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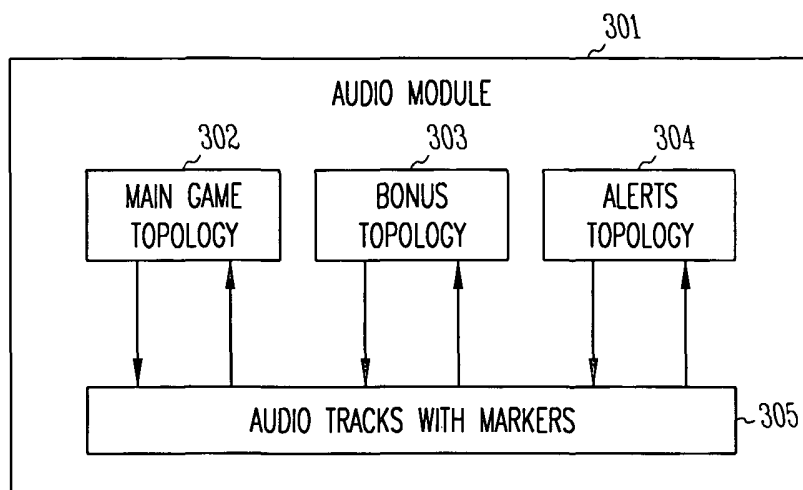
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(54) Title: AUDIO MARKERS IN A COMPUTERIZED WAGERING GAME



(57) Abstract: A computerized wagering game system has a gaming module comprising a processor and gaming code which is operable when executed on the processor to present or conduct a wagering game on which monetary value can be wagered. An audio module is operable to process markers embedded within an audio stream, wherein the markers comprise structured audio commands.

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AUDIO MARKERS IN A COMPUTERIZED WAGERING GAME

Related Application(s)

5 This application claims the priority benefit of U.S. Provisional Application Serial No. 60/615564, filed 1 October 2004, the contents of which are incorporated herein by reference.

Field of the Invention

10 The invention relates generally to audio in wagering gaming systems, and more specifically to audio markers in a computerized wagering game system.

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Background of the Invention

20 A wide variety of gaming devices are now available to gamers and to casino operators in computerized form, from slot machines to games that are traditionally played live such as poker and blackjack. These computerized games provide many benefits to the game owner and to the gambler, including greater reliability than can
25 be achieved with a mechanical game or human dealer, more variety, sound, and animation in presentation of a game, and a lower overall cost of production and management.

Computerized video game systems must be designed with many of the same concerns as their mechanical and table game ancestors - they must be fair, they must provide sufficient feedback to the gamer to make the game fun to play, and they must meet a variety of gaming regulations to ensure that both the machine owner and gamer are honest and fairly treated in implementing the game. Further, they must provide a gaming experience that is at least as attractive as the older mechanical gaming machine experience to the gamer, to ensure success in a competitive gaming market.

Many computerized wagering game systems have a variety of sound and graphical elements designed to attract and keep a game player's attention, such as sound effects, music, and animation. These game presentation features often include a variety of music, sound effects, and voices presented to complement a video presentation of the wagering game on a display.

But, many challenges are faced in presenting audio to enhance a wagering game. Sounds must be stored on the wagering game system, which requires storage space and is expensive despite many sounds being stored in a compressed format. Even when compressed, sounds must be decompressed to be played, resulting in consumption of significant processor resources.

Further, it is difficult to coordinate the playing of sounds with animation or wagering game activity presented on the screen, particularly when sounds and animations presented run for significant lengths of time. Starting and stopping various audio clips or sounds repeatedly can be distracting as a solution can also be problematic, as this requires management of a greater number of audio clips and the transition between audio clips is often audible due to DC offsets or other sharp transitions.

It is therefore desirable to better manage the audio presented in the computer wagering game.

Summary of the Invention

The present invention provides in one embodiment a computerized wagering game system having a gaming module comprising a processor and gaming code which is operable when executed on the processor to conduct a wagering game on which monetary value can be wagered. An audio module is operable to process markers embedded within an audio stream, wherein the markers comprise structured audio commands.

Brief Description of the Figures

Figure 1 shows a computerized reel slot gaming system employing an audio module operable to process audio stream markers, consistent with an example embodiment of the present invention.

Figure 2 shows an audio stream with embedded markers, consistent with an example embodiment of the present invention.

Figure 3 shows a modular view of an audio module supporting multiple audio topologies, consistent with an example embodiment of the present invention.

Figure 4 shows an audio stream with an embedded chorus marker and a chorus audio stream with embedded markers, consistent with an example embodiment of the present invention.

Detailed Description

In the following detailed description of sample embodiments of the invention, reference is made to the accompanying drawings which form a part hereof, and in which is shown by way of illustration specific sample embodiments in which the invention may be practiced. These embodiments are described in sufficient detail to enable those skilled in the art to practice the invention, and it is to be understood that other embodiments may be utilized and that logical, mechanical, electrical, and other changes may be made without departing from the spirit or scope of the present invention. The following detailed description is, therefore, not to be

taken in a limiting sense, and the scope of the invention is defined only by the appended claims.

The present invention provides in one example embodiment a computerized wagering game system having a gaming module comprising a processor and gaming
5 code which is operable when executed on the processor to conduct or present a wagering game on which monetary value can be wagered, and an audio module that is operable to process markers embedded within an audio stream, wherein the markers comprise structured audio commands.

Figure 1 illustrates a computerized wagering game machine, as may be used
10 in an embodiment of the present invention. The computerized gaming system shown generally at 100 is a video wagering game system, which displays information for at least one wagering game upon which monetary value can be wagered on video display 101. Video display 101 is in various embodiments a CRT
15 display, an LCD display, a surface conducting electron emitter display, or any other type of display suitable for displaying electronically provided display information. Alternate embodiments of the invention will have other game indicators, such as mechanical reels instead of the video graphics reels shown at 102 that comprise a part of a video slot machine wagering game.

A game of chance is implemented as software within the wagering game,
20 such as via instructions stored on a machine-readable medium such as a hard disk drive or nonvolatile memory. In some further example embodiments, some or all of the software stored in the wagering game machine is encrypted or is verified using a hash algorithm or encryption algorithm to ensure its authenticity and to verify that it has not been altered. The game of chance takes various forms in different wagering
25 game machines, and includes such well-known wagering games as reel slots, video poker, blackjack, craps, roulette, or hold 'em games. The wagering game is played and controlled with inputs such as various buttons 103 or via a touchscreen overlay to video screen 101. In some alternate examples, other devices such as pull arm 104 used to initiate reel spin in this reel slot machine example are employed to provide

other input interfaces to the game player.

Monetary value is typically wagered on the outcome of the games, such as with tokens, coins, bills, or cards that hold monetary value. The wagered value is conveyed to the machine through a changer 105 or a secure user identification
5 module interface 106, and winnings are returned via the returned value card or through the coin tray 107. Sound is also provided through speakers 108. In some further embodiments, the wagering game machine is coupled to a network, and is operable to use its network connection to receive wagering game data, track players and monetary value associated with a player, and to perform other such functions.

10 Figure 2 illustrates the content of an audio stream with embedded markers, consistent with an example embodiment of the present invention. The audio stream portion illustrated begins with a region marker 201 that identifies the particular region of the audio stream and in various embodiments contains data such as the length of the region and the region name or other identifier. The following data in
15 section 202 is audio data that is a part of the defined region, while 203 is a chorus marker within the region. Upon reaching the chorus marker, the marker is passed to the audio module which plays the chorus before proceeding through the audio stream of Figure 2. In some embodiments, the chorus marker identifies a specific chorus by name, number, or other identifier. Upon completing the chorus, the audio
20 module resumes playing the audio stream data 204, until reaching another chorus marker that is similarly processed at 205. Upon subsequent completion of playing the audio stream data contained in portion 206 of the encoded audio stream, a stop marker is reached at 207 which triggers a controlled stop of play of the audio stream.

In some embodiments of the invention, the stop marker need not be present
25 to identify the point at which the audio module is to stop playing a region, as the region marker in some embodiments identifies a region length that defines the size of a region so that when a region is played only a certain length of audio stream data is played. The stop marker 207 in some embodiments is processed by the audio module to create a smooth or gradual stop rather than a hard transition from playing

an audio stream to not playing the audio stream. In many existing systems, stopping playback of an audio stream at an arbitrary point results in stopping while the audio signal is at a voltage level other than zero, resulting in a sharp pop or click as the audio signal voltage transitions abruptly to a zero level. Various embodiments of the present invention transition to a zero voltage level in a slow or controlled manner, or simply wait until the voltage level reaches zero to stop.

In one audio module example, the audio module comprises multiple topologies, each operable to independently manage playback of audio streams, as is illustrated in Figure 3. The audio module 301 includes a separate audio topology for the main game at 302, bonus events 303, and alerts 304. Each is operable to read audio stream data 305 and to receive and process markers embedded in the audio streams, as well as to communicate control data with other executing applications such as a wagering game module that conducts a game of chance on which monetary value can be wagered.

In operation, the volume, playback state, and other such parameters of each topology are independently managed, and do not affect the topology state of other topologies. In one example, when a wagering game machine experiences an exception condition and the game is halted, the main game topology and the bonus topology are muted or paused while the alerts topology continues to be operable to play alert sounds to attract a floor manager's attention. In other embodiments, other categories of topologies are used so that audio can be independently controlled for different categories of sound.

Figure 4 illustrates how markers embedded in an audio stream can control playback of the audio stream through the data embedded in the markers. Audio stream 401 has a chorus marker 402, which calls a chorus named "adventure". The audio topology then begins playing back the adventure chorus, identified by the region marker 403 of the adventure chorus audio stream 404. The region marker 403 comprises a region name or other identifier, which in this example is the name "adventure". It also defines the length of the audio stream as 512 segments, and

contains the instruction that the chorus is to be repeated twice. After the adventure chorus of 512 segments is played twice, the audio module returns audio stream processing to the audio stream 401.

Other markers are used to provide different feedback or control signals to the audio module, the audio topology, or other application software. A beat marker embedded in the audio stream is able to indicate the timing of a beat in the music contained in the audio stream, enabling the software to receive the beat marker data and synchronize video or other events to beats in the music. A break marker is operable to break play of an audio stream, either immediately or on a zero crossing event in various embodiments. A chorus marker is operable to call a chorus region of audio stream data, as illustrated in Figure 4. A topo marker identifies the topology in which an audio stream should be played, or to which other audio markers should be passed. A stop marker indicates that playback is to stop, such as on a zero crossing or via a slow transition to being inaudible. A wait marker enables an audio stream to wait for a signal before proceeding through playing an audio stream, such as receiving a signal that a video event is beginning to coordinate playback of an audio stream to accompany the video event. Similarly, other signal markers are able to send other signals and marker data to the audio engine.

Use of the embedded markers relies upon having both an audio stream format able to store the embedded marker data and an audio engine able to receive and interpret the audio markers. In some embodiments, standard audio file formats are used with markers embedded in reserved non-audio locations, or with markers embedded as inaudible components of the actual audio signal. The audio engine is designed specifically to receive and decode the marker data, and to process it according to the marker type and data contained within the marker.

Markers can be placed in audio streams in a number of ways, such as by using unused or reserved fields in various music coding formats or by encoding inaudible signals in the music stream that are detectable and interpretable as marker data. Because many lossy formats for music compression would discard inaudible

information encoded into the audio stream such as embedded positional information or other such data that may be used by the audio engine in playback, such embodiments will often use lossless compression such as rice coding, Meridian lossless packing, MP4 lossless encoding, or other such lossless encoding schemes.

5 Still other audio formats, such as the WAV audio file format, are uncompressed and have reserved space into which markers can be easily inserted.

Use of markers in compressed audio streams further enables selective decompression or decoding of the encoded data, whether lossless or lossy, because only the audio stream data in a called region, chorus, or other segment of the audio stream needs to be decoded at a given time. Various embodiments of the invention

10 will decode future or soon-to-be-used regions of the audio stream, but need not decode or decompress an entire audio stream to manage playback using markers. This improves system performance, and reduces the demand on an audio module that would otherwise need to decode or decompress an entire audio file.

15 The examples shown herein have illustrated how markers embedded in an audio stream can be used in a computerized wagering game system to send non-audio data as structured commands to an audio module. Although specific embodiments have been illustrated and described herein, it will be appreciated by those of ordinary skill in the art that any arrangement which is calculated to achieve

20 the same purpose may be substituted for the specific embodiments shown. This application is intended to cover any adaptations or variations of the invention. It is intended that this invention be limited only by the claims, and the full scope of equivalents thereof.

Claims

1. A computerized wagering game system, comprising:
a gaming module comprising a processor and gaming code which is operable when executed on the processor to present a wagering game on which monetary value can be wagered;
an audio module operable to process markers embedded within an audio stream, wherein the markers comprise structured audio commands.
2. The computerized wagering game system of claim 1, wherein processing the markers comprises passing marker data to an application.
3. The computerized wagering game system of claim 1, wherein the markers comprise beat markers operable to identify a beat location within an audio stream.
4. The computerized wagering game system of claim 1, wherein the markers comprise break markers operable when processed to cause playback of the audio stream to stop.
5. The computerized wagering game system of claim 4, wherein the audio stream stop occurs at a zero crossing point of the audio stream.
6. The computerized wagering game system of claim 1, wherein the markers comprise topo markers that indicate a desired playback topology in a multiple audio topology environment.
7. The computerized wagering game system of claim 6, wherein the multiple audio topology environment comprises multiple independently managed audio playback environments.

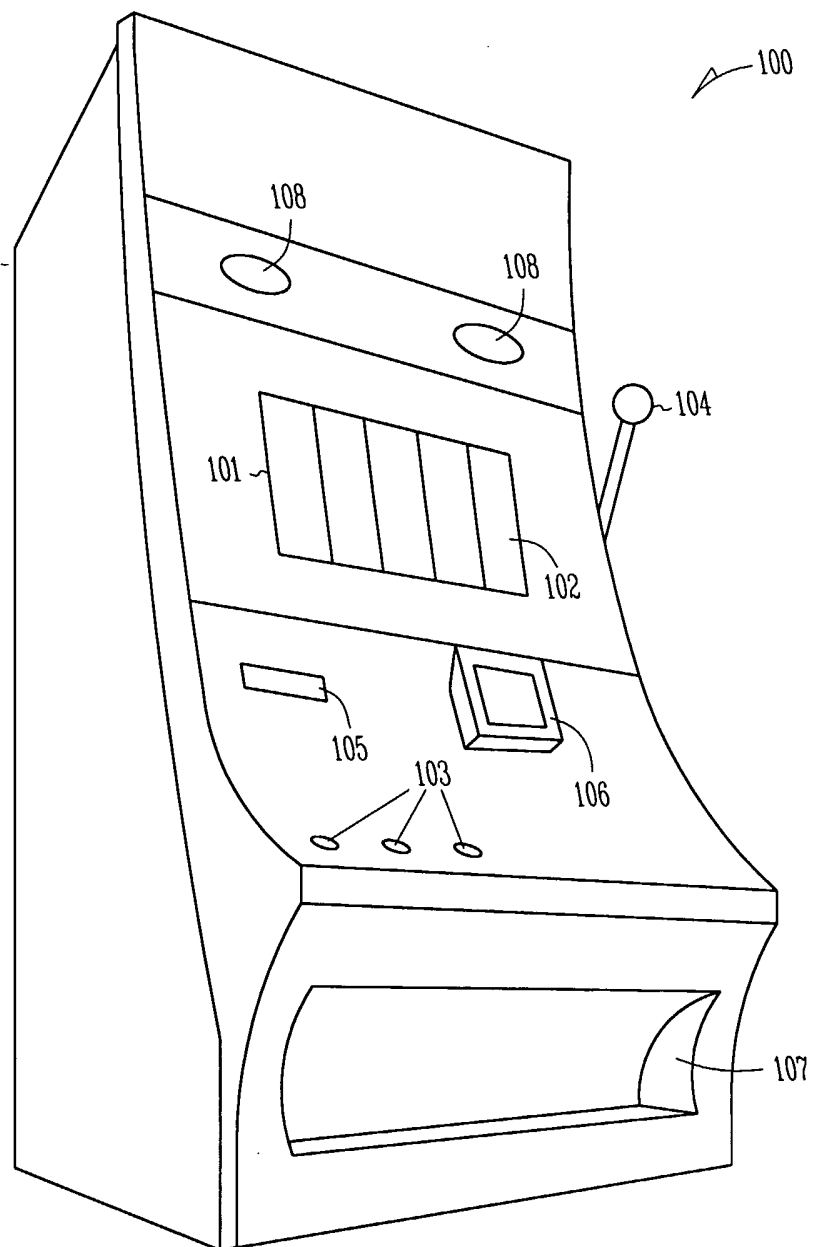
8. The computerized wagering game system of claim 1, wherein the markers comprise stop markers operable when processed to cause a controlled stop of the audio stream playback.
9. The computerized wagering game system of claim 1, wherein the markers comprise wait markers operable when processed to cause the audio module to wait for a signal before playing the audio stream.
10. The computerized wagering game system of claim 1, wherein the markers comprise signal markers operable to send data embedded in the signal marker to an application.
11. The computerized wagering game system of claim 1, wherein the markers comprise region markers used to identify regions within an audio stream.
12. The computerized wagering game system of claim 11, wherein the region markers comprise region length data.
13. A method of operating a computerized wagering game system, comprising:
presenting a wagering game on which monetary value can be wagered;
processing markers embedded within an audio stream in an audio module,
wherein the markers comprise structured audio commands.
14. The method of claim 13, wherein processing the markers comprises passing marker data to an application.
15. The method of claim 13, wherein the markers comprise beat markers operable to identify a beat location within an audio stream.

16. The method of claim 13, wherein the markers comprise break markers operable when processed to cause playback of the audio stream to stop.
17. The method of claim 16, wherein the audio stream stop occurs at a zero crossing point of the audio stream.
18. The method of claim 13, wherein the markers comprise topo markers that indicate a desired playback topology in a multiple audio topology environment.
19. The method of claim 18, wherein the multiple audio topology environment comprises multiple independently managed audio playback environments.
20. The method of claim 13, wherein the markers comprise stop markers operable when processed to cause a controlled stop of the audio stream playback.
21. The method of claim 13, wherein the markers comprise wait markers operable when processed to cause the audio module to wait for a signal before playing the audio stream.
22. The method of claim 13, wherein the markers comprise signal markers operable to send data embedded in the signal marker to an application.
23. The method of claim 13, wherein the markers comprise region markers used to identify regions within an audio stream.
24. The method of claim 23, wherein the region markers comprise region length data.

25. A machine-readable medium with instructions stored thereon, the instructions when executed operable to cause a computerized wagering game system to:
- present a wagering game on which monetary value can be wagered;
 - process markers embedded within an audio stream in an audio module,
- wherein the markers comprise structured audio commands.
26. The method of claim 25, wherein processing the markers comprises passing marker data to an application.
27. The method of claim 25, wherein the markers comprise beat markers operable to identify a beat location within an audio stream
28. The method of claim 25, wherein the markers comprise break markers operable when processed to cause playback of the audio stream to stop.
29. The method of claim 28, wherein the audio stream stop occurs at a zero crossing point of the audio stream.
30. The method of claim 25, wherein the markers comprise topo markers that indicate a desired playback topology in a multiple audio topology environment.
31. The method of claim 30, wherein the multiple audio topology environment comprises multiple independently managed audio playback environments.
32. The method of claim 13, wherein the markers comprise stop markers operable when processed to cause a controlled stop of the audio stream playback.

33. The method of claim 25, wherein the markers comprise wait markers operable when processed to cause the audio module to wait for a signal before playing the audio stream.
34. The method of claim 25, wherein the markers comprise signal markers operable to send data embedded in the signal marker to an application.
35. The method of claim 25, wherein the markers comprise region markers used to identify regions within an audio stream.
36. The method of claim 35, wherein the region markers comprise region length data.

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**FIG. 1**

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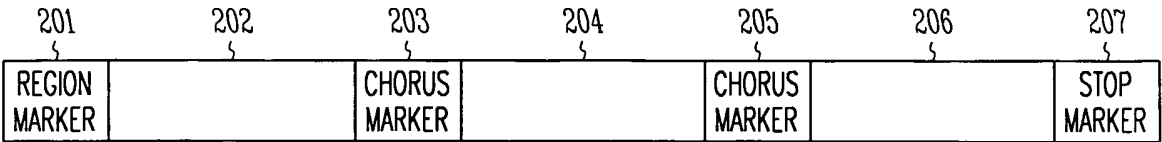


FIG. 2

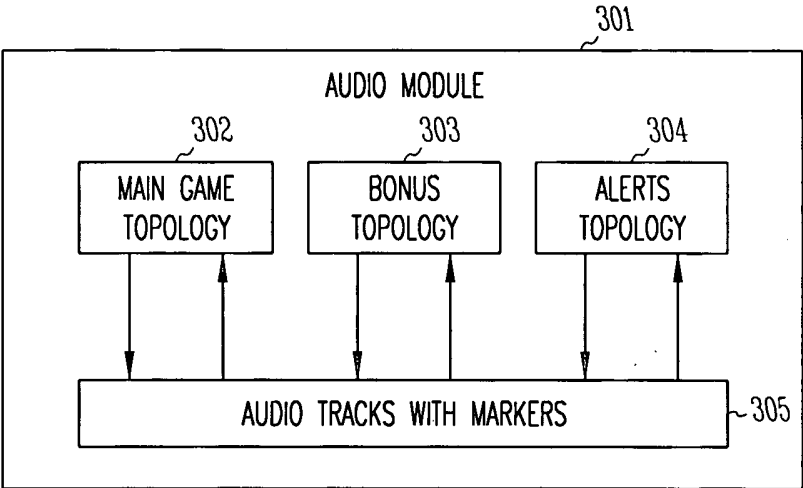


FIG. 3

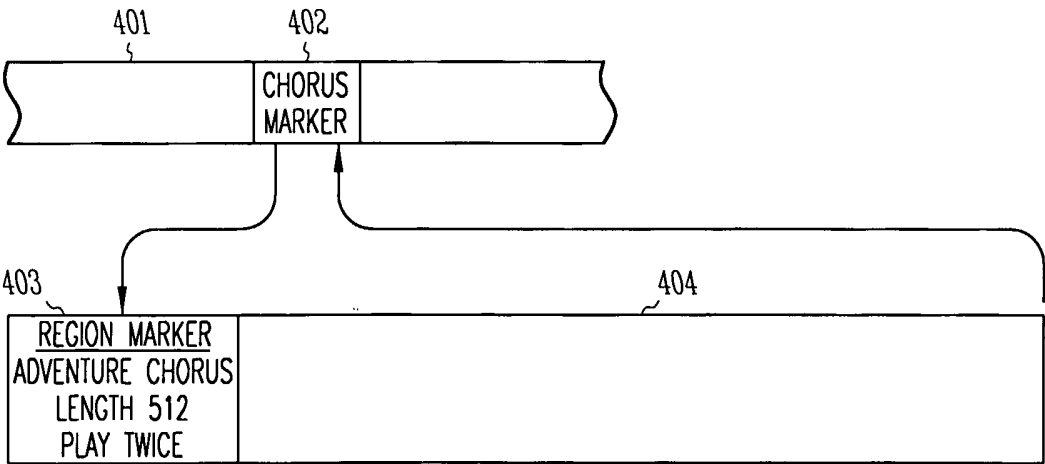


FIG. 4