

DECLARATION OF John Andrews

I, John Andrews, pursuant to 28 U.S.C. § 1746, hereby declare as follows:

1. I am a Translator at TransPerfect, Inc.
2. I submit this declaration to certify the accuracy of the English translation of JP2007013705A.
3. My statements are based on personal knowledge and my review of JP2007013705A and its Japanese to English translation. If called as a witness about the facts contained in these statements, I could testify competently based on such personal knowledge and the investigation I have conducted.
4. Attached as Exhibit A is a true and accurate copy of JP2007013705A.
5. Attached as Exhibit B is a true and accurate copy of an English translation of JP2007013705A (“the JP2007013705A Translation”).
6. The JP2007013705A Translation is a true and accurate translation of JP2007013705A from Japanese to English.
7. All statements made herein of my own knowledge are true, and all statements made on information and belief are believed to be true. Further, I am aware that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001. I declare under penalty of perjury that the foregoing is true and correct.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct. Executed on July 20, 2023, at New York, New York.



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(54) [Title of Invention] Simultaneous reproduction system, information processing apparatus, midway participation method, and midway participation program

(57) [ABSTRACT]

[Problem to be solved]

To provide a technology whereby a terminal can take a midway participation in the simultaneous playback processing among the other terminals while the other terminals share data and simultaneously reproduce the shared data.

[Means for solving the problems]

In a simultaneous reproduction system, wherein a PDA 2, a mobile phone 3, and a digital camera 4 are connected to a network, when the PDA 2 transmits content data to each player terminal in response to a request from each player terminal and each player terminal carries out simultaneous playback processing, a notebook PC 5 taking a midway part in the simultaneous playback processing acquires a playback timestamp TSa for denoting an elapsed time after playback start of the content data from the PDA 2, and determines a playback start time TI of the content data relative to the playback timestamp TSa in response to a delay time required for data communication with the PDA 2, and requests the PDA 2 to transmit the content data after the playback start time TI, and reproduces the content data after the playback start time TI acquired from the PDA 2 in response to the

request from the notebook PC 5 in the timing of the playback start time TI.

[Selection drawing] FIG. 3

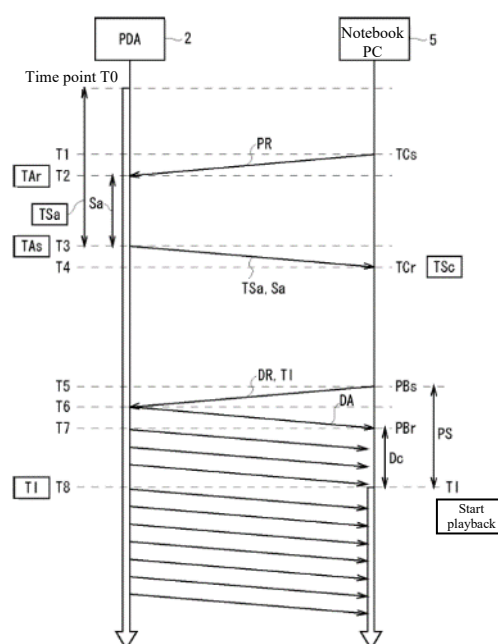


FIG. 3 Timing chart of midway participation processing

[Scope of Claims]

[Claim 1]

The present invention relates to a simultaneous playback system consisting of a simultaneous playback system in which a transmitter terminal and one or more player terminals are connected to a network, and the aforementioned transmitter terminal transmits the content data upon request from each player terminal, and in which the other player terminals participates midway in the aforementioned simultaneous playback process when each of the aforementioned player terminals simultaneously processes the aforementioned content data;

the other player terminals described above obtain playback elapsed time information indicating the elapsed time since the start of playback of the content data from each of the aforementioned player terminals or the aforementioned transmitter terminals, and determine the playback start time of the aforementioned content data based on the delay time required for data communication with the aforementioned transmitter terminal, and request the aforementioned content data from the aforementioned transmitter terminal from the aforementioned playback start time; 10

the aforementioned transmitter terminal transmits the content data from the aforementioned playback start time to the aforementioned other player terminal in response to a request from the aforementioned midway participating terminal;

the other player terminals above receives the aforementioned content data after the aforementioned playback start time, and play the aforementioned content data after the aforementioned playback start time at the aforementioned playback start time.

[Claim 2] 20

An information processing device comprising of a transmitter terminal and one or more player terminals that are connected to a network, and whereby the aforementioned transmitter terminal transmits the content data in response to a request from each player terminal, and whereby each of the aforementioned player terminals is simultaneously processing the aforementioned content data in the midway simultaneous playback process;

a means for obtaining playback elapsed time information indicating the elapsed time since the start of playback of the content data from each of the aforementioned player terminals or the aforementioned transmitter terminals;

a playback start time for determining the playback start time of the content data based on the aforementioned elapsed time information in accordance with the delay time required for data communication with the aforementioned transmitter terminal; 30

a transmission means for sending a request signal for the aforementioned content data to the aforementioned transmitter terminal after the aforementioned playback start time;

a receiving means for receiving the aforementioned content data from the aforementioned start time of playback supplied from the aforementioned transmitter terminal;

and a playback means for playback of the aforementioned content data after the aforementioned playback start time at the aforementioned playback start time.

[Claim 3]

The information processing device according to Claim 2, whereby a transmission means described above includes requesting the above content data from the aforementioned transmitter terminal after the aforementioned playback start time by transmitting a data transmission request; 40

and a method of determining the aforementioned playback start time includes

determining the aforementioned playback start time by adding a certain amount of time including the aforementioned delay time to the transmission time of the data transmission request.

[Claim 4]

and a method of determining the aforementioned playback start time includes

An information processing device according to Claim 3, whereby the aforementioned playback start time is determined by adding only the aforementioned delay time and the playback preparation time required for preparation for the start of playback to the transmission time of the data transmission request.

[Claim 5]

and a method of determining the aforementioned playback start time includes 50

The aforementioned playback start time is determined by adding the aforementioned delay time, the playback preparation time required for preparation for the start of playback, and the temporary storage time for temporarily storing

the aforementioned content data in a buffer memory to the transmission time of the aforementioned data transmission request; .

[Claim 6]

the aforementioned acquisition means

matches the aforementioned playback elapsed time information obtained from each of the aforementioned player terminals or the aforementioned transmitter terminals with the playback time representing the playback time when playing the aforementioned content data using the aforementioned playback means; .

[Claim 7]

the aforementioned acquisition means

the aforementioned playback elapsed time acquires information representing the moment when each of the aforementioned player terminals or the aforementioned transmitter terminals started playing the aforementioned content data configuration unit; .

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[Claim 8]

the aforementioned acquisition means

each player terminal or the transmitter terminal receives the processing time from the acquisition of the aforementioned request signal for the aforementioned elapsed playback time information from the aforementioned information processing device to the transmission of the aforementioned elapsed playback time information together with the aforementioned elapsed playback time information..

[Claim 9]

and a method of determining the aforementioned playback start time includes

The information processing apparatus according to Claim 6, wherein the aforementioned playback time is calculated based on the aforementioned playback time to determine the aforementioned playback start time.

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[Claim 10]

and a method of determining the aforementioned playback start time includes

The information processing apparatus according to Claim 9, wherein the aforementioned playback start time is expressed as the value of the aforementioned playback time.

[Claim 11]

The information processing device according to Claim 2, whereby a transmission means described above includes

The aforementioned data transmission request configured by the TimeSeekRange.dlna.org.HTTP header specified by DLNA (Digital Living Network Alliance) is transmitted.

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[Claim 12]

The aforementioned receiving means

receives the aforementioned content data with the TimeSeekRange.dlna.org.HTTP header specified by the Digital Living Network Alliance (DLNA).

[Claim 13]

the aforementioned acquisition means

A data offset value from the leading portion of the content data acquires information together with the aforementioned playback elapsed time information

and a method of determining the aforementioned playback start time includes

and calculates the aforementioned data offset value to determine the aforementioned playback start time.

[Claim 14]

and a method of determining the aforementioned playback start time includes

An information processing device according to Claim 13, wherein the aforementioned playback start time is expressed as the aforementioned data offset value.

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[Claim 15]

The information processing device according to Claim 2, whereby a transmission means described above includes

An information processing device according to Claim 14, wherein a data transmission request is configured using the Range HTTP header specified in the Hypertext Transfer Protocol (HTTP).

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[Claim 16]

The aforementioned receiving means

An information processing device according to claim 15, wherein the above content data with the Content-Range HTTP header specified in the Hypertext Transfer Protocol (HTTP) is received.

[Claim 17]

The aforementioned playback means

starts the aforementioned playback process at the time before the playback preparation time required to prepare for the aforementioned playback start time..

[Claim 18]

A midway participation method characterized by a method of participating in the process of the information processing device in the aforementioned simultaneous playback process when the transmitter terminal and one or more player terminals are connected to a network, and the aforementioned transmitter terminal transmits the content data in response to a request from each player terminal, and the aforementioned player terminal simultaneously processes the aforementioned content data;

an acquisition step of acquiring the playback elapsed time information indicating the elapsed time since the start of playback of the content data from each of the aforementioned player terminals or the aforementioned transmitter terminals;

an playback start time determination step for determining the aforementioned playback start time of the content data based on the aforementioned elapsed time information in accordance with the delay time required for data communication with the aforementioned transmitter terminal;

a transmission step of transmitting a request signal for the content data after the aforementioned playback start time to the aforementioned transmitter terminal;

a receiving step of receiving the content data from the aforementioned transmitter terminal after the aforementioned playback start time;

and a playback step for playback of the aforementioned data after the aforementioned playback start time at the aforementioned playback start time.

[Claim 19]

A midway participation program whereby a transmitter terminal and one or more player terminals are connected to a network, and whereby the aforementioned transmitter terminal transmits the content data in response to a request from each player terminal, and wherein each of the aforementioned player terminals is simultaneously processing the aforementioned content data in the midway simultaneous playback process

an acquisition step of acquiring the playback elapsed time information indicating the elapsed time since the start of playback of the content data from each of the aforementioned player terminals or the aforementioned transmitter terminals;

an playback start time determination step for determining the aforementioned playback start time of the content data based on the aforementioned elapsed time information in accordance with the delay time required for data communication with the aforementioned transmitter terminal;

a transmission step of transmitting a request signal for the content data after the aforementioned playback start time to the aforementioned transmitter terminal;

a receiving step of receiving the content data from the aforementioned transmitter terminal after the aforementioned playback start time;

and a playback step for playback of the aforementioned data after the aforementioned playback start time at the aforementioned playback start time.

[Detailed description of invention]

[Technical field]

[0001]

The present invention relates to simultaneous playback systems, information processing devices, midway participation methods, and midway participation programs, and is suitable for applications where, for example, an ad hoc network is formed between multiple Mobile terminals, and other Mobile terminals are joined to simultaneous playback during simultaneous playback of content data.

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[Background Technology]

[0002]

Traditionally, wireless communication environments called ad hoc networks where multiple Mobile terminals in the same space form a network that is unique to each other and cannot communicate wirelessly with each other are increasing. Between groups formed in this type of ad hoc network, simultaneous reproduction of communication tools requiring real-time performance, such as AV contents, is required.

[0003]

In this ad hoc network, it is possible that different Mobile terminals may participate in simultaneous playback between multiple Mobile terminals. In such a case, it is necessary for the mobile terminal that participates in the middle of the program to acquire the same part of the AV content as that of the mobile terminal that is currently playing back the same part.

[0004]

Incidentally, in methods such as multicast streaming and unicast streaming, the transmission terminal can transmit the same portion of the AV content to each mobile terminal at a uniform transmission speed, and play the transmitted AV content sequentially at the same time. In such a simultaneous playback system, when there is a mobile terminal that wishes to participate midway, this transmission terminal uniformly transmits the AV content to the mobile terminal that participates midway and reproduces it, thereby simultaneously playing it back from the midway (see, for example, Patent Literature 1).

[Patent Literature 1] JP 2003-235027 A

[Disclosure of invention]

[Problem to be solved by the invention]

[0005]

By the way, in the midway participation method as shown in FIG. 13, the transmission terminal 50 transmits the same portion of the AV content 51 and 52 to the Mobile terminal A and B during simultaneous playback at a uniform transmission speed, and the Mobile terminal A and B receive the common AV content at a common reception point and play at the same playback point. Therefore, it was possible for the Mobile terminal C participating in the middle to receive AV content 53 from the same reception point as the Mobile terminal A and B, and to simultaneously play from the middle part by starting playback at the same playback point as the Mobile terminal A and B after waiting a little.

[0006]

On the other hand, as shown in FIG. 14, in the ad hoc network, a download method may be performed in which each Mobile terminal A' and B' actively requests the transmission terminal 60 to transmit data of AV content and acquire AV content individually. In this case, there is an HTTP (Hypertext Transfer Protocol, RFC 2616) used in version 1 of the DLN A HN (Digital Living Network Alliance, Home Networked Device), etc., and for example, an HTTP Client that becomes the receiving Mobile terminal A' and B' sends an HTTP GET request as a data transmission request to an HTTP server that becomes the transmission terminal 60, and as a result, AV content 61 and 62 are sent from the transmission terminal 60.

[0007]

Therefore, in this download method, there was a problem that the reception points of the Mobile terminal A' and B' are not uniform at a certain point, and the Mobile terminal C' would not know which reception points should receive the AV content 63 when they attempt to participate in this simultaneous playback group (Mobile terminal A' and B') midway, and they would not be able to participate in the simultaneous playback process.

[0008]

The present invention is made in consideration of the above points, and it is intended to propose a simultaneous playback system, an information processing device, a midway participation method, and a midway participation program in which other Mobile terminals that attempt to participate in the middle of the content can perform the simultaneous playback process from the middle of the content during the simultaneous playback process between multiple Mobile terminals.

[Means for solving the problem]

[0009]

In order to solve such problems, in the simultaneous playback system of the present invention, the transmitter terminal and one or more player terminals are connected to a network connection, and the transmitter terminal transmits the content data at the request of each player terminal, and when each player terminal is simultaneously processing the content data, the other player terminal obtains the simultaneous playback elapsed time information from each player terminal or the transmitter terminal indicating the elapsed time since the start of playback of the content data, and determines the playback start time of the content data based on the elapsed time information based on the delay time required for data communication with the transmitter terminal, and requests the content data from the transmitter terminal after the playback start time, and transmits the content data after the playback start time to the other player terminal upon the request from the midway participation terminal, and the other player terminal receives the content data after the playback start time. 10

[0010]

This allows for simultaneous playback of the same content data as that currently being played by each player terminal at the same time as that currently being played by the other player terminal by playing content data from the start time of playback supplied by the transmission terminal during simultaneous playback of the content data supplied by each player terminal. 20

[0011]

Further, in the information processing device of the present invention, a transmitter terminal and one or more player terminals are connected to a network, and the transmitter terminal transmits the content data in response to a request from each player terminal, and thus producing an information processing device that participates midway in simultaneous playback processing when each player terminal is performing simultaneous playback processing of the content data, and which comprises an acquisition means for acquiring the playback elapsed time information indicating the elapsed time since the start of playback of content data from each player terminal or transmitter terminal, a playback start time determination means for determining a playback start time of content data based on elapsed time information according to a delay time required for data communication with a transmitter terminal, a transmission means for transmitting a request signal for the content data after the playback start time to the transmitter terminal, a reception means for receiving the content data after the playback start time supplied from the transmitter terminal, and a playback means for playing back the content data after the playback start time at the timing of the playback start time. 30

[0012]

In this way, in the information processing device of the present invention, content data from the start time of playback supplied by the transmitter terminal can be played simultaneously from the middle of the same content data as that of the player terminal being played simultaneously by the information processing device by playing the content data from the start time of playback supplied by the transmitter terminal while each player terminal is playing the content data simultaneously. 40

[0013]

In addition, in the midway participation method of the present invention, a method of midway participation in which the transmitter terminal and one or more player terminals are connected to a network connection and transmit content data at the request of each player terminal, and when each player terminal is simultaneously processing the content data, the other player terminal participates in the simultaneous playback process, and which comprises of the steps of: obtaining playback elapsed time information from each player terminal or the transmitter terminal indicating the elapsed time since the start of playback of the content data, determining the playback start time based on the elapsed time information based on the delay time required for data communication with the transmitter terminal, sending the transmitter terminal a request signal of the content data after the playback start time, receiving the content data from the transmitter terminal after the playback start time, and playing the content data after the playback start time. 50

[0014]

In this way, in the midway participation method of the present invention, by playing content data from the start time of playback supplied by the transmitter terminal at the timing of the start time determined by the information processing device, while each player terminal is playing content data supplied by the transmitter terminal at the same time, the same content data as that supplied by the transmitter terminal can be played at the same time from the middle.

[0015]

In addition, in the midway participation program of the present invention, the transmitter terminal and one or more player terminals are connected to a network connection, and the transmitter terminal transmits the content data at the request of each player terminal, and when each player terminal is simultaneously processing the content data, the other player terminals that participate in the simultaneous midway playback process are performed with the acquisition step of obtaining the playback elapsed time information indicating the elapsed time since the start of the playback of the content data from each player terminal or the transmitter terminal, and determines the playback start time of playback of the content data based on the elapsed time information based on the delay time required for data communication with the transmitter terminal, and transmits the request signal of the content data from the transmitter terminal after the playback start time, and receives the content data from the transmitter terminal after the playback start time, and plays content data from the start time.

[0016]

In this way, in the midway participation program of the present invention, the content data from the start time of playback supplied by the transmitter terminal can be played at the same time from the middle of the same content data as that being played at the same time by each player terminal by playing the content data from the start time of playback supplied by the transmitter terminal at the time of the playback start time determined by the information processing device.

[Effects of the present invention]

[0017]

According to the present invention, by playing content data from the start time of playback provided by the transmitter terminal and subsequent to the start time of playback provided by the transmitter terminal while each player terminal is playing content data simultaneously, it is possible to realize a simultaneous playback system in which each player terminal can play the same content data from the middle of the playback, and thus participate in the simultaneous playback process.

[0018]

According to the present invention, by playing content data from the start time of playback supplied by the transmitter terminal at the time of playback, which is determined by the information processing device, while each player terminal is playing content data supplied by the transmitter terminal at the same time, each player terminal can play the same content data from the middle of playback at the same time, and thus realizing an information processing device, a midway participation method, and a midway participation program.

[Detailed Description of the Preferred Embodiments]

[0019]

An embodiment of the present invention will be described in detail below with reference to the drawings.

[0020]

(1) Simultaneous playback system

(1-1) Overall configuration

In FIG. 1, 1 indicates a simultaneous playback system as a whole. In this simultaneous playback system 1, the Personal Digital Assistant (PDA) 2, the mobile phone 3, and the digital camera 4 each have wireless communication functions such as IEEE (Institute of Electrical and Electronics Engineers) 802.11 g and Bluetooth (registered trademark), and by connecting to each other through the wireless communication functions, an ad hoc network 7 is constructed.

[0021]

Furthermore, in the simultaneous playback system 1, and for the ad hoc network 7 mentioned above, a midway participation in the ad-hoc network 7 is achieved by wirelessly connecting the aforementioned PDA 2, mobile phone 3 and digital camera 4 via the wireless communication function of the notebook personal computer (hereinafter referred to as a notebook PC) 5 itself, which is a midway participation terminal.

[0022]

Here, in the ad hoc network 7, each of the PDA 2, the mobile phone 3, and the digital camera 4 individually owns moving image content as content data, and shares these moving image content within the group that is building the ad hoc network 7. At this time, one mobile terminal becomes a controller terminal, and the transmitter terminal that owns the moving image content to be delivered transmits the moving image content to another player terminal in accordance with the instructions of the controller terminal, so that all of the PDA 2, mobile phone 3, and digital camera 4 can play the moving image content simultaneously as a player terminal. 10

[0023]

In this case, the PDA 2, which is the controller terminal, is configured to give instructions for causing the other player terminals, the mobile phone 3 and the digital camera 4, to perform simultaneous playback processing of moving image content. In addition, the mobile phone 3 and digital camera 4 are configured to play the moving image content simultaneously between the PDA 2, the mobile phone 3, and the digital camera 4 in accordance with instructions from the PDA 2, which is the controller terminal. 20

[0024]

In this ad hoc network 7, data sharing may be subject to various other content data, such as voice files, text files, still image data files, or game programs, rather than moving image content as the content data subject to data sharing.

[0025]

PDA 2 is then configured to create a list of concurrent playback data based on a list of playback data, which is a list of moving image content owned by each player terminal. Here, the simultaneous playback data list is composed of the name of the moving image content and the information of the transmitter terminal to which the moving image content is sent, the master terminal to which the clock is based, and the like. 30

[0026]

Therefore, based on this list of concurrent playback data, PDA 2 causes the moving image content to be sent from the transmitter terminal to each player terminal while synchronizing the clock of each player terminal to the master terminal. The PDA 2 is then configured to perform the simultaneous playback process by sending a request to each player terminal to start simultaneous playback, and having the moving image content that has been transmitted play simultaneously. 40

[0027]

(1-2) Midway participation

Next, in this simultaneous playback system 1, when each player terminal of the ad hoc network 7 is playing moving image content simultaneously, the notebook PC 5, which is a midway participation terminal, participates in the simultaneous playback processing of the moving image content, and starts the simultaneous playback processing from the midway of the moving image content. 40

[0028]

In this case, as shown in FIG. 2, the controller terminal PDA 2 sends the moving image content to the mobile phone 3 and digital camera 4 as a transmitter terminal. As now shown in FIG. 3, at time T0, PDA 2 begins playing moving image content. In FIG. 3, although the mobile phone 3 and digital camera 4 are omitted, playback is started at the same time as PDA 2. In addition, each player terminal has a playback timer, not shown, and the elapsed time from the start of playback is counted with the start time of playback of moving image content (time point T0) as zero. 50

[0029]

Notebook PC 5 (FIG. 2), which is a midway participation terminal, generates a midway participation request JR, which is a request for midway participation in the simultaneous playback processing, and transmits it to the controller terminal. Here, the notebook PC 5 does not know which player terminal is the controller terminal, so it sends this midway participation request JR to PDA 2, the mobile phone 3, and the digital camera 4, respectively.

[0030]

In response to the midway participation request JR, the PDA2, which is the controller terminal, returns a midway participation preparation request OR, which is a request to prepare for the midway participation, to the notebook PC5. As a result, the PDA 2 can cause the notebook PC 5 to recognize that the PDA 2, which is the transmission source of the midway participation preparation request OR, as the controller terminal. In response to this, the mobile phone 3 and digital camera 4 do not respond to this midway participation request for JR. 10

[0031]

Here, the midway participation preparation request OR includes information about the transmitter terminal transmitting the moving image content currently being played and the master clock information for clock synchronization correction, so that the notebook PC 5 recognizes that the current transmitte terminal is PDA 2.

[0032]

Notebook PC 5 then corrects its clock with master clock information and synchronizes it with the master terminal. As a result, the notebook PC 5 can synchronize the master terminal and each player terminal and their clock, and can match the playback timing of the moving image content with each player terminal. 20

[0033]

At time point T1 (FIG. 3), the notebook PC 5 sends a playback timestamp request PR for causing PDA 2 to transmit a playback timestamp TSa representing the current playback portion of the moving image content, and temporarily stores the time point T1 as the transmission time TCs of the playback timestamp request PR.

[0034]

At time point T2, when PDA 2 receives a playback timestamp request PR sent from notebook PC 5 at time point T1, it temporarily stores the time point T2 as a receiving time TAr. PDA 2 then calculates the count value of the playback timer corresponding to the playback time TAs at the moment of starting playback in the next configuration unit (frame or field, etc.) in the currently playing moving image content as the playback timestamp TSa indicating the playback elapsed time information. 30

[0035]

Further, PDA 2 calculates the stay time Sa before returning a message to the playback timestamp request PR from the notebook PC 5. PDA 2 then sends the playback timestamp TSa and the stay time Sa to the notebook PC 5 at the time T3 of the playback time TAs.

[0036]

At time point T4, when the notebook PC 5 receives the playback timestamp TSa and the stay time Sa transmitted from PDA 2 at time point T3, one-way propagation delay time Lc, which is the time required for data communication with PDA 2, is calculated as the received time TCr at this time point T4 according to the following formula. 40

[0037]

$$Lc = (TCr - TCs - Sa) / 2 \quad \dots\dots (1)$$

[0038]

In this case, notebook PC 5 uses the one-way propagation delay time Lc by dividing the time from reception time TCr to transmission time TCs and the time required to send and receive round trips by 2.

[0039]

Notebook PC 5 then sets the playback timestamp TSc of the playback timer indicating its own playback time when playing the moving image content based on this one-way propagation delay time Lc and the reception time TCr of playback timestamp TSa. Specifically, the notebook PC 5 calculates its own playback timestamp TSc using the reception time TCr that received the PDA 2 playback timestamp TSa according to the following formula.

[0040]

$$TSc = TSr + Lc \quad \dots (2)$$

[0041]

As a result, the notebook PC 5 adds the one-way propagation delay time Lc to the playback stamp TS to obtain the same playback timestamp TSc as the other player terminals. 10

[0042]

Notebook PC 5 then calculates and determines the playback start time TI indicating the actual playback start time based on the processing time required for itself to start the playback process after receiving the moving image content, that is the playback preparation time Dc, and the one-way propagation delay time Lc, based on this playback timer.

[0043]

Specifically, as shown in FIG. 4, the notebook PC 5 first calculates the playback start processing time PS representing the time from the data request time PBs to the PDA 2 to the playback start time TI according to the following equation.

[0044]

$$PS = 2 \times Lc + Dc \quad \dots (3) \quad 20$$

[0045]

In this case, notebook PC 5 doubles the one-way propagation delay time Lc calculated earlier to calculate the corresponding time required for round-trip communication with the PDA 2, and adds the playback preparation time Dc. In this way, the notebook PC 5 can calculate the minimum required playback start processing time PS before playback starts.

[0046]

Notebook PC 5 (FIG. 3) then determines the data request time PBs that is the time of sending the data request for sending the moving image content, and calculates the playback start time TI of the moving image content based on this data request time PBs and playback start processing time PS according to the following formula. 30

[0047]

$$TI = PBs + PS \quad \dots (4)$$

[0048]

In this case, the notebook PC 5 calculates the playback start time TI by adding the playback start processing time PS to the data request time PBs.

[0049]

Then, at the moment of this data request time PBs, which is time point T5, the notebook PC 5 sends this playback start time TI to PDA 2 along with a data transmission request DR configured by the TimeSeekRange.dlna.org HTTP header, for example, as defined by the DLNA (Digital Living Network Alliance) as shown in FIG. 5. It should be noted that the data transmission request DR in FIG. 5 indicates a request message for transmitting the moving image content from the playback start time TI = 100.00 seconds. 40

[0050]

As a result, the notebook PC 5 calculates the playback start time TI by adding the minimum required playback start processing time PS to the data request time PBs, and specifies the moving image content after the playback start time TI to the PDA 2, and requests the delivery of subsequence moving image content. Therefore, it is prepared to start playback by the said playback start time TI, and it is possible to start the playback processing of the moving image content at the time of the said playback start time TI.

[0051]

Upon receiving such data transmission request DR and the playback start time TI at time point T6, PDA 2 sequentially transmits the moving image content from the playback start time TI to notebook PC 5 with a data transmission response DA configured by the TimeSeekRange.dlna.org HTTP header defined in DLNA, for example as shown in FIG. 6. It should be noted that the data transmission response DA in FIG. 6 indicates a reply message to the effect that the moving 50

image content from 100.00 seconds (reproduction start time TI) to 150.00 seconds will be transmitted.

[0052]

When the notebook PC 5 receives the moving image content from the PDA 2 after the playback start time TI at time point T7 (FIG. 4), it starts preparing for the playback process, and at time point T8 when the playback preparation time Dc has elapsed, it plays and displays the moving image content after the playback start time TI.

[0053]

As a result, in this simultaneous reproduction system 1, by reproducing the moving image content after the playback start time TI acquired by the notebook PC 5 at the playback start time TI, the notebook PC 5 can playback the moving image content after the playback start time TI at the moment when the moving image content being played by each player terminal reaches the playback start time TI, and the notebook PC 5 can simultaneously playback the same portion of the moving image content as each player terminal.

[0054]

In addition, in order to calculate the playback start time TI based on the playback start processing time PS consisting of the corresponding time required for round-trip communication with PDA 2 and the playback preparation time Dc required for the playback processing (FIG. 4), notebook PC 5 can complete preparations for starting the playback processing by the playback start time TI, and in addition, it can start playback immediately after the minimum time required for the playback processing of the moving image content delivered from PDA 2, and can quickly participate in the simultaneous playback processing performed by each player terminal.

[0055]

In this way, the notebook PC 5 sets a playback timer representing the time from the start of playback by means of the playback timestamp TSa obtained from the PDA 2, and determines the playback start time TI in accordance with the corresponding time required for round-trip communication with the playback preparation time Dc and the PDA 2 based on the playback timer, and requests the moving image content from the playback start time TI onward from the PDA 2. Since the result notebook PC 5 may receive content data from the playback start time TI and complete playback start preparation by the playback start time TI, it is possible to play the moving image content from the playback start time TI at the timing of the playback start time TI, and thus to display the moving image content at the same time as each player terminal.

[0056]

(2) Circuit configuration of notebook PC 5

Next, the circuit configurations of the PDA 2, which is the controller terminal, the transmitter terminal, and the player terminal, and the notebook PC 5, which is the midway participation terminal, will be described. Here, the circuit configuration required for simultaneously playback of the moving image content is common to each mobile terminal, and the circuit configuration of the common portion will be described.

[0057]

As shown in FIG. 7, the notebook PC 5 has a configuration in which a display unit 28 consisting of a network transmission/reception unit 22, an operation unit 26, a speaker unit 27, and an LCD (Liquid Crystal Display) are connected to a control unit 23 of a CPU (Central Processing Unit) configuration that is in overall control.

[0058]

The wireless communication interface 21 connected to the network transmission/reception unit 22 is configured to perform near-field communication with other Mobile terminals such as IEEE802.11g and Bluetooth (registered trademark), and the network transmission/reception unit 22 is configured to receive the midway participation request JR, the midway participation preparation request OR, the playback timestamp request PR, the playback timestamp TSa, the playback start time TI, the data transmission request DR, the data transmission response DA, and the moving image content.

[0059]

The control unit 23 is configured to perform various processing based on the basic program and the midway participation program that are read out from ROM 35, and the simultaneous playback midway participation processing procedure described below.

[0060]

The control unit 23 also includes a decoder 33 for decoding encoded moving image content acquired via the wireless communication interface 21, and a RAM 34 used as a work area for temporarily storing various information such as decoded moving image content and transmission and reception times.

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[0061]

The control unit 23 is also configured to display the decoded moving image content in the display unit 28, and output audio data from the speaker unit 27 in the same manner, and to start the simultaneous playback midway participation processing in response to user operation instructions for the operation unit 26 consisting of buttons, touch panels, etc.

[0062]

In addition, the control unit 23 has a time information management unit 31 that manages the playback timer, and a calculation unit 32 for calculating the one-way propagation delay time L_c , the notebook PC 5 playback timestamp TS_c , the playback start processing time PS , the playback start time TI , the PDA 2 playback time TS_a , and the stay time Sa , etc., in addition to matching the reference time for performing simultaneous playback processing between each player terminal.

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[0063]

In this manner, in the simultaneous playback system 1, PDA 2, which is the controller terminal and the transmitter terminal, and the notebook PC 5, which is a midway terminal, basically have a common circuit configuration as shown in FIG. 7 above, and the mobile phone 3 and digital camera 4, which are player terminals, also have this common circuit configuration, so it is possible to participate in the ad hoc network 7, which is simultaneously playing any player terminal, as the midway terminal.

[0064]

(3) Simultaneous playback midway participation processing procedure

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Next, procedures for processing participation during midway simultaneous playback in the simultaneous playback system 1 are described. As shown in FIG. 8, the simultaneous playback system 1 is configured to communicate between the controller terminal and the transmitter terminal PDA 2 and the notebook PC 5, which is a midway participating terminal, in accordance with the following processing sequence.

[0065]

In step SP1, the notebook PC 5, which is a midway terminal, sends a midway participation request JR to the PDA 2, which is the controller terminal, in response to the user's operation, and requests midway participation in the simultaneous playback process for the moving image content being played, and then moves to the next step SP2.

[0066]

At this time, in response to the receipt of such midway participation request JR, PDA 2, the controller terminal, in step SP11, sends to notebook PC 5 a master clock information for clock synchronization correction and a midway participation preparation request OR containing the transmitter terminal information of the currently playing moving image content, and requests preparation to perform simultaneous playback midway participation processing, and moves to the next step SP12.

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[0067]

This allows the PDA 2 to cause the notebook PC 5 to recognize that the current transmitter terminal is PDA 2.

[0068]

At this time, in step SP2, when the notebook PC 5 receives the midway participation preparation request OR, clock correction is performed using the master clock information, and it moves to the next step SP3.

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[0069]

In step SP3, when the notebook PC 5 sends a playback timestamp request PR to PDA 2, which is the transmitter terminal, at the timing of time T1 (FIG. 3), and requests a value of the playback timer to count the playback time from the start of playback (time point T0) as the playback timestamp TSa of PDA 2, it moves to the next step SP4.

[0070]

At this time, in step SP12, when the PDA 2 receives the playback timestamp request PR at the timing of time T2 (FIG. 3), at time point T3, which is the moment at which playback is started in a predetermined configuration unit in the next moving image content to be played, the value of the playback timer at this moment is sent to the notebook PC 5 as the playback timestamp TSa. At the same time, the PDA 2 sends the stay time Sa, which represents the stay time from the time of receiving the playback timestamp request PR to the time of sending the playback timestamp TSa to the notebook PC 5, to the next step SP13 (FIG. 8).

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[0071]

At this time, in step SP4, when the playback timestamp TSa and the stay time Sa corresponding to the timing of time point T4 (FIG. 3) are supplied, based on the received time TCr at this time, the transmission time TCs in step SP3 (FIG. 8), and the stay time Sa, the one-way propagation delay time Lc required for one-way transmission and reception with PDA 2 is calculated by formula (1).

[0072]

Furthermore, based on this one-way propagation delay time Lc and the playback timestamp TSa of PDA 2 at time point T3, the notebook PC 5 calculates the playback timestamp TSc by equation (2), and sets the count value of the playback timer indicated by this playback timestamp TSc, and moves to the next step SP5 (FIG. 8).

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[0073]

This allows the notebook PC 5 to match the value of the playback timer that the PDA 2 has, so that the timing of playback of the moving image content can be aligned.

[0074]

In step SP5, the notebook PC 5 calculates the playback start processing time PS, which is based on the one-way propagation delay time Lc and the playback preparation time Dc (FIG. 3), which is the time required for the playback processing, from the data request time PBs to the actual start of playback, according to the formula (3).

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[0075]

Notebook PC 5 further determines the data request time PBs when transmitting the moving image content playback start time TI to PDA 2, and determines the playback start time TI based on the equation (4) based on the playback start processing time PS and the data request time PBs. Notebook PC 5 then sends the playback start time TI and data transmission request DR (FIG. 5) to PDA 2 at the moment of the data request time PBs (time point T5), and requests the data of the moving image content after the playback start time TI, and then moves to the next step SP6 (FIG. 8).

[0076]

At this time, in step SP13, when the data transmission request DR and playback start time TI are received at the timing of time point T6 (FIG. 3), PDA 2 sends a data transmission response DA (FIG. 6), and responds to the fact that moving image content is sent, and sequentially transmits the moving image content from the said playback start time TI (FIG. 3) to notebook PC 5, and moves to the next step S P14 to finish processing.

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[0077]

At this time, in step SP6, when the moving image content of the start time of playback TI or later is supplied along with the data transmission response DA at the time of the image reception time PBr at time point T7 (at time point 7 in FIG. 3), the notebook PC 5 receives the moving image content of the playback start time TI or later sequentially, and temporarily stores the moving image content of the playback start time TI and starts the playback preparation process.

[0078]

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The notebook PC 5 then matches the playback timing with each player terminal by starting playback from the portion corresponding to the moving image content playback start time TI at the playback start time TI (time point T8) after the playback preparation time Dc has elapsed, and moves to the next step SP7 (FIG. 8) to end the processing.

[0079]

(4) Operation and effects

In the above configuration, in the simultaneous playback system 1, when the playback timestamp TSa obtained by the notebook PC 5 from the PDA 2 matches the playback timestamp TSc as the playback time elapsed information, and determines the playback start time TI according to the one-way propagation delay time Lc required for communication with the PDA 2, the moving image content from the said playback start time TI is requested from the PDA 2. When the notebook PC 5 receives the moving image content after the playback start time TI, it plays the moving image content after the playback start time TI at the timing of the playback start time TI. 10

[0080]

This allows the notebook PC 5 to play the moving image content supplied by PDA 2 at the moment that the moving image content being played by each player terminal becomes the playback start time TI, so that the same moving image content can be played at the same time with each player terminal.

[0081]

In addition, notebook PC 5 may request moving image content from PDA 2 after the playback start time TI by determining the playback start time TI, and acquire the moving image content from PDA 2, so it may participate in the middle even if it is in the form of a download-type simultaneous playback processing in which the receiving terminal requests data from the transmitting terminal. 20

[0082]

At this time, the notebook PC 5 calculates the playback start time TI with the playback timer of the notebook PC 5 and the playback timer of each player terminal synchronized, and the PDA 2 receives the moving image content after this playback start time TI, and starts playing at the moment of this playback start time TI. By doing so, the time of the moving image content playback start time TI at the notebook PC 5 can be synchronized with the time of the moving image content playback start time TI at each player terminal, and the simultaneous playback process can be performed with each player terminal accurately. 30

[0083]

In addition, since the notebook PC 5 is configured to determine the playback start time TI according to the one-way propagation delay time Lc of the data communication, the moving image content can be received by the playback start time TI and playback can be started, so the moving image content can be played after the playback start time TI at the timing of the playback start time TI.

[0084]

Furthermore, since the notebook PC 5 determines the playback start time TI by adding only the playback preparation time Dc in addition to the one-way propagation delay time Lc described above, it is possible to reliably acquire the moving image content by the playback start time TI, and to start the playback process after completing the playback preparation for the moving image content, so it is possible to eliminate wasted waiting time and start the simultaneous playback process quickly. 40

[0085]

In addition, since the notebook PC 5 receives the moving image content after the playback start time TI and starts playback at the timing of the playback start time TI, time is not wasted acquiring the moving image content of the portion that does not perform playback processing, and it is possible to efficiently participate in midway simultaneous playback processing. Similarly, PDA 2 can efficiently perform simultaneous playback processing because it does not need to send unnecessary moving image content to notebook PC 5.

[0086]

Also, since the notebook PC 5 can determine the playback start time TI to start playback using the one-way propagation delay time Lc used to determine the playback timestamp TSa, it is not necessary to obtain special information from the PDA 2 to determine the playback start time TI, and it is possible to start the simultaneous playback process in the shortest 50

possible time to determine the playback start time TI to quickly provide the user with common moving image content between each player terminal.

[0087]

According to the above configuration, in the simultaneous playback system 1, the notebook PC 5 matches the playback timestamp TSa of the PDA 2 and the playback timestamp TSc of the notebook PC 5 itself, and determines the playback start time TI according to the one-way propagation delay time Lc required for data communication with the PDA 2, and starts playing the moving image content after the playback start time TI at the moment when the moving image content being played at the same time becomes the playback start time TI by each player terminal, so that the later participating notebook PC 5 can simultaneously play the moving image content common with each player terminal.

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[0088]

(5) Other embodiments

It should be noted that in the above-described embodiment, the notebook PC 5 has described the case where the playback start processing time PS, which is the time after sending the data transmission request DR to PDA 2 and actually starting the playback, is calculated by the formula (3), but the present invention is not limited to this, and the playback start processing time PS may be set to a predetermined fixed time, for example, as shown in FIG. 9. In this case, the notebook PC 5 determines this playback start processing time PS to be longer than the time summed up by the playback preparation time Dc plus the one-way propagation delay time Lc for the round trip. This allows the notebook PC 5 to reduce the processing time required for the calculation since it is not necessary to accurately calculate the playback start processing time PS.

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[0089]

Similarly, as shown in FIG. 10, the notebook PC 5 may be calculated by the following equation based on one way propagation delay time Lc as the playback start processing time PS, the playback preparation time Dc, and the buffer time Bc for buffering the received moving image content.

[0090]

$$PS = 2 \times Lc + Bc + Dc \quad \dots (5)$$

[0091]

This allows the notebook PC 5 to buffer the received moving image content into a buffer memory that does not show the moving image content, in addition to the minimum time required for the aforementioned playback start, so that even if reception of the moving image content is temporarily interrupted due to vibration or communication trouble, it is possible to read and play the moving image content from the buffer memory, and ensure stable playback processing.

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[0092]

In the above-described embodiment, the notebook PC 5 uses the playback timer as the playback time, and the playback process is started from the playback start time TI of the moving image content based on the playback timer, but the present invention is not limited to this, for example, when playing back music data at a fixed rate, a playback data offset counter may be used instead of the playback timer, and may be counted as a data offset value with the amount of data at the start of playback processing set to zero. In this case, the notebook PC 5 calculates the relationship between the data amount and the playback time by the time information management unit 31, and determines the playback start data offset value instead of the playback start time TI, and requests PDA 2 to send data from this playback start data offset value.

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[0093]

Further, in the above-described embodiment, notebook PC 5 has been described as using the TimeSeekRange.dlna.org HTTP header specified in DLNA as data transmission request DR, but the present invention is not limited to this, and it may also be used as using the Range HTTP header ER specified in HTTP, for example, as shown in FIG. 11. In addition, FIG. 11 shows a request message to the effect that the PDA 2 is requested for the moving image content from the 20,000,000th byte.

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[0094]

Further, in the above-described embodiment, the PDA 2 uses the TimeSeekRange.dlna.org HTTP header defined by DLNA as the data transmission response DA, but the present invention is not limited to this, and for example, as shown in FIG. 12, a Content-Range HTTP header EA defined by HTTP may be used. FIG. 12 shows a reply message to the effect that the moving image content from 20,000,000th bytes to 29,999,999th bytes is sent to notebook PC 5.

[0095]

Furthermore, in the above-described embodiment, the notebook PC 5 uses the TimeSeekRange.dlna.org HTTP header as the data transmission response DA and transmits it together with the moving image content, but the present invention is not limited to this, and it is also acceptable to separately transmit the data transmission response DA and the moving image content in a separate manner, and to include the moving image content in the data transmission response DA.

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[0096]

Furthermore, in the above-described embodiment, the notebook PC 5 transmits a midway participation request JR to the PDA 2, which is the controller terminal, and the PDA 2 in response to this transmits a midway participation preparation request OR, but the present invention is not limited to this, and it is acceptable to send the midway participation request JR to each player terminal, and to send the midway participation preparation request OR in response by one terminal. At this time, regardless of which terminal responds, each player terminal synchronizes the clock to the master terminal, so the notebook PC 5 can perform clock correction, and the effect does not change.

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[0097]

Further, in the above-described embodiment, the notebook PC 5 corrects the clock to match the clock with each player terminal, and further matches the playback timer with each player terminal based on the playback timestamp TSa, but the present invention is not limited to this, and only one of the clock and the playback timer may be matched.

[0098]

In addition, in the above-described embodiment, the notebook PC 5 expresses the playback start time TI as the count value of the playback timer representing the elapsed time from the start of playback, but the present invention is not limited to this, and the time based on the reference clock of the notebook PC 5 may be specified. In this case, the notebook PC 5 can perform midway participation in the simultaneous playback process by synchronizing the clock of each player terminal and the reference clock in advance.

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[0099]

Further, in the above-described embodiments, the PDA 2 transmits the stay time Sa together with the playback timestamp TSa, but the present invention is not limited to this, and the receiving time TAr and the playback time TAs may be transmitted together with the playback timestamp TSa.

[0100]

In addition, in the above-described embodiment, the PDA 2 transmits the playback timestamp TSa and the playback processing time Sa to the notebook PC 5 in response to the playback timestamp request PR, but the present invention is not limited to this, and the playback timestamp TSa and the playback processing time Sa may be transmitted together with the playback information response, which is a message to the effect that the playback timestamp TSa and the playback processing time Sa are to be transmitted.

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[0101]

Furthermore, in the above-described embodiment, the PDA 2, which is a controller terminal, is described as a transmitter terminal, but this invention is not limited to this, and any player terminal may be a controller terminal, and the mobile phone 3 or digital camera 4 may be a transmitter terminal.

[0102]

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In addition, in the above-described embodiment, each player terminal may establish an ad hoc network 7 wirelessly, but the present invention is not limited to this, and either wired or wireless methods may be used to construct a network in a community where each terminal simultaneously plays the same moving image content at a remote location by means of a network such as the Internet, and uses another tool such as a mobile phone or chat to conduct conversations.

[0103]

Furthermore, in the above-described embodiment, the time information management unit 31 may be used as an acquisition means, and the wireless communication interface 16 may be used as a transmission means and a reception means, and the time information management unit 31 and the calculation unit 32 may be used as a playback start time determination means, and the notebook PC 5 as an information processing device may be configured with the decoder 33 and used as a playback means, but the present invention is not limited to this, and the information processing device may be configured by the acquisition means, the playback start time determination means, the playback means, the transmission means, and the reception means, with each having various configurations.

[Industrial Applicability]

[0104]

The simultaneous playback system, the information processing device, the midway participation method and the midway participation program of the present invention can be applied when intervening from the midway in communication through simultaneous playback via wired or wireless electronic devices such as ad hoc networks, the Internet, etc.

[Brief Description of Drawings]

[0105]

[FIG. 1] A schematic diagram showing the overall configuration of the simultaneous playback system.

[FIG. 2] A schematic diagram explaining transmission of a midway participation request.

[FIG. 3] A timing chart explaining midway participation processing.

[FIG. 4] A schematic diagram explaining the calculation of the playback start time in the embodiment.

[FIG. 5] A schematic diagram showing the data transmission request in the present embodiment.

[FIG. 6] A schematic diagram showing the data transmission response in the present embodiment.

[FIG. 7] A schematic block diagram showing the circuit configuration of each terminal.

[FIG. 8] A flowchart explaining the midway participation processing procedure.

[FIG. 9] A schematic diagram explaining calculation (1) of the playback start time of another embodiment.

[FIG. 10] A schematic diagram explaining calculation (2) of the playback start time of another embodiment.

[FIG. 11] A schematic diagram showing the data transmission request of another embodiment.

[FIG. 12] A schematic diagram showing a data transmission response of another embodiment.

[FIG. 13] A schematic diagram explaining midway participation by conventional multicast streaming.

[FIG. 14] A schematic diagram explaining midway participation by conventional download-type streaming.

[Reference Signs List]

[0106]

1... Data sharing simultaneous playback system, 2... PDA, 3... Mobile phone, 4... Digital camera, 5... Notebook PC, 7... Simultaneous playback system, 21... Wireless communication interface, 22... Network transmission/reception unit, 23... Control unit, 26... Operation unit, 27... Speaker unit, 28... Display unit, 31... Time information management unit, 32... Calculation unit, 33... Decoder, 34... RAM, 35... ROM.

[FIG. 1]

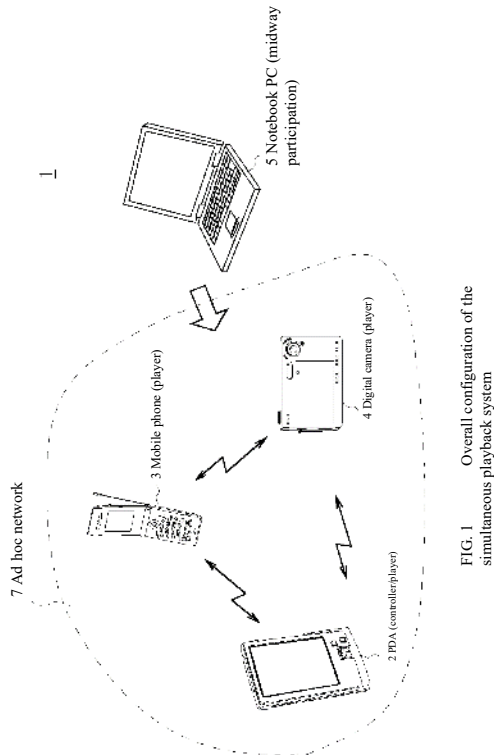


FIG. 1 Overall configuration of the simultaneous playback system

[FIG. 2]

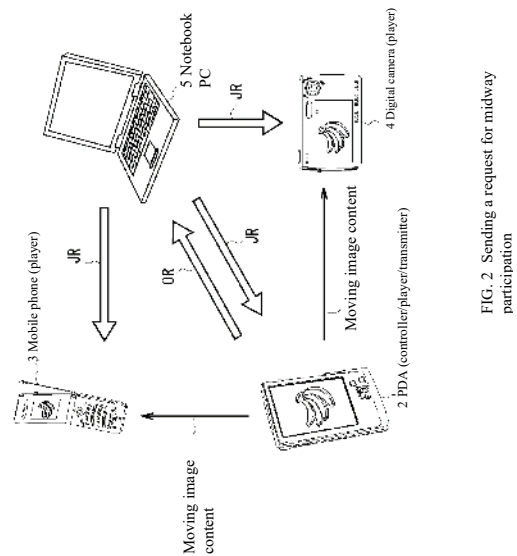


FIG. 2 Sending a request for midway participation

[FIG. 3]

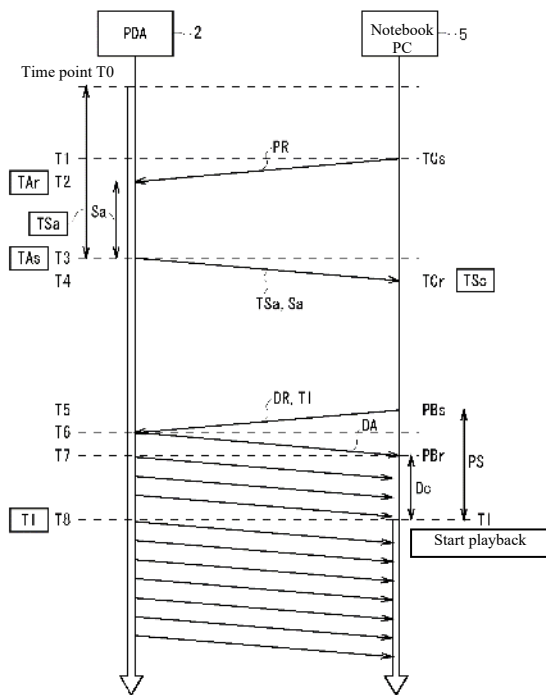


FIG. 3 Timing chart of midway participation processing

[FIG. 4]

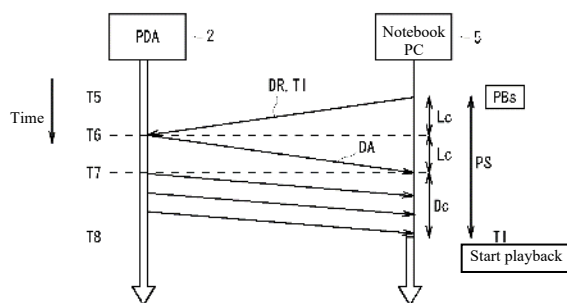


FIG. 4 Calculation of the playback start time of the present embodiment

[FIG. 5]

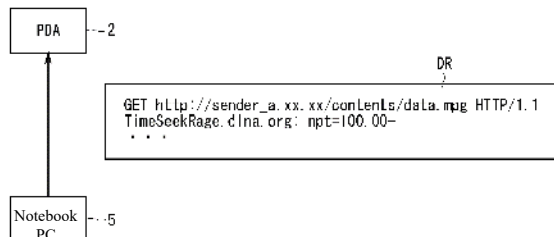


FIG. 5 Data transmission request in this embodiment

[FIG. 6]



FIG. 6 Data transmission response of the present embodiment

[FIG. 7]

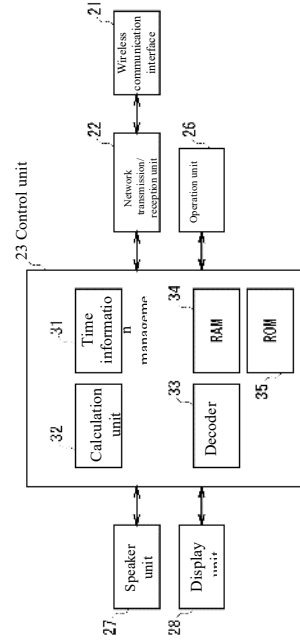


FIG. 7 Circuit configuration of each terminal

[FIG. 8]

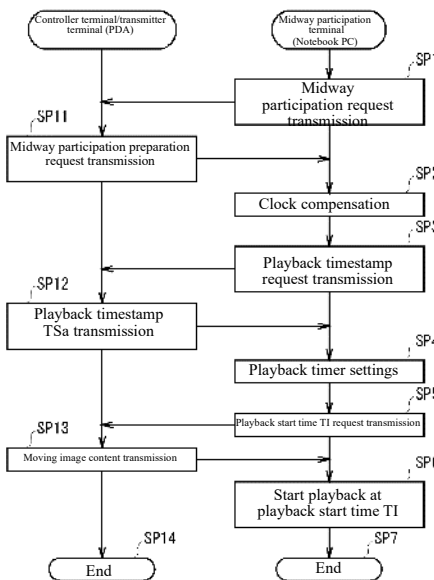


FIG. 8 Midway participation processing procedure

[FIG. 9]

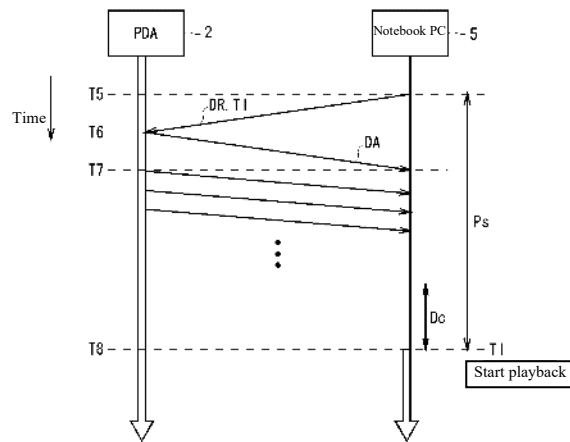


FIG. 9 Calculation of the playback start time of another embodiment (1)

[FIG. 10]

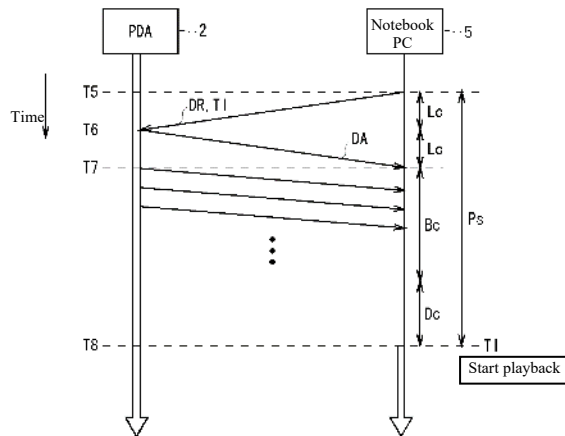


FIG. 10 Calculation of the playback start time of another embodiment (2)

[FIG. 11]



FIG. 11 Data transmission request of another embodiment

[FIG. 12]

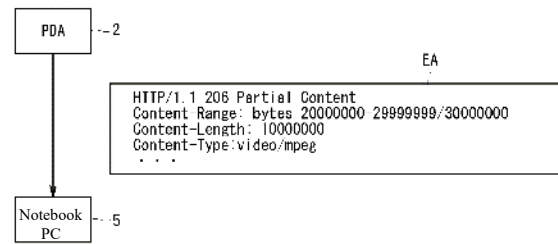


FIG. 12 Data transmission response of another embodiment

[FIG. 13]

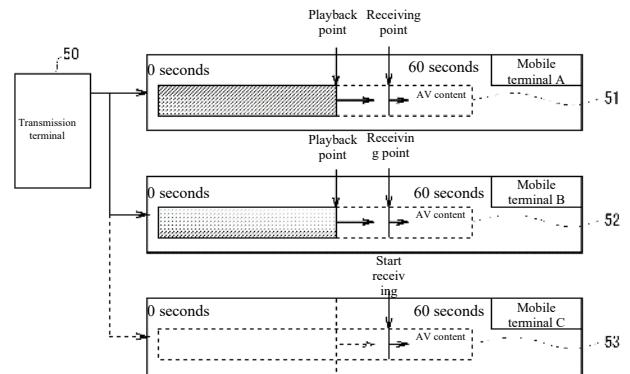


FIG. 13 Midway participation progress in conventional multicast streaming

[FIG. 14]

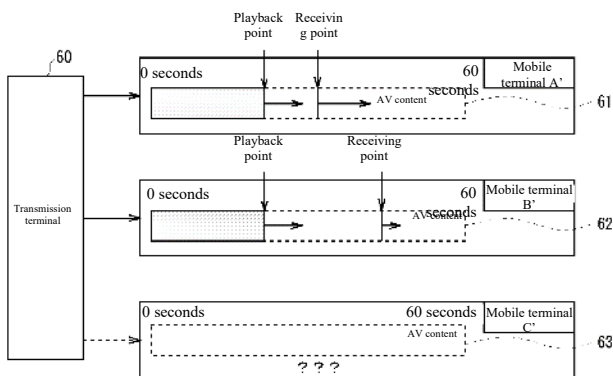


FIG. 14 Midway participation progress in download type streaming