sur un degré ajustable d'interaction utilisateur.
11. Un dispositif configuré pour permettre de réaliser toutes les étapes de la méthode de chacune des revendications précédentes.
12. Un programme d'ordinateur configuré pour permettre de réaliser toutes les étapes de la méthode de chacune des revendications précédentes.

Figure 1

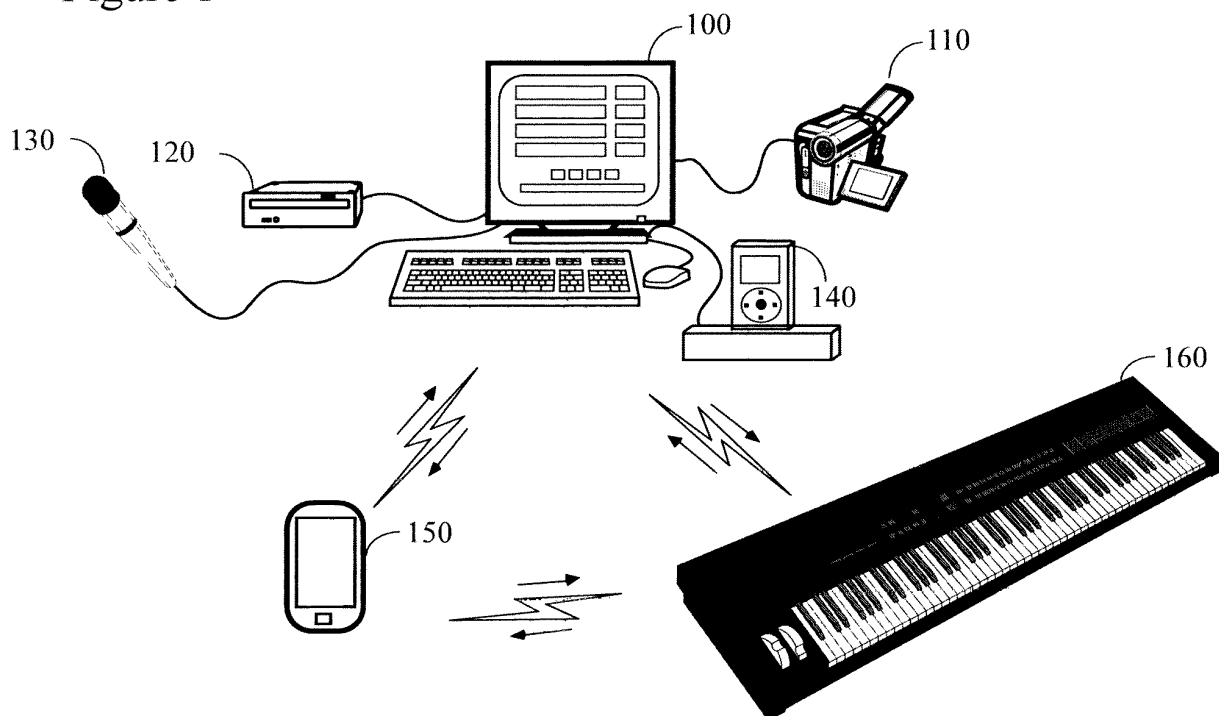


Figure 3

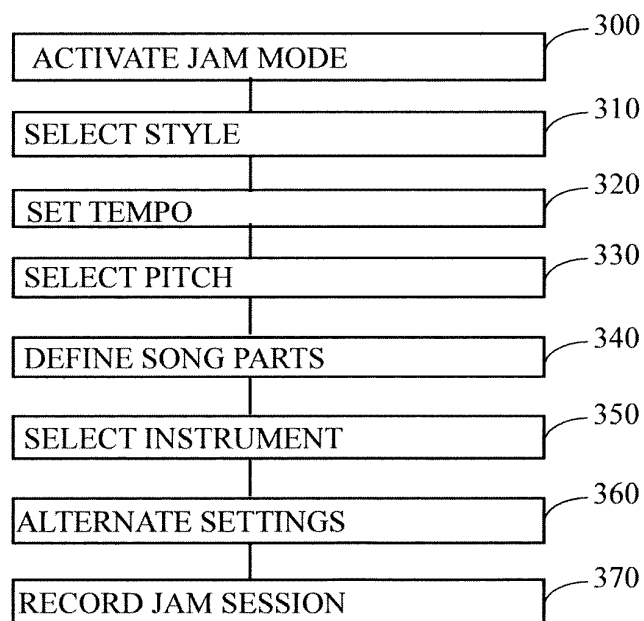


Figure 2

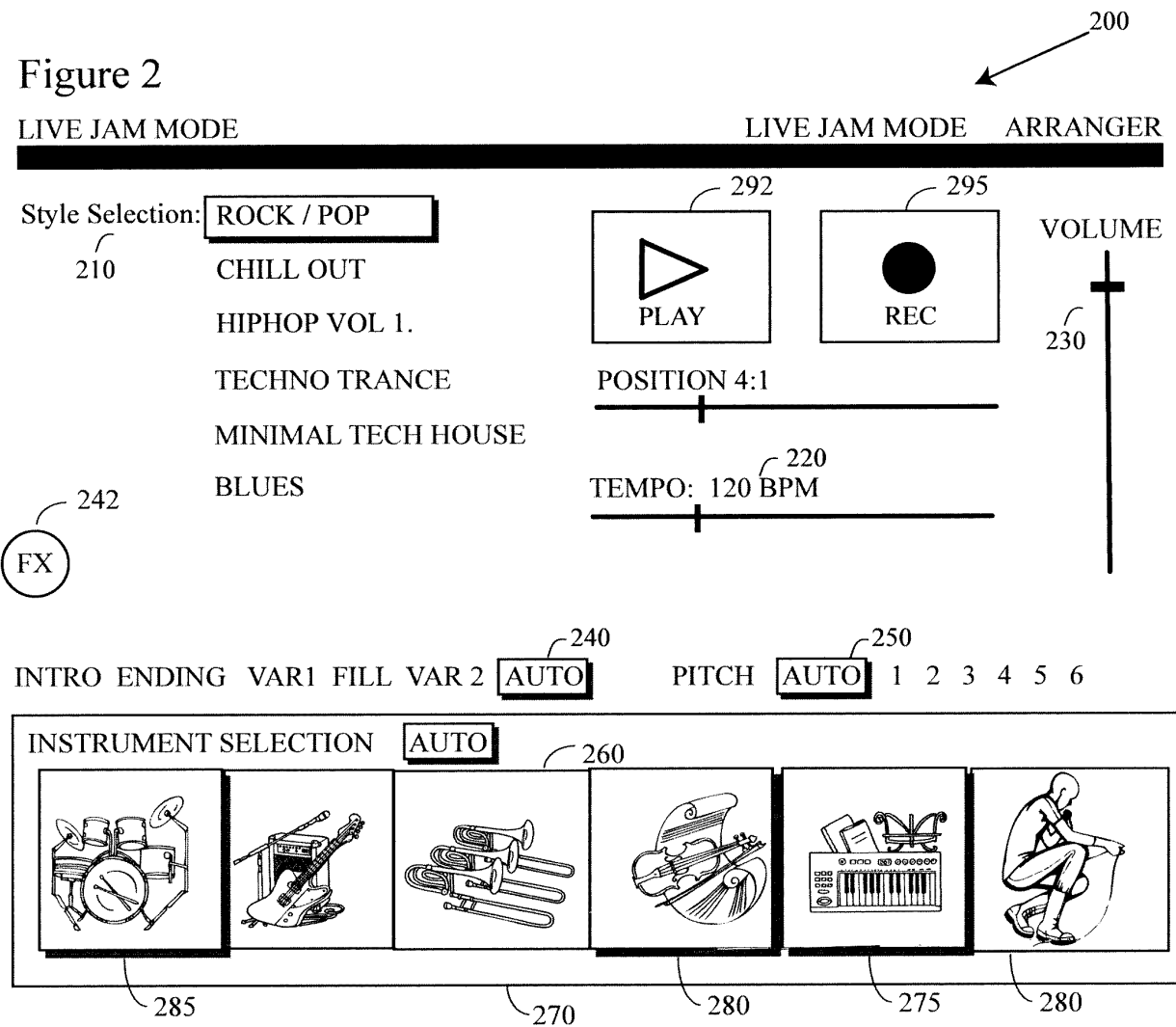


Figure 4

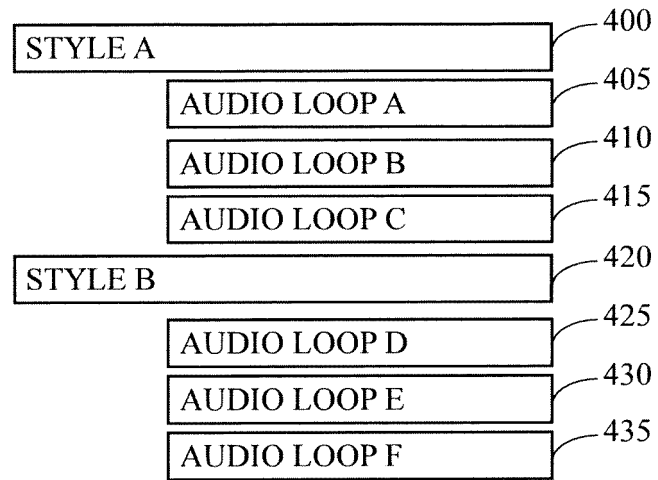


Figure 5

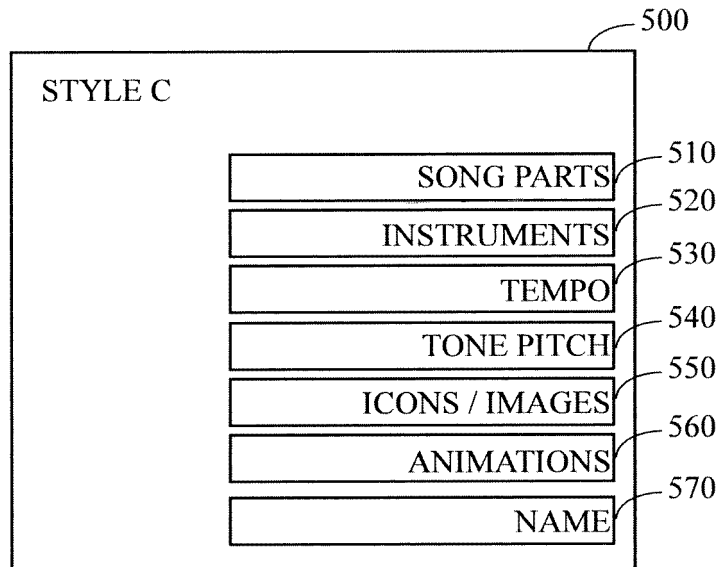


Figure 6

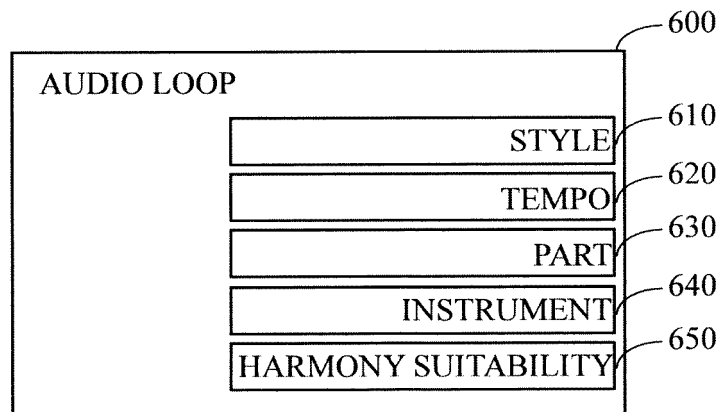


Figure 7

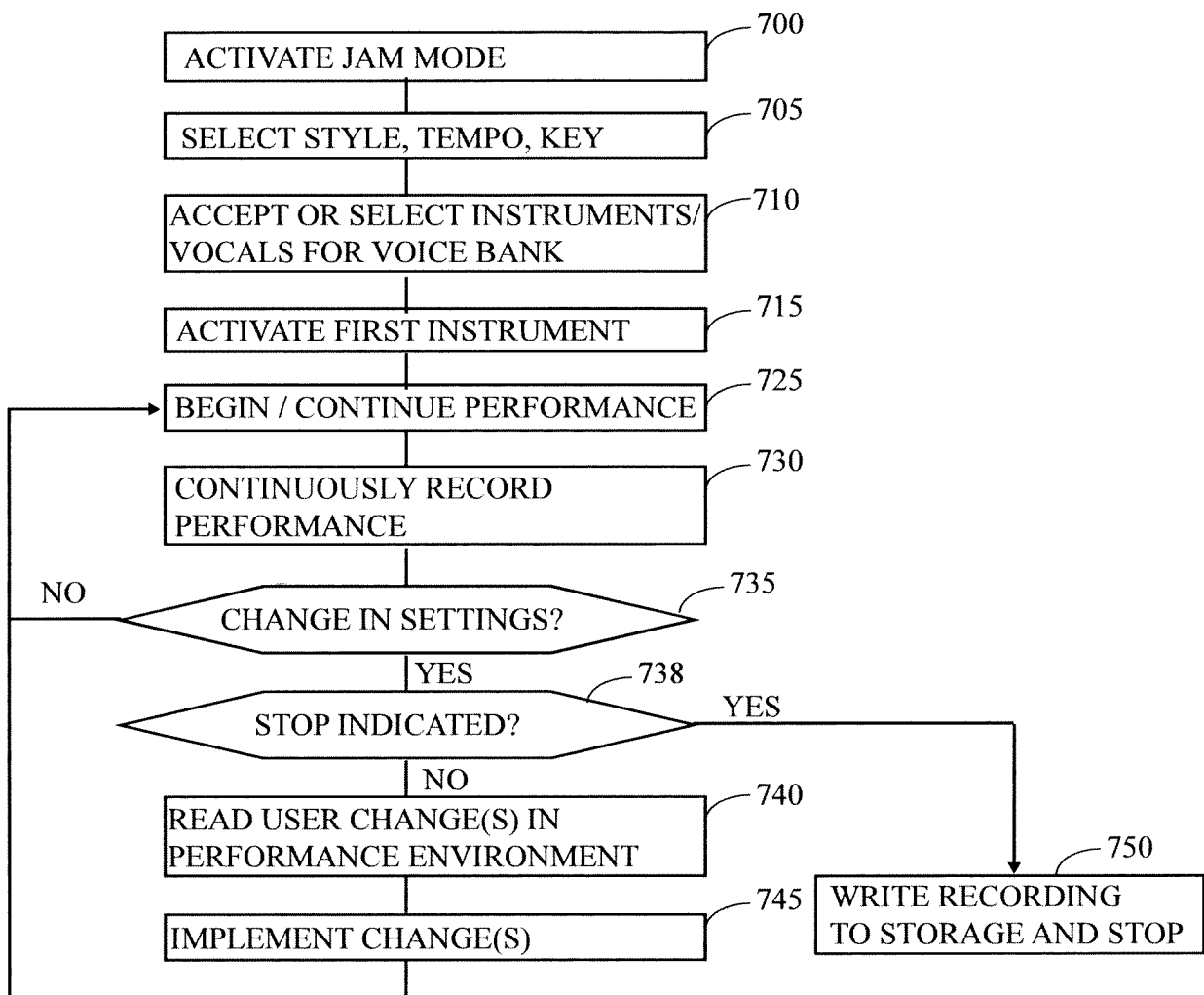
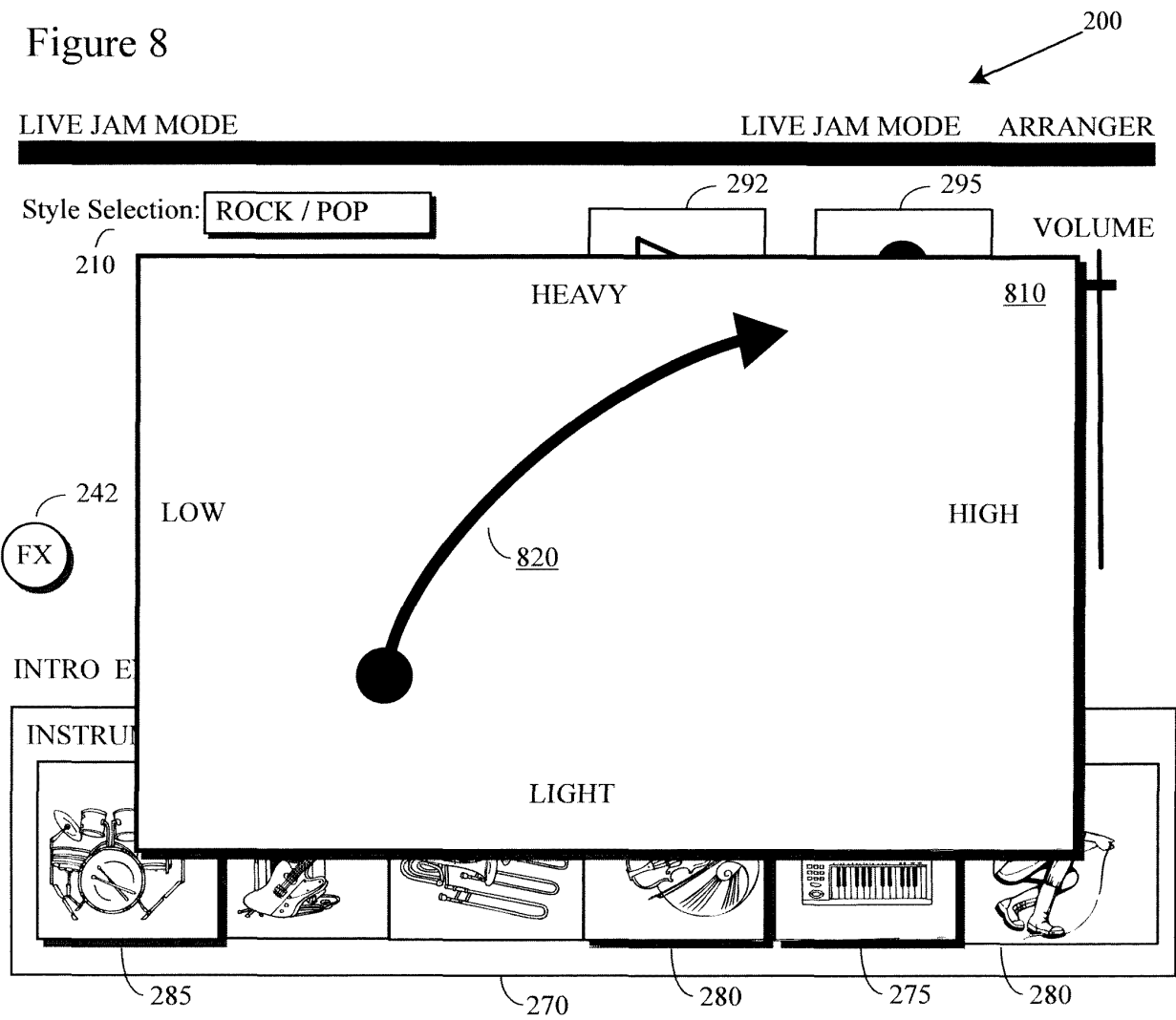


Figure 8



REFERENCES CITED IN THE DESCRIPTION

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