VIDEO INFORMATION REPRODUCTION METHOD AND SYSTEM, AND VIDEO INFORMATION CONTENT

FIELD OF THE INVENTION

[0001]

The present invention relates to a video information reproduction method and a video information reproduction system for reproducing encoded data delivered via a network or encoded data read from storage media. The present invention also relates to content delivered via networks or read from storage media.

BACKGROUND ART

[0002]

A program clock reference (PCR) included in a transport stream (TS) is generally used for synchronizing reproductioin of content delivered to a plurality of reproducing devices without causing underflow or overflow of buffer memory (see, for example, Patent Document 1).

PRIOR ART REFERENCES

PATENT DOCUMENTS

[0003]

Patent document 1: Japanese Patent Application Publication No. 2008-96756

SUMMARY OF THE INVENTION

PROBLEM TO BE SOLVED BY THE INVENTION

[0004]

In terrestrial digital broadcasts and other broadcasts using a TS (Transport Stream), data are transmitted from the data transmitter at a fixed bit rate, so that if the system clock of the decoder does not perfectly match the standard 27 MHz, the buffer memory may be emptied or overflow, making normal reproduction impossible. An available means of avoiding this problem is to use the PCR (Program Clock Reference) to correct the system clock of the decoder

WHAT IS CLAIMED IS:

1. A video information reproduction method for receiving content formed by a sequence including at least intra-frame encoded image information and inter-frame forward prediction encoded image information, and including time stamp information, from a content server connected by a network or from storage media, at a plurality of video information reproducing devices and decoding and reproducing the content at the video information reproducing devices, the video information reproduction method comprising:

a detection step for selecting a video information reproducing device from among the plurality of video information reproducing devices as a reproduction time reference and detecting a reproduction time difference between each of the video information reproducing devices and the reference video information reproducing device; and

an adjustment step for adjusting a number of frames to be reproduced, when lagging the reference video information reproducing device, by subtracting a number of frames of encoded content to be reproduced from a number of frames to be reproduced by the reference video information reproducing device according to the lag time, and when leading the reference video information reproducing device, by adding a number of frames of encoded content to be reproduced to the number of frames to be reproduced by the reference video information reproducing device according to the lead time.

2. The video information reproduction method of claim 1 wherein, in the step for detecting the reproduction time difference between each of the video information reproducing devices and the reference video information reproducing device, the content server collates reproduction times reported from each of the video information reproducing

devices and selects a video information reproducing device with a reproduction time closest to an average value to be the reference.

3. The video information reproduction method of claim 1 wherein, in the step for detecting the reproduction time difference between each of the video information reproducing devices and the reference video information reproducing device, the content server collates reproduction times reported from each of the video information reproducing devices and selects a video information reproducing device with the most delayed reproduction time to be the reference.

4. The video information reproduction method of claim 1 wherein, in the step for detecting the reproduction time difference between each of the video information reproducing devices and the reference video information reproducing device, the content server collates reproduction times reported from each of the video information reproducing devices and selects a video information reproducing device with the most advanced reproduction time to be the reference.

5. The video information reproduction method of claim 1, further comprising:

a decision step for deciding whether the reproduction time difference detected in the detection step is within a range synchronizable by the adjustment made in the adjustment step;

a discarding step for, when the difference is decided in the decision step not to be within the synchronizable range, suspending reproduction of the content currently being reproduced and discarding the data of the content stored in a buffer memory;

a storage step for, in the video information

reproducing device in which the reproduction is suspended, beginning when the next content is received, storing the data of the content in the buffer memory; and

a start control step for, when the video information reproducing device in which the reproduction is suspended is notified by the content server of a timing at which the reference video information reproducing device has started reproduction of the next content, starting reproduction of the next content on reception of such notification.

6. The video information reproduction method of any one of claims 1 to 5, wherein the intra-frame encoded image information and inter-frame forward encoded image information are MPEG-2 or H.264 encoded information.

7. A video information reproduction system for receiving content formed by a sequence including at least intra-frame encoded image information and inter-frame forward prediction encoded image information, and including time stamp information, from a content server connected by a network or from storage media, at a plurality of video information reproducing devices and decoding and reproducing the content at the video information reproducing devices, the video information reproduction system comprising:

a means for selecting a video information reproducing device from among the plurality of video information reproducing devices as a reproduction time reference and detecting a reproduction time difference between each of the video information reproducing devices and the reference video information reproducing device; and

a means for adjusting a number of frames to be reproduced, when lagging the reference video information reproducing device, by subtracting a number of frames of encoded content to be reproduced from a number of frames to

be reproduced by the reference video information reproducing device according to the lag time, and when leading the reference video information reproducing device, by adding a number of frames of encoded content to be reproduced to the number of frames to be reproduced by the reference video information reproducing device according to the lead time.

8. The video information reproduction system of claim 7 wherein, in the means for detecting the reproduction time difference between each of the video information reproducing devices and the reference video information reproducing device, the content server collates reproduction times reported from each of the video information reproducing devices and selects a video information reproducing device with a reproduction time closest to an average value to be the reference.

9. The video information reproduction system of claim 7 wherein, in the means for detecting the reproduction time difference between each of the video information reproducing devices and the reference video information reproducing device, the content server collates reproduction times reported from each of the video information reproducing devices and selects a video information reproducing device with the most delayed reproduction time to be the reference.

10. The video information reproduction system of claim 7 wherein, in the means for detecting the reproduction time difference between each of the video information reproducing devices and the reference video information reproducing device, the content server collates reproduction times reported from each of the video information reproducing devices and selects a video information reproducing device with the most advanced reproduction time to be the reference.

11. The video information reproduction system of claim 7, further comprising:

a decision means for deciding whether the reproduction time difference detected in the detection means is within a range synchronizable by the adjustment made by the adjustment means;

a discarding means for, when the difference is decided by the decision means not to be within the synchronizable range, suspending reproduction of the content currently being reproduced and discarding the data of the content stored in a buffer memory;

a storage means for, in the video information reproducing device in which the reproduction is suspended, beginning when the next content is received, storing the data of the content in the buffer memory; and

a storage means for storing the data of the next content in the buffer memory, beginning when the next content is received, in the video information reproducing device in which the reproduction is suspended; and

a start control means for, when the video information reproducing device in which the reproduction is suspended is notified by the content server of a timing at which the reference video information reproducing device has started reproduction of the next content, starting reproduction of the next content on reception of such notification.

12. The video information reproduction system of any one of claims 7 to 11, wherein the intra-frame encoded image information and inter-frame forward encoded image information are MPEG-2 or H.264 encoded information.

13. Video information content delivered from a content server connected via a network or read from storage media,

formed by a sequence including at least intra-frame encoded image information and inter-frame forward prediction encoded image information and including time stamp information, wherein:

plural intra-frame encoded image information and inter-frame forward prediction encoded image information for displaying video of the same content as in a last frame of main content are added to the last frame of the main content.

14. The video information content of claim 13, wherein the intra-frame encoded image information and inter-frame forward encoded image information are MPEG-2 or H.264 encoded information.

METHOD AND SYSTEM FOR PLAYING VIDEO INFORMATION, AND COMPUTER READABLE RECORDING MEDIUM STORING VIDEO INFORMATION CONTENT

FIELD OF THE INVENTION

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WHAT IS CLAIMED IS:

1. A video information reproduction method for receiving content formed by a sequence including at least intra-frame encoded image information and inter-frame forward prediction encoded image information, and including time stamp information, delivered from a content server connected by a network, at a plurality of video information reproducing devices and decoding and reproducing the content at the video information reproducing devices, at a time designated by the time stamp information, according to clock pulse signals generated by a crystal oscillator, the video information reproduction method comprising:

a reproduction time reporting step performed by each of the plurality of video information reproducing devices for reporting, to the content server, the reproduction time at which the content has been reproduced according to the clock pulse signals;

a reference reproduction time notifying step performed by the content server for selecting, based on the reproduction time reported by the plurality of video information reproducing devices, a reference video information reproducing device from among the plurality of video information reproducing devices, and setting the reproduction time reported by the reference video information reproducing device as a reference reproduction time and notifying the plurality of video information reproducing devices of the reference reproduction time;

a detection step performed by each of the plurality of video information reproducing devices for comparing the reproduction time reported by the video information reproducing devices to the content server, and the reference reproduction time notified by the content server, and detecting a difference between the reproduction time reported by the video information reproducing devices, and the reference reproduction time notified by the content server; and

an adjustment step performed by each of the plurality of video information reproducing devices for adjusting a number of frames to be reproduced, when the reproduction time reported by the video information reproducing devices to the content server lags the reference reproduction time, by subtracting a number of frames of encoded content to be

reproduced from a number of frames to be reproduced by the reference video information reproducing device according to the lag time, and when the reproduction time reported by the video information reproducing devices to the content server leads the reference reproduction time, by adding a number of frames of encoded content to be reproduced to the number of frames to be reproduced by the reference video information reproducing device according to the lead time.

2. The video information reproduction method of claim 1, wherein the content comprises frames constituting a main part formed by a sequence including at least the intra-frame encoded image information and the inter-frame forward prediction encoded image information, and synchronization adjustment frames consisting of a sequence including at least the intra-frame encoded image information and the inter-frame forward prediction encoded image information, and encoded to display video of the same video as in a last frame in the frames constituting the main part.

3. The video information reproduction method of claim 1 or 2 wherein, in the step for detecting the difference, the content server collates reproduction times reported from each of the video information reproducing devices and selects a video information reproducing device with a reproduction time closest to an average value to be the reference.

4. The video information reproduction method of claim 1 or 2 wherein, in the step for detecting the difference, the content server collates reproduction times reported from each of the video information reproducing devices and selects a video information reproducing device with the most delayed reproduction time to be the reference.

5. The video information reproduction method of claim 1 or 2 wherein, in the step for detecting the difference, the content server collates reproduction times reported from each of the video information reproducing devices and selects a video information reproducing device with the most advanced reproduction time to be the reference.

6. The video information reproduction method of claim 1

or 2, further comprising:
a decision step performed by each of said video information reproducing devices for deciding whether the difference detected in the detection step is within a range synchronizable by the adjustment made in the adjustment step;
a discarding step performed by each of said video information reproducing devices for, when the difference is decided in the decision step not to be within the synchronizable range, suspending reproduction of the content currently being reproduced and discarding the data of the content stored in a buffer memory;
a storage step performed by each of said video information reproducing devices for storing, when the video information reproducing device suspends the reproduction, beginning when the next content is received, the data of the content in the buffer memory; and
a start control step performed by each of said video information reproducing devices for starting, when the video information reproducing device in which the reproduction is suspended is notified by the content server of a timing at which the reference video information reproducing device has started reproduction of the next content, reproduction of the next content on reception of such notification.

7. The video information reproduction method of claim 1 or 2, wherein the intra-frame encoded image information and inter-frame forward prediction encoded image information are MPEG-2 or H.264 encoded information.

8. A video information reproduction system having a content server for delivering content formed by a sequence including at least intra-frame encoded image information and inter-frame forward prediction encoded image information, and including time stamp information, and a plurality of video information reproducing devices connected to the content server by a network, for receiving the content delivered from the content server and decoding and reproducing the content, at a time designated by the time stamp information, according to clock pulse signals generated by a crystal oscillator, wherein
each of the video information reproducing devices comprises

a means for reporting, to the content server, the reproduction time at which the content has been reproduced according to the clock pulse signals;
the content server selects, based on the reproduction time reported by the plurality of video information reproducing devices, a reference video information reproducing device from among the plurality of video information reproducing devices, and sets the reproduction time reported by the reference video information reproducing device as a reference reproduction time and notifies the plurality of video information reproducing devices of the reference reproduction time;
each of the video information reproducing devices also comprises:
a means for comparing the reproduction time reported by the video information reproducing devices to the content server, and the reference reproduction time notified by the content server, and detecting a difference between the reproduction time reported by said each of the video information reproducing devices, and the reference reproduction time notified by the content server, and
a means for adjusting a number of framesto be reproduced, when the reproduction time reported by the video information reproducing devices to the content server lags the reference reproduction time, by subtracting a number of frames of encoded content to be reproduced from a number of frames to be reproduced by the reference video information reproducing device according to the lag time, and when the reproduction time reported by the video information reproducing devices to the content server leads the reference reproduction time, by adding a number of frames of encoded content to be reproduced to the number of frames to be reproduced by the reference video information reproducing device according to the lead time.

9. The video information reproduction system of claim 8, wherein the content comprises frames constituting a main part formed by a sequence including at least the intra-frame encoded image information and the inter-frame forward prediction encoded image information, and synchronization adjustment frames consisting of a sequence including at least the intra-frame encoded image information and the inter-frame forward prediction encoded image information,

and encoded to display video of the same video as in a last frame in the frames constituting the main part.

10. The video information reproduction system of claim 8 or 9 wherein, in the means for detecting the difference, the content server collates reproduction times reported from each of the video information reproducing devices and selects a video information reproducing device with a reproduction time closest to an average value to be the reference.

11. The video information reproduction system of claim 8 or 9 wherein, in the means for detecting the difference, the content server collates reproduction times reported from each of the video information reproducing devices and selects a video information reproducing device with the most delayed reproduction time to be the reference.

12. The video information reproduction system of claim 8 or 9 wherein, in the means for detecting the difference, the content server collates reproduction times reported from each of the video information reproducing devices and selects a video information reproducing device with the most advanced reproduction time to be the reference.

13. The video information reproduction system of claim 8 or 9, wherein each of the video information reproducing devices further comprises:
a decision means for deciding whether the difference detected in the means for detecting is within a range synchronizable by the adjustment made by the means for adjusting;
a discarding means for, when the difference is decided by the decision means not to be within the synchronizable range, suspending reproduction of the content currently being reproduced and discarding the data of the content stored in a buffer memory;
a storage means for storing, when the video information reproducing device suspends the reproduction, beginning when the next content is received, the data of the content in the buffer memory; and
a start control means for starting, when the video information reproducing device in which the reproduction is

suspended is notified by the content server of a timing at which the reference video information reproducing device has started reproduction of the next content, reproduction of the next content on reception of such notification.

14. The video information reproduction system of claim 8 or 9, wherein the intra-frame encoded image information and inter-frame forward prediction encoded image information are MPEG-2 or H.264 encoded information.

15. A computer-readable recording medium in which video information content is stored, said video information content comprising frames constituting a main part formed by a sequence including at least intra-frame encoded image information and inter-frame forward prediction encoded image information, and synchronization adjustment frames consisting of a sequence including at least said intra-frame encoded image information and said inter-frame forward prediction encoded image information, and encoded to display video of the same video as in a last frame in the frames constituting the main part, and also including time stamp information.

16. The computer-readable recording medium of claim 15, wherein the intra-frame encoded image information and inter-frame forward prediction encoded image information of the video information content are MPEG-2 or H.264 encoded information.